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Regulation in the Behavioral Era

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Article

Regulation in the Behavioral Era

**Michael P. Vandenbergh,[†] Amanda R. Carrico,^{††}
and Lisa Schultz Bressman^{†††}**

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INTRODUCTION

Individuals do not always respond to regulation as *Homo economicus*, and administrative agencies have finally begun to notice.¹ The fact that individuals deviate in predictable ways from neoclassical assumptions of rationality has been widely recognized in the academic literature and has become well known to the public.² But only recently has it begun to shape regulatory policy.³ Agencies have begun to develop regulations

1. RICHARD H. THALER & CASS R. SUNSTEIN, *NUDGE* 6 (2008).

2. See, e.g., DAN ARIELY, *PREDICTABLY IRRATIONAL*, at xx (2008); Christine Jolls et al., *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471, 1471 (1998); Daniel Kahneman & Amos Tversky, *Choices, Values, and Frames*, 39 AM. PSYCHOLOGIST 341, 341 (1984); Matthew Rabin, *Psychology and Economics*, 36 J. ECON. LITERATURE 11, 11 (1998).

3. For recent accounts in popular literature, see Dan Charles, *Leaping the Efficiency Gap*, 325 SCIENCE 804 (2009), and Michael Grunwald, *How Obama Is Using the Science of Change*, TIME, Apr.13, 2009, at 28.

and policies that reflect the insights of behavioral economics,⁴ and the Office of Information and Regulatory Affairs (OIRA) within the Office of Management and Budget (OMB) has introduced behavioral economics to White House review of agency regulations.⁵ As a result, the influence of behavioral economics on agency decisionmaking is likely to grow substantially. Regulation has entered the behavioral era.

Although behavioral research is often referred to as “behavioral economics,” economists are not the only sources of insight for making regulation sensitive to the ways in which individuals depart from the traditional rational-actor model. Somewhat overshadowed in the public and policymaking world are the important insights of other fields within the behavioral and social sciences. These insights suggest, for example, that it may be as important for regulators to account for descriptive and prescriptive norms as for the insights of behavioral economics, such as framing, hyperbolic discounting, loss aversion, and so on.⁶ Taken together, the behavioral and social sciences

4. See, e.g., Letter from Cass R. Sunstein, Adm'r, Office of Info. & Regulatory Affairs, to the Honorable David Strickland, Adm'r, Nat'l Highway Traffic Safety Admin. (Mar. 19, 2010), available at http://www.reginfo.gov/public/postreview/Tire_Fuel_Efficiency_Consumer_Information_Final_Rule.pdf (encouraging the Agency to complete comprehensive studies that reflect principles of behavioral economics, such as promoting easy comparison shopping).

5. See, e.g., OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, 2009 REPORT TO CONGRESS ON THE BENEFITS AND COSTS OF FEDERAL REGULATIONS AND UNFUNDED MANDATES ON STATE, LOCAL, AND TRIBAL ENTITIES 35 (2010), available at http://www.whitehouse.gov/sites/default/files/omb/assets/legislative_reports/2009_final_BC_Report_01272010.pdf (“OMB recommends consideration of behaviorally informed approaches to regulation. Such approaches, rooted in several decades of work in social science, can serve to improve rules by incorporating insights that come from relaxing assumptions usually invoked in neoclassical economic theory. With an accurate understanding of human behavior, agencies would be in a position to suggest innovative, effective, and low-cost methods of achieving regulatory goals.”); see also Memorandum from Cass R. Sunstein, Adm'r, Office of Info. & Regulatory Affairs, to the Heads of Executive Departments and Agencies 1 (June 18, 2010) [hereinafter 2010 OIRA Disclosure Memo], available at http://www.whitehouse.gov/sites/default/files/omb/assets/infoereg/disclosure_principles.pdf (providing “guidance to inform the use of disclosure and simplification in the regulatory process”).

6. Behavioral economics incorporates many of cognitive psychology's findings, and it has become common in the media to apply the term “behavioral economics” to the findings of several fields. See, e.g., Hunt Allcott & Sendhil Mullainathan, *Behavior and Energy Policy*, 327 SCIENCE 1204, 1204–05 (2010); Grunwald, *supra* note 3, at 28. For widely read recent works in social psychology, see NOAH J. GOLDSTEIN ET AL., YES: 50 SCIENTIFICALLY PROVEN WAYS TO BE PERSUASIVE (2008); DOUGLAS MCKENZIE-MOHR & WILLIAM SMITH, FOSTERING SUSTAINABLE BEHAVIOR (1999).

suggest that a multitude of factors beyond price explain the variability in human behavior, and understanding these factors can make regulation more effective.⁷ For simplicity, we refer in this Article to behavioral economics and the related behavioral and social sciences as “behavioral science,” although we note that the term as we refer to it includes a wide range of fields, such as sociology and social psychology, that are more commonly referred to as social science.⁸

Behavioral insights are important at three critical stages in the regulatory process. First, they can help to improve the manner in which agencies develop regulatory options early on in the regulatory process.⁹ A quick illustration is helpful. Although electric cars have the potential to reduce carbon- and other air-emissions, recent studies suggest that their impact and cost may vary dramatically based on whether drivers recharge their vehicles at peak or off-peak periods (e.g., when they arrive home from work, or in the middle of the night).¹⁰

7. See, e.g., W. KIP VISCUSI, FATAL TRADEOFFS: PUBLIC AND PRIVATE RESPONSIBILITIES FOR RISK 153–59 (1992) (arguing that information about risk increases regulations’ effectiveness); John D. Graham & Jonathan Baert Wiener, *Resolving Risk Tradeoffs*, in RISK VERSUS RISK 226, 241–68 (John D. Graham & Jonathan Baert Wiener eds., 1995) (describing regulatory efforts that take into account human behavior); Cass R. Sunstein, *Cognition and Cost-Benefit Analysis*, 29 J. LEGAL STUD. 1059, 1077–88 (2000) (noting that one role of cost-benefit analysis is to correct for decisionmaking by policymakers under pressure from non-rational public responses to risk).

8. We include a number of fields in the term “behavioral science.” See, e.g., GARY S. BECKER & KEVIN M. MURPHY, SOCIAL ECONOMICS (2000) (economic sociology); GOLDSTEIN ET AL., *supra* note 6 (social psychology); Kahneman & Tversky, *supra* note 2 (cognitive psychology); George Loewenstein et al., *Neuroeconomics*, 59 ANN. REV. PSYCHOL. 647 (2008) (neuroeconomics).

9. Section 6(a)(3)(C)(iii) of Executive Order 12,866 directs agencies to analyze “potentially effective and reasonably feasible alternatives to the planned regulation.” Exec. Order No. 12,866 § 6(a)(3)(C)(iii), 3 C.F.R. 638, 645 (1993), reprinted in 5 U.S.C. § 601 (2006); see also Jonathan Baert Wiener, *Mechanism Choice*, in PUBLIC CHOICE AND PUBLIC LAW (Daniel A. Farber & Anne Joseph O’Connell eds., forthcoming 2010) (manuscript at 30–31), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1408163 (discussing the potential influence of behavioral insights on regulatory-instrument choice); 2010 OIRA Disclosure Memo, *supra* note 5, at 3, 9 (identifying principles to assist agencies’ use of information disclosure, simplification, and default rules).

10. See discussion *infra* Part III.A. We use the term “electric cars” to refer to all personal light-duty vehicles that draw some or all of their energy from the electric grid, including plug-in hybrids as well as standard electric cars. The Department of Energy has included deployment of 500,000 plug-in hybrid electric vehicles per year by 2015 in its seven “high priority performance goals.” OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, ANALYTICAL PERSPECTIVES, BUDGET OF THE UNITED STATES GOVERNMENT, FISCAL YEAR 2011, at 79 (2010) [hereinafter ANALYTICAL PERSPECTIVES],

Even though Congress has not passed a statute narrowing the options, the discussion of options already has begun to focus on approaches that reflect the traditional assumption that individuals respond in predictably rational ways to monetary incentives and technological fixes.¹¹ If an agency focuses only on approaches for recharging electric cars based on the price of electricity or the development of new equipment, however, it may miss opportunities for greater emissions reductions at lower cost. For example, increasing electricity rates during peak periods may discourage peak-period recharging, but the magnitude of the price increase necessary to induce the desired level of off-peak recharging may generate consumer and political backlash.¹² By accounting for a more complete range of responses (e.g., the importance of cognitive costs, habits, and hyperbolic discounting), and by combining pricing strategies with behaviorally sensitive solutions (e.g., immediate feedback and normative messaging), an agency may be able to develop alternative or complementary regulatory strategies that are more effective, efficient, and politically viable. Pairing price- and technology-based approaches with behavioral approaches also may produce synergistic gains.¹³ Billions of dollars—and millions of tons of carbon emissions—may be at stake.

Second, behavioral science insights can add value when agencies subject their regulatory options to cost-benefit analysis and when these cost-benefit analyses are subject to OIRA

available at http://www.whitehouse.gov/omb/budget/Analytical_Perspectives (click on “Performance & Management” hyperlink).

11. See discussion *infra* Part III.A; see also Thomas Webler & Seth P. Tuler, *Getting the Engineering Right Is Not Always Enough: Researching the Human Dimensions of the New Energy Technologies*, 38 ENERGY POL’Y 2690, 2691 (2010).

12. AHMAD FARUQUI & LISA WOOD, QUANTIFYING THE BENEFITS OF DYNAMIC PRICING IN THE MASS MARKET 30 (2008), available at http://www.eei.org/ourissues/electricitydistribution/Documents/quantifying_benefits_final.pdf (noting that the level of off-peak to on-peak price shift needed to induce a reduction in peak load demand is often higher than utilities are willing to implement due to the fear of negative customer response).

13. Some evidence for this effect can be found in programs that have paired economic disincentives, such as taxes or fines, with public education campaigns that highlight the moral case for adoption of the target behavior. For example, a tax on plastic grocery bags in Ireland paired with an aggressive media campaign led to a ninety-four percent drop in the use of plastic bags. Elisabeth Rosenthal, *With Irish Tax, Plastic Bags Go the Way of the Snakes*, N.Y. TIMES, Feb. 2, 2008, at A3, available at 2008 WL 1990925.

review.¹⁴ Cost-benefit analysis, which relies heavily on neoclassical economics, was originally intended to reduce regulatory burdens by eliminating regulation with costs in excess of benefits.¹⁵ But such analysis has attracted support from those who have found in it the potential not to eliminate regulation but to improve regulation, by making regulation work better for affected parties.¹⁶ On this account, cost-benefit analysis focuses agency officials on accepted economic criteria for regulation, enabling regulators to resist their own narrow preferences or pressures from an irrational public. As Cass Sunstein has argued, one role of cost-benefit analysis—whether narrowly or broadly construed—is to provide the data necessary to serve as a counterweight to irrational perceptions of and responses to risk.¹⁷ But many have realized that cost-benefit analysis, whatever its theoretical advantages, cannot deliver in practice if it fails to correct for extra-rational responses to regulation. Behavioral insights are useful in this regard.

Third, to the extent that behavioral remedies reduce the economic or political cost of a regulatory measure or increase its effectiveness, behavioral insights can affect not only the specific regulatory measure selected, but also the social goal that a regulatory action is designed to achieve. Lower regulatory costs and greater effectiveness may allow regulators to achieve a more ambitious goal or may save resources for other social investments. In short, behavioral insights may not only affect development and review of particular regulations, but also the selection and achievement of broader social goals.

Although agencies and OIRA have come to recognize the potential of behavioral economics to respond to predictable deviations from traditional rationality assumptions,¹⁸ they lack a

14. See Exec. Order No. 12,866 § 6(a)(C)(iii), 3 C.F.R. at 646 (requiring that agencies “assess both the costs and the benefits of the intended regulation”).

15. NICK HANLEY & CLIVE L. SPASH, *COST-BENEFIT ANALYSIS & THE ENVIRONMENT* 4–6 (1993).

16. See Sunstein, *supra* note 7, at 1096.

17. See *id.* at 1077–88; see also *ANALYTICAL PERSPECTIVES*, *supra* note 10, at 98 (“By drawing attention to the consequences of proposed courses of action, benefit-cost analysis can help the public to evaluate regulatory initiatives.”).

18. See, e.g., SOC’Y FOR RISK ANALYSIS, COMMITTEE OF PAST PRESIDENTS’ RECOMMENDATIONS TO OMB ON REGULATORY REVIEW 5 (2009), available at http://reginfo.gov/public/jsp/EO/fedRegReview/OIRA_EO_12866_revision_SRA_comments.pdf (recommending that OIRA “[e]nhance the role of social and behavioral sciences, regarding how and why people (as individuals or groups) behave and decide in response to risks, opportunities, and uncertainty”); 2010

framework for incorporating these insights into regulatory analysis with anywhere near the rigor of traditional rational-actor-based considerations. Behavioral research demonstrates the extent and limits of rational action, but it does not tell us how to consider what appear to be extra-rational tendencies (e.g., reliance on heuristics, framing effects, or motivational crowding) in regulatory analysis.¹⁹ Nor have legal scholars articulated a framework for incorporating behavioral insights into the regulatory process, despite excellent theoretical work in the area.²⁰

The purpose of this Article is to take an initial step toward developing such a framework. A framework will better enable agencies to apply behavioral analysis in a systematic and concrete fashion.²¹ In this way, it will better enable agencies to apply behavioral analysis in a manner sufficient to achieve its intended results—that is, to prevent agencies from making irrational decisions, either because of their own misperceptions

OIRA Disclosure Memo, *supra* note 5, at 3–12 (providing guidance to agencies on use of behavioral principles in the regulatory process).

19. There is an ongoing debate as to whether the empirical observations reviewed here represent actual departures from rationality or are simply the result of other factors that are consistent with a rational, utility-maximizing agent. See *BOUNDED RATIONALITY* 10 (Gerd Gigerenzer & Reinhard Selten eds., 2001); Richard A. Posner, *Rational Choice, Behavioral Economics, and the Law*, 50 STAN. L. REV. 1551, 1552 (1998). In this Article, we contrast empirical findings from social and behavioral findings with the “thick” conceptions of rationality that have dominated, implicitly if not explicitly, much of the study of law and economics. See Russell B. Korobkin & Thomas S. Ulen, *Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics*, 88 CALIF. L. REV. 1051, 1066, 1070–73 (2000). We do not intend to engage in the debate over the definition of rationality. Instead, we hope to offer a framework for incorporating a greater degree of behavioral realism (regardless of how labeled) into the process of regulatory development, review, and selection. For ease of discussion, we refer to this set of behavioral tendencies as “extra-rational behavior.”

20. See, e.g., Matthew D. Adler, *Bounded Rationality and Legal Scholarship*, in *THEORETICAL FOUNDATIONS OF LAW AND ECONOMICS* 137, 137 (Mark D. White ed., 2010) (identifying the need for legal scholars to account for bounded rationality in the development of legal prescriptions); Grant M. Hayden & Stephen E. Ellis, *Law and Economics After Behavioral Economics*, 55 U. KAN. L. REV. 629, 660–67 (2007) (proposing a behavioral framework that emphasizes the context of human action as an independent factor in the regulatory process); Jolls et al., *supra* note 2, at 1476 (providing a framework for the use of behavioral economics research in law).

21. For a more general framework, see Jolls et al., *supra* note 2, at 1508–45. For the classic example of the development and application of a rigorous framework for legal analysis, see Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089, 1090–111 (1972).

or unanticipated responses from the public. In addition, such a framework will enable agencies to generate data about behavioral effects and will reveal areas for further research. Behavioral analysis is likely to develop incrementally. A framework will accelerate the pace of learning.

Without a framework like that in question, agencies may not only miss an opportunity to use behavioral analysis to improve the efficacy and efficiency of regulation, but they may use behavioral analysis in a way that actually decreases the effectiveness of regulation. Important insights may simply be overlooked in the thicket of published studies. As with traditional price-based mechanisms, behavioral measures may, at times, lead to counterproductive results, particularly when not implemented properly.²² Or behavioral analysis may be used selectively to support desired outcomes and ignored when contrary to desired outcomes.²³ At the same time, it may be used without the necessary transparency to facilitate judicial review of regulation,²⁴ or to promote congressional oversight.²⁵ In this sense, it may decrease the accountability of regulation.²⁶ At a

22. See, e.g., W. Kip Viscusi, *The Lulling Effect: The Impact of Child-Resistant Packaging on Aspirin and Analgesic Ingestions*, 74 AM. ECON. REV. 324, 326–27 (1984) (documenting that the proportion of accidental aspirin ingestions from safety-capped bottles rose sharply after the introduction of child-resistant bottle caps); W. Kip Viscusi & Gerald Cavallo, *Safety Behavior and Consumer Responses to Cigarette Lighter Safety Mechanisms*, 17 MANAGERIAL & DECISION ECON. 441, 456 (1996) (suggesting that regulators consider consumer responses to product safety improvements and consider pairing technological approaches with hazard warnings and consumer education).

23. See Lisa Schultz Bressman & Michael P. Vandenbergh, *Inside the Administrative State: A Critical Look at the Practice of Presidential Control*, 105 MICH. L. REV. 47, 94–95 (2006) (noting that the selective presidential control of agency regulation, as exercised in part through OIRA, can undermine the legitimacy of such regulation). A related danger is that ad hoc review will enable agencies to overvalue one consideration at the expense of others. Many have argued that OIRA overemphasizes consideration of costs at the expense of benefits, which can tilt regulation in an antiregulatory direction. See, e.g., Nicholas Bagley & Richard L. Revesz, *Centralized Oversight of the Regulatory State*, 106 COLUM. L. REV. 1260, 1262–63 (2006) (arguing that uneven application of cost-benefit analysis by OIRA can lead to a deregulatory bias).

24. See Elena Kagan, *Presidential Administration*, 114 HARV. L. REV. 2245, 2331–39 (2001) (noting the importance of transparency in the OMB and of greater White House control of agency regulation).

25. See Mathew D. McCubbins et al., *Administrative Procedures as Instruments of Political Control*, 3 J.L. ECON. & ORG. 243, 254–58 (1987) (arguing that congressional monitoring of agency regulation depends in part on constituent access to information about such regulation).

26. See Lisa Schultz Bressman, *Procedures as Politics in Administrative Law*, 107 COLUM. L. REV. 1749, 1805–07 (2007) (arguing that congressional

minimum, a framework will help on these fronts by promoting the regularity and transparency of behavioral analysis as well as the rationality and accountability of regulation.

The framework that we present can be described succinctly as follows.²⁷ An agency will ask whether the targeted behavior occurs in any of the situations under which individuals are likely to depart from traditional rationality assumptions. When developing new rules or policies, agencies will account for these extra-rational responses. When justifying a regulation under cost-benefit analysis, an agency will include behavioral considerations alongside more traditional ones. Accounting for behavioral insights may induce the agency to adopt a different regulatory option or different mix of options. For example, an energy regulation that involves electric cars may have fewer costs and greater benefits if coupled with a plan that includes behavioral measures to induce drivers to recharge at optimal hours; and it might have fewer costs and greater benefits than entirely different alternatives directed at the transportation sector.

Our framework also includes an important assumption about behavior that is easily overlooked in the regulatory process—that people are concerned with social outcomes in addition to monetary outcomes (i.e., wealth). For example, as discussed in more detail below, people seek social status within valued social groups and social inclusion (e.g., descriptive norms), and they seek to avoid social sanctions (e.g., injunctive norms). Furthermore, as with monetary outcomes, they seek social outcomes in both rational and extra-rational ways. As in other social and behavioral sciences, a number of economists have explored the role of preferences for social outcomes in economic models.²⁸ The framework we articulate is an attempt to

oversight, particularly when coupled with White House regulatory review, can improve the accountability of agency regulation).

27. In developing our framework, we build on earlier work that examined the implications of behavioral economics for cost-benefit analysis. See Adler, *supra* note 20, at 155–62; Jolls et al., *supra* note 2, at 1481–85; Sunstein, *supra* note 7, at 1060–61; Cass R. Sunstein, *Willingness to Pay vs. Welfare*, 1 HARV. L. & POL'Y REV. 303, 315–16 (2007).

28. For instance, the desires for fairness, altruistic tendencies, and morality have been extensively researched within economics. See, e.g., Kjell Arne Brekke et al., *An Economic Model of Moral Motivation*, 87 J. PUB. ECON. 1967, 1968 (2003) (examining the role of moral self-image in influencing prosocial behavior); Catherine C. Eckel & Philip J. Grossman, *Altruism in Anonymous Dictator Games*, 16 GAMES & ECON. BEHAV. 181, 188 (1996) (examining altruism as a motivating factor in behavior); Matthew Rabin, *Incorporating Fairness*

incorporate recent theoretical and empirical advancements regarding bounded rationality into a simple framework to be used in the regulatory process.²⁹

To implement these insights, our framework does not jettison the classical economic track that focuses largely on the role of monetary outcomes in an individual's utility function. However, we conceptualize this track as containing two prongs, one that assumes rational action and one that takes account of predictable extra-rational action. We also introduce a parallel track that assumes individuals are concerned with social outcomes. Although social outcomes in theory can be incorporated into traditional approaches to utility maximization, too often social outcomes are not fully accounted for in the regulatory development, review, and selection process.³⁰ As with monetary outcomes, we assume that individuals consider social outcomes in both rational and extra-rational ways. Under the rational actor prong of the social outcomes track, we examine the effects of social influences (e.g., descriptive norms and status) on decisionmaking. As with monetary outcomes, understanding the effects of inadequate information is an important part of the analysis. After evaluating rational responses to social signals, an agency would move to the second prong. Substantively, this prong includes behavioral tendencies that deviate from expectations based on a socially rational actor. In some cases these tendencies mirror the behavioral quirks discussed in the behavioral economics literature, such as framing effects. In other cases, these deviations are specific to social outcomes, such as commitment effects or the development of personal norms.

When we organize the analytical framework in this way, it becomes apparent that accounting for extra-rational responses to social outcomes is an essential, but largely underappreciated, area of regulatory analysis. If cost-benefit analysis can account for rational and extra-rational action regarding monetary outcomes, it also can account for rational and extra-

into *Game Theory and Economics*, 83 AM. ECON. REV. 1281, 1282 (1993) (presenting a framework to study implications of fairness in economic situations).

29. See, e.g., Daniel Kahneman, *A Perspective on Judgment and Choice: Mapping Bounded Rationality*, 58 AM. PSYCHOLOGIST 697, 697–720 (using the term “bounded rationality” as the notion that human decisionmaking is bounded by cognitive and informational constraints).

30. See, e.g., MATTHEW D. ADLER & ERIC A. POSNER, *NEW FOUNDATIONS OF COST-BENEFIT ANALYSIS* 68–73 (2006); Adler, *supra* note 20, at 160 (noting that cost-benefit analysis is “the traditional technique for implementing wealth-maximization and Kaldor-Hicks efficiency”).

rational action regarding social outcomes.³¹ Legal scholars have hinted at the issue, noting that some behavior responds to social signals rather than pricing signals—for example, placing an emoticon (sad face) on a high electric bill has the potential to reduce future energy usage.³² But scholars have not fully integrated this intuition into an analytical framework. Furthermore, they have not explored how individuals sometimes react to social signals in a manner that appears to conflict with what is socially optimal to that individual, just as individuals react to pricing signals in ways that produce suboptimal monetary outcomes.

To make the second prong workable under both the monetary and social outcome assumptions, we add another refinement. Drawing on social psychology and sociology, we argue that agencies should consider the multiple levels of influence on decisionmaking, including individual-level factors (e.g., income and cognition) and social and community-level factors (e.g., local infrastructure and peer groups). Although it is not possible to incorporate variables at all levels and the analysis will not yield a simple quantitative outcome, this addition to the framework provides a means for mapping the points of influence on behavior and identifying convergent or competing influences. Agencies that recognize opportunities for synergistic policy mechanisms (such as normative messaging to reinforce a price signal) can take advantage of these opportunities. Similarly, variables that may cause a policy to be ineffective (e.g., infrastructure limitations) can be considered in regulatory design.

After we sketch our framework, we apply it to two concrete examples: policies to encourage electric cars, as mentioned above, and policies to encourage investments in energy efficient appliances.³³ We show that accounting for behavioral insights

31. Cf. Calabresi & Melamed, *supra* note 21, at 1119–20 (identifying a matrix including property rules and liability rules with entitlements assigned to polluters or victims, and noting that the framework leads to the insight that a liability-rule-protected entitlement might be assigned to a polluter as well as a victim). The importance of analyzing non-rational responses to social outcome maximization emerges from our framework in a similar way. See discussion *infra* Part II.A.2.b.

32. See THALER & SUNSTEIN, *supra* note 1, at 68–69.

33. Individual and household behavioral changes could reduce U.S. carbon emissions by seven percent in ten years. See Thomas Dietz, Gerald T. Gardner, Jonathan Gilligan, Paul C. Stern & Michael P. Vandenbergh, *Household Actions Can Provide a Behavioral Wedge to Rapidly Reduce U.S. Carbon Emissions*, 106 PROC. NAT'L ACAD. SCI. 18,452, at 18,452 (2009).

may require agency officials to suspend intuition regarding the most effective ways to influence behavior and to frame information. We also show that agency officials may need to develop more comprehensive and creative policy measures. Using these examples, we show that the payoffs for well-designed programs can be substantial.

We do not resolve all uncertainties in the application of our framework. The behavioral research of the last several decades has not provided all of the information that agency officials need to consider preferences regarding social outcomes comprehensively. We expect that behavioral analysis will develop incrementally and cautiously, just as cost-benefit analysis did in its early years when it focused only on cost effectiveness and was only able to draw on limited or experimental data to support various aspects of the analysis.³⁴ Thus, we expect that agencies will conduct behavioral analysis in some cases with less data than what has come to be expected for modern cost-benefit analysis. But that will change over time, and will do so sooner as a result of the systematic application of the type of analysis that our framework facilitates. As we note above, our framework also identifies promising new areas for behavioral research. Such research could provide the data that would allow agency officials to design policies that reflect behavioral insights, and would facilitate more rigorous evaluation of the costs and benefits of such policies.³⁵ In particular, it may be necessary to develop new lines of research within social psychology and sociology to examine extra-rational patterns of behavior in pursuit of social outcomes. It also may be necessary for agencies and OIRA to add social psychologists, sociologists, and other behavioral experts to their regulatory teams.³⁶

If agencies identify early wins using behavioral and social science insights, the current momentum will continue. Similarly, if OIRA continues to signal that it values and takes the im-

34. In the Carter Administration, economic analysis of regulations was conducted to determine only the cost effectiveness of regulatory actions. See Robert W. Hahn & Cass R. Sunstein, *A New Executive Order for Improving Federal Regulation? Deeper and Wider Cost-Benefit Analysis*, 150 U. PA. L. REV. 1489, 1505–06 (2002). Benefits analysis was added in the Reagan Administration. *Id.*; see also W. Kip Viscusi, *Risk Equity*, 29 J. LEGAL STUD. 843, 854 (2000).

35. For a discussion of regulatory instrument choice, see Jonathan Baert Wiener, *Global Environmental Regulation: Instrument Choice in Legal Context*, 108 YALE L.J. 677, 679–80, 704–35 (1999).

36. The recent OIRA memorandum on the use of behavioral approaches notes the importance of consulting with behavioral scientists and of conducting rigorous empirical studies. See 2010 OIRA Disclosure Memo, *supra* note 5, at 5.

plications seriously, then agencies are more likely to follow suit.³⁷ We also can imagine that certain administrative law requirements might help prompt agency officials to consider seriously the findings of behavioral analysis. If behavioral analysis is necessary to a rational decision, then courts can ensure that agencies consider it under the “arbitrary and capricious” standard of the Administrative Procedure Act.³⁸ And if agencies rely on behavioral analysis in making a decision, then courts can review the adequacy of the analysis.³⁹ It is not our goal to address these issues until we see the effects of a more systematic application of behavioral analysis.⁴⁰

Finally, we do not attempt to wade into the debate about the precise form of cost-benefit analysis that agencies or OIRA should perform,⁴¹ or whether entirely different alternatives are preferable.⁴² Whether conducted as a part of traditional cost-benefit analysis, as a parallel process that yields results that accompany the results of the cost-benefit analysis, or as a part of some alternative process, we believe that a structured, rigorous approach to behavioral insights will enhance the likelihood that agencies will make effective, rational, and accountable decisions.

37. *Id.*

38. See 5 U.S.C. § 706(2) (2007); *Motor Vehicle Mfrs. Ass’n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 42–43 (1983) (interpreting the “arbitrary and capricious standard” of the Administrative Procedure Act to require that agencies demonstrate that they have considered all relevant factors and all important aspects of a problem).

39. See *SEC v. Chenery Corp.*, 318 U.S. 80, 95 (1943) (requiring the Agency to reveal the actual basis on which it relied and declining to uphold the agency’s decision on any other basis).

40. Likewise, we do not and cannot address whether behavioral or traditional economic analysis should prevail in cases of conflict. Our framework does not purport to provide a fully integrated model; indeed, pursuit of such a model is akin to pursuit of the Holy Grail. These sorts of issues are not exclusive to behavioral analysis. In some sense, they are present in the classic conflict between agency expertise and political accountability in administrative law. See Jody Freeman & Adrian Vermeule, *Massachusetts v. EPA: From Politics to Expertise*, 2007 SUP. CT. REV. 51 (2008) (using the Supreme Court’s decision in *Massachusetts v. EPA*, 549 U.S. 497 (2007), to discuss the tension between administrative expertise and political accountability). When technocratic judgment and political responsiveness point in different directions, agencies are forced to make a choice (and sometimes courts may have a say as well).

41. See, e.g., ADLER & POSNER, *supra* note 30, at 68–100.

42. See, e.g., Daniel A. Farber, *Rethinking the Role of Cost-Benefit Analysis*, 76 U. CHI. L. REV. 1355, 1379–96 (2009) (arguing that the European regulatory model is a superior alternative to cost-benefit analysis for regulating toxic chemicals).

This Article proceeds in four Parts. In Part I, we discuss the role of models for predicting behavior in regulatory development and review, and the limits of the price mechanism that often is the selected regulatory instrument for problems analyzed using the dominant rational-actor model. Part II suggests an analytical framework to ensure that behavioral insights fulfill their promise of improving the efficacy of regulation while simultaneously promoting the rationality and accountability of regulation. To illustrate the framework, Part III then applies it to regulatory actions aimed at improving energy efficiency and reducing carbon emissions. This Article concludes that the proposed analytical framework is an important first step in the process of incorporating behavioral insights into regulatory development and review and ultimately the selection of regulatory objectives.

I. MODELS FOR PREDICTING BEHAVIOR: THEORETICAL BACKGROUND

In this Part, we describe the regulatory environment in which behavioral economics and social science research has emerged. Specifically, we discuss the role of models for predicting behavior in regulatory development, review, and selection. We show that a rational-actor model leads to a heavy reliance on the price mechanism, which seeks to change behavior by increasing the monetary cost of undesired behaviors and decreasing the cost of desired behaviors. Furthermore, we examine the limits of the price mechanism for predicting behavior and show that consideration of complementary or alternative regulatory instruments will often lead to more effective, efficient, and politically viable regulation.

A. THE IMPORTANCE OF MODELS FOR PREDICTING BEHAVIOR

Agencies use implicit or explicit models when evaluating the anticipated response of regulated entities, whether individuals or firms, to various regulatory instruments.⁴³ The model that an agency selects affects its regulatory initiative from inception through OMB regulatory review to agency regulatory adoption and judicial review.⁴⁴ Whether an agency chooses to

43. Cf. Kahneman, *supra* note 29, at 705–06 (discussing how assumptions about and models of human behavior frame decisions that aim to maximize utility).

44. Cf. Gregory Scott Crespi, *The Fatal Flaw of Cost-Benefit Analysis: The Problem of Person-Altering Consequences*, 38 ENVTL. L. REP. 10,703, at 10,703

adopt a regulatory directive (e.g., a traditional command-and-control regulation), an economic incentive (e.g., tax, subsidy, or cap-and-trade scheme), a liability scheme, an informational disclosure requirement, or other measure, it must consider the expected response of the regulated community. In fact, this consideration affects all aspects of the policy choice, including the level of resources the agency devotes to the effort, which regulatory tool (if any) it ultimately selects from the alternatives, and the outcome the regulatory tool is expected to achieve.

Yet agencies face barriers in evaluating the effects of regulation on the regulated community. Among the leading barriers is the inability of simple models to predict responses to interventions by the regulated community, such as efforts designed to reduce energy use and carbon emissions.⁴⁵ For example, price is an important factor, but household energy strategies that rely on assumptions of rational responses to price signals (e.g., increasing the price of electricity to induce efficiency and conservation) or price signals combined with new technologies often yield disappointing results.⁴⁶ In the absence of an accessi-

n.1 (2008) ("Prospective cost-benefit analyses of rulemaking initiatives and subsequent OIRA review (and, upon occasion, also judicial review) now appear to be entrenched as a significant feature of the federal regulatory process." (citation omitted)).

45. See Paul C. Stern, *Toward a Coherent Theory of Environmentally Significant Behavior*, 56 J. SOC. ISSUES 407, 419–20 (2000); Michael P. Vandenbergh, *Order Without Social Norms: How Personal Norms Can Protect the Environment*, 99 NW. U. L. REV. 1101, 1103–06 (2005); Charlie Wilson & Hadi Dowlatabadi, *Models of Decision Making and Residential Energy Use*, 32 ANN. REV. ENV'T & RESOURCES 169, 189 (2007). Our focus here is on individuals and households, although many of the behavioral insights are relevant to the behavior of small businesses, large corporations, and nonprofit organizations as well. Of course, behavioral analysis could just provide policymakers with a means to "avoid painful but more effective solutions rooted in traditional economics," such as removing subsidies or introducing taxes. George Loewenstein & Peter Ubel, *Economics Behaving Badly*, N.Y. TIMES, July 15, 2010, at A31, available at 2010 WLNR 14148206; see also Gregory Mitchell, *Why Law and Economics' Perfect Rationality Should Not Be Traded for Behavioral Law and Economics' Equal Incompetence*, 91 GEO. L.J. 67, 72 (2002) (positing that a middle ground between perfect rationality and equal incompetence illuminates ways the legal system may foster rational or counter-irrational behavior). We note that behavioral measures need not displace traditional regulatory measures, however. In many cases, behavioral measures may supplement traditional measures or may fill gaps when public support is lacking for such measures.

46. See, e.g., Paul C. Stern, *Blind Spots in Policy Analysis: What Economics Doesn't Say About Energy Use*, 5 J. POL'Y ANALYSIS & MGMT. 200, 210–11 (1986) (noting that when the monetary value of price incentives for energy ef-

ble account that reflects the complex influences on behavior, regulators all too often appear to rely solely on the price mechanism or to fall back on common intuitions. The magnitude of the price increase necessary to achieve the desired behavior change solely from financial incentives, however, often undermines the political viability of the price mechanism.⁴⁷ In addition, approaches that do not account for behavioral insights may discourage the development of more viable policy options and can even lead to counterproductive results.⁴⁸

B. THE EXTENT AND LIMITS OF RATIONAL ACTION

Rational choice theory (RCT) underlies the dominant model for analysis of regulatory policy alternatives, including those that affect individuals and households. Although there are multiple interpretations of RCT,⁴⁹ a common assumption is that individuals are rational actors whose decisions are driven by the desire to maximize utility given resource constraints.⁵⁰ RCT, at its core, assumes that individuals hold stable preferences and seek out the necessary information regarding their set of options prior to making a decision. Ultimately, decisions are made on the basis of a deliberate analysis of the expected payoffs of a set of options, considering both their desirability and their probability of occurring. A choice is considered ra-

ciency investments are held constant, participation rates can vary by a factor of ten due to non-price-related factors).

47. See, e.g., W. Ross Morrow et al., *Analysis of Policies to Reduce Oil Consumption and Greenhouse-Gas Emissions from the U.S. Transportation Sector*, 38 ENERGY POL'Y 1305, 1317–18 (2010) (concluding that a price of gasoline between \$5.00 and \$7.00 per gallon would be necessary to achieve a fourteen percent U.S. reduction in greenhouse gas emissions below 2005 levels by 2025).

48. See, e.g., Robert B. Cialdini, *Crafting Normative Messages to Protect the Environment*, 12 CURRENT DIRECTIONS PSYCHOL. SCI. 105, 108–09 (2003) (noting that public education campaigns that communicate that an undesirable behavior is “regrettably frequent” can lead to an increase in the undesirable behavior by sending the descriptively normative message that the behavior is common and therefore acceptable); Michael P. Vandenbergh, *Beyond Elegance: A Testable Typology of Social Norms in Corporate Environmental Compliance*, 22 STAN. ENVTL. L.J. 55, 104–05, 115 (2003) (discussing studies on the unintended effects of regulatory interventions on tax compliance); Viscusi, *supra* note 22, at 326–27 (discussing unintended consequences of child-resistant bottle caps).

49. For a discussion of the interpretations of the rational-actor model, see Korobkin & Ulen, *supra* note 19, at 1070–74.

50. For a discussion of the assumptions and variations of rational choice theory, see Andrew M. Colman, *Cooperation, Psychological Game Theory, and Limitations of Rationality in Social Interaction*, 26 BEHAV. & BRAIN SCI. 139, 139–43 (2003), and Korobkin & Ulen, *supra* note 19, at 1060–66.

tional if there is no alternative that provides a more optimal outcome to the individual.⁵¹

The specific criteria by which the utility of an outcome is measured have been heavily disputed by those within the behavioral sciences. In the narrowest application of RCT, individual utility is measured largely in terms of monetary self-interest.⁵² As such, nonmonetary benefits such as social inclusion or an environment free of litter are generally assumed to be excluded from the cost-benefit calculations of rational individuals.⁵³ Given the wealth of behavioral data to suggest a broader set of motivations are in play, many economists no longer subscribe to this limited interpretation of self-interest.⁵⁴ However, this approach remains prominent within law and economics at least implicitly, as seen in the types of policy mechanisms that are often advocated.⁵⁵ A number of potential reasons may explain the continued persistence of this approach. First, a rigid view of individual utility does allow for a clearly defined baseline from which to develop behavioral predictions, which the more expanded interpretations of rationality do not provide. Although a substantial degree of variance may exist in how individuals respond to price mechanisms, the thick version of RCT allows for clear predictions about those responses in the aggregate.⁵⁶ An expanded definition of utility may require agencies to spend substantial time and money on research into the effectiveness of regulatory alternatives. Simi-

51. For a more detailed discussion of rational choice theory, see GARY S. BECKER, *THE ECONOMIC APPROACH TO HUMAN BEHAVIOR* 3–14 (1976); Colman, *supra* note 50, at 139–43; and Korobkin & Ulen, *supra* note 19, at 1060–66.

52. See Adler, *supra* note 20, at 158–59; Korobkin & Ulen, *supra* note 19, at 1064–65; see also Ann E. Carlson, *Recycling Norms*, 89 CALIF. L. REV. 1231, 1237–38 & n.12 (2001) (noting that measuring utility entirely based on monetary incentives is often described as a “thick” approach to utility).

53. Korobkin & Ulen, *supra* note 19, at 1065.

54. See, e.g., Loewenstein et al., *supra* note 8, at 661 (noting that the position that individuals act only according to pure self-interest is a minority position within economics); Posner, *supra* note 19, at 1551–52 (explaining his broadly defined interpretation of rational action as well as the point that the economic analysis of law has “long ago abandoned the model of hyper rational, emotionless, unsocial, supremely egoistic, nonstrategic man (or woman)”).

55. See Robert E. Scott, *The Limits of Behavioral Theories of Law and Social Norms*, 86 VA. L. REV. 1603, 1622 n.39 (2000); see also Loewenstein & Ubel, *supra* note 45, at A31.

56. See Korobkin & Ulen, *supra* note 19, at 1057 n.18 (positing that aggregate behavior follows predictions of rational choice theory even where individuals deviate from that behavior, so long as those deviations are symmetrically distributed).

larly, regulations that anticipate individual variation in responses to law and policy may require a substantial degree of segmentation and tailoring to regulatory targets. Again, although potentially more effective, the broader approach sacrifices scalability and therefore may not be feasible in some circumstances.

In the broadest applications of RCT, individuals are conceived of as rational in the sense that they act deliberately to maximize their own interests; yet the individual's interests are subjectively defined.⁵⁷ Thus, an individual could act to maximize objectively defined monetary outcomes or subjectively defined social outcomes. However, in both cases one should expect that the individual will act in a manner that is consistent with his or her own goals. It is this version of RCT that has been most often applied by psychologists and those in the social sciences, as well as a growing number of economists, because it accommodates both monetary and social drivers of behavior such as group membership and social norms.⁵⁸ The emphasis on subjective, rather than objective, well-being is largely due to a growing field of research that has revealed a host of non-monetary motivators that influence decisionmaking, sometimes to the point of overwhelming the role of financial self-interest. For example, a preference for the status quo leads many to maintain retirement plans that are economically suboptimal and unnecessarily risky.⁵⁹ Similarly, social dilemma experiments have shown that despite predictions based on a rational-actor model, individuals display a remarkable willingness to cooperate in some situations.⁶⁰ This is particularly true when

57. See Carlson, *supra* note 52, at 1237–38 (noting that this is often described as a “thin” approach to utility). For a discussion of thin conceptions of utility, see Jolls et al., *supra* note 2, at 1479 (discussing “bounded self-interest”), and Korobkin & Ulen, *supra* note 19, at 1061–62.

58. See Robyn M. Dawes, *Social Dilemmas*, 31 ANN. REV. PSYCHOL. 169, 175–78 (1980) (discussing an expanded definition of utility that includes non-monetary outcomes); Posner, *supra* note 19, at 1551–52.

59. William Samuelson & Richard Zeckhauser, *Status Quo Bias in Decision Making*, 1 J. RISK & UNCERTAINTY 7, 31–33 (1988).

60. In a meta-analysis of over one hundred social dilemma experiments, David Sally found an average cooperation rate of forty-seven percent within one-shot Prisoner's Dilemma games, although cooperation varied widely depending on the situational variables manipulated in the studies. David Sally, *Conversation and Cooperation in Social Dilemmas: A Meta-Analysis of Experiments From 1958 to 1992*, 7 RATIONALITY & SOC'Y 58, 60–62 (1995). In their review of this literature, Robyn Dawes and Richard Thaler state that cooperation rates in one-shot social dilemmas typically range between forty and sixty percent, even though rational choice theory (where utility is measured by

the individual feels a sense of social connectedness or reciprocity with the other individuals involved in the dilemma.⁶¹ Other work finds that individuals will go to great lengths to conform to the attitudes and beliefs of those around them, even when conforming violates known facts or one's own ideological worldview.⁶²

In addition to questions about the definition of self-interest, additional work within the behavioral sciences has questioned whether we can assume that individuals actually make calculated considerations of costs and benefits, even when self-interest is expanded to include noneconomic drivers of behavior. For example, empirical studies have challenged the view that individuals truly hold a set of stable preferences, as is presumed by RCT. Psychologists and behavioral economists have found that preferences are highly contingent on factors such as how choices are framed and the temporal distance between costs and benefits.⁶³ The seminal work of Daniel Kahneman and Amos Tversky revealed that humans rely heavily on decisional heuristics that reduce cognitive effort, but

monetary self-interest) would predict a zero percent cooperation rate. Robyn M. Dawes & Richard H. Thaler, *Anomalies: Cooperation*, 2 J. ECON. PERSP. 187, 188–89 (1988).

61. See Robyn M. Dawes & David M. Messick, *Social Dilemmas*, 35 INT'L J. PSYCHOL. 111, 114 (2000) (noting that social identification with others involved in social dilemmas leads to greater levels of cooperation); Peter Kollock, *Social Dilemmas: The Anatomy of Cooperation*, 24 ANN. REV. SOC. 183, 195–97 (1998) (reviewing literature on the influence of reciprocity norms on decision-making in social dilemmas).

62. For example, Solomon Asch demonstrated that roughly one-third of individuals will give an obviously incorrect answer to a simple line judgment task when that answer is given by the others in the room. Solomon E. Asch, *Effects of Group Pressure Upon the Modification and Distortion of Judgments*, in GROUPS, LEADERSHIP AND MEN 177, 177–81, 186 (Howard Guetzkow ed., 1951). Geoffrey Cohen has found that support of a welfare policy among liberals and conservatives depends more on whether the policy is endorsed by a Republican or Democrat than on the actual content of the policy. Geoffrey L. Cohen, *Party Over Policy: The Dominating Impact of Group Influence on Political Beliefs*, 85 J. PERS. & SOC. PSYCHOL. 808, 819 (2003).

63. See Stephen J. Hoch & George F. Loewenstein, *Time-Inconsistent Preferences and Consumer Self-Control*, 17 J. CONSUMER RES. 492, 497 (1991) (discussing the impact of temporal proximity on consumer preferences); Kahneman & Tversky, *supra* note 2, at 143–44 (discussing how the framing of possible outcomes may change individual preferences); Amos Tversky & Daniel Kahneman, *The Framing of Decisions and the Psychology of Choice*, 211 SCIENCE 453, 453–58 (1985) (discussing how the framing of prospects, contingencies, and outcomes can lead to preference reversals).

these decision rules often lead to suboptimal outcomes.⁶⁴ Even when the motivation is to conform to a social norm, individuals do not always appear to make a deliberate or calculated decision about many behaviors.⁶⁵

Despite its shortcomings, RCT continues to be a dominant model in legal and policy frameworks.⁶⁶ As mentioned, it provides a clear starting place from which to make behavioral predictions. Meanwhile, psychological and sociological theories that offer a more nuanced understanding of human behavior are often applied on an ad hoc basis.⁶⁷ Predictions and tests of those predictions are often specific to a single outcome variable, or subset of behaviors.⁶⁸ Although this approach may allow for a more detailed understanding of the variables that influence specific behaviors within certain populations, it fails to offer a simple and comprehensive model that can be applied across multiple contexts and groups.⁶⁹ Furthermore, without the pressure that has existed within law and economics to develop a single, overarching framework and broadly applicable laws and policies,⁷⁰ psychology and sociology have suffered from theory inflation. The litany of models and variables that have been revealed to influence behavior has seemed to spiral out of control

64. See, e.g., Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, in JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES 3, 3–20 (Daniel Kahneman et al. eds., 1982) (reviewing several judgmental heuristics and the cognitive biases they tend to produce). For a review of cognitive heuristics in decisionmaking, see Daniel Kahneman, *Maps of Bounded Rationality: Psychology for Behavioral Economics*, 93 AM. ECON. REV. 1449 (2003).

65. Jessica Nolan and her coauthors found that while individuals believed that the behavior of their neighbors had little impact on their own energy-use behaviors, the data showed that descriptive norms were the strongest predictor of actual behavior. Jessica M. Nolan et al., *Normative Social Influence Is Underdetected*, 34 PERSONALITY SOC. PSYCHOL. BULL. 913, 920–21 (2008).

66. See Wilson & Dowlatabadi, *supra* note 45, at 172 (analyzing rational choice as a building block of economic theory).

67. See, e.g., Rabin, *supra* note 2, at 12 (listing multiple theories of economically relevant psychology that he does not apply to his analysis).

68. See Bernice A. Pescosolido, *Beyond Rational Choice: The Social Dynamics of How People Seek Help*, 97 AM. J. SOC. 1096, 1102 (1992) (describing how certain actions or choices are targeted for testing, while others are ignored).

69. See, e.g., Eric A. Posner, *Law and Social Norms: The Case of Tax Compliance*, 86 VA. L. REV. 1781, 1788–89 (2000) (concluding that the effects of personal norms are not valuable for explaining tax behavior); Scott, *supra* note 55, at 1622 n.39 (explaining that personal norms are not consistent with environmental behavior).

70. See, e.g., Wilson & Dowlatabadi, *supra* note 45, at 172 (describing rational choice theory as background to economics and policy decisions).

in some cases.⁷¹ Identical or nearly identical theories or constructs are often referred to under different names across sub-disciplines (and even sometimes within a subdiscipline).⁷² This has created a sense of confusion among those who are not trained within these disciplines and has led many to embrace the more simplified rational-choice model for its parsimony, if not its precision.⁷³

The continued reliance on RCT has had several effects on regulatory decisionmaking. Foremost, it has fostered continued reliance on price mechanisms as regulatory instruments.⁷⁴ Whether through regulation, Pigouvian taxes and subsidies, or Coasian cap-and-trade measures, regulators often seek to change behavior by increasing the monetary cost of undesirable behavior or lowering the price of desirable behavior.⁷⁵ Although it is clear that prices affect behavior, the degree of variance in response to price-based mechanisms is often overlooked. For example, energy efficiency policies and programs around the country have predominantly operated under the theory that cost-effective technologies and practices will sell themselves.⁷⁶ Rational-actor models assume that if cost structures are favorable to the consumer, individuals will behave rationally.⁷⁷ Yet, decades of research suggest that, despite a preponderance of cost-effective options, only a limited investment in these tech-

71. See, e.g., Rabin, *supra* note 2, at 12 (listing a multitude of psychology theories that researchers use to explain behavior).

72. This problem has been noted by multiple researchers within psychology and is sometimes referred to as the “jangle fallacy.” See, e.g., Jack Block, *Three Tasks for Personality Psychology*, in DEVELOPMENTAL SCIENCE AND THE HOLISTIC APPROACH 155, 156–57 (Lars R. Bergman et al. eds., 2000); see also Michael W. Katzko, *The Rhetoric of Psychological Research and the Problem of Unification in Psychology*, 57 AM. PSYCHOL. 262, 264–69 (2002).

73. See Stern, *supra* note 46, at 200–01 (explaining how policy analysts use the simplified rational-actor theory).

74. See, e.g., Morrow et al., *supra* note 47, at 1307–08 (examining several federal programs using financial incentives to influence individual behavior).

75. See LOREN LUTZENHISER ET AL., CAL. INST. FOR ENERGY AND ENV’T, BEHAVIOR AND ENERGY PROGRAM, BEHAVIORAL ASSUMPTIONS UNDERLYING CALIFORNIA RESIDENTIAL SECTOR ENERGY EFFICIENCY PROGRAMS 20–24 (2009), available at http://uc-ciee.org/pubs/ref_behavior.html; MICHAEL J. SULLIVAN, CAL. INST. FOR ENERGY AND ENV’T, BEHAVIOR AND ENERGY PROGRAM, BEHAVIORAL ASSUMPTIONS UNDERLYING ENERGY EFFICIENCY PROGRAMS FOR BUSINESSES 21–24 (2009), available at http://uc-ciee.org/pubs/ref_behavior.html (concluding that rational decision models lead to an over-emphasis on information- and price-based approaches); Wiener, *supra* note 35, at 704–35 (discussing economic theory and other instruments of regulation).

76. See Wilson & Dowlatabadi, *supra* note 45, at 172.

77. *Id.*

nologies has occurred (i.e., the “efficiency gap”).⁷⁸ Price clearly matters, but research suggests that the role of price varies widely depending on the situation. In some cases, price accounts for less variance in behavior than other factors, such as a psychological commitment or social norms.⁷⁹ In other cases, the effectiveness of price-based mechanisms can be bolstered when paired with well-designed behavioral interventions.⁸⁰

The success of price-based policies also depends heavily on non-price-related features. Participation rates in a set of home efficiency programs that offer identical financial incentive packages vary by a factor of ten.⁸¹ Nonfinancial variables such as program marketing and management explain much of this variance.⁸² Furthermore, nonfinancial factors become more important in determining program success as the incentive becomes more attractive to the consumer.⁸³ In many cases, efficient and effective incentive programs thus require program design, implementation, and marketing that build on social scientific expertise in consumer decisionmaking.⁸⁴ This is true even when the incentive package is highly favorable for the consumers to make efficiency upgrades that would otherwise be cost prohibitive.⁸⁵

Individuals also can be induced to change their behavior in many cases even when no economic incentives are present. Interventions such as feedback, peer education, and social marketing campaigns have successfully reduced energy use among office employees, dormitory residents, and individuals living on military bases.⁸⁶ In each of these cases, individuals were not fi-

78. See Marilyn A. Brown, *Market Failures and Barriers as a Basis for Clean Energy Policies*, 29 ENERGY POL’Y 1197, 1198–99 (2001); Charles, *supra* note 3, at 810–11.

79. See Thomas A. Heberlein & G. Keith Warriner, *The Influence of Price and Attitude on Shifting Residential Electricity Consumption From On- to Off-Peak Periods*, 4 J. ECON. PSYCHOL. 107, 125 (1983); Nolan et al., *supra* note 65, at 921.

80. See Rosenthal, *supra* note 13, at A3.

81. See Stern, *supra* note 45, at 210–11.

82. See *id.*

83. See Wilson & Dowlatabadi, *supra* note 46, at 174 (explaining how individual preferences are not fixed).

84. *Id.* at 174–75 (discussing the importance of framing the decisions available to consumers in intervention programs).

85. See *generally id.* at 175 (emphasizing how consumers are influenced more by comfort and fulfilled desires than by energy efficiency when renovating their homes).

86. For a workplace example, see Amanda R. Carrico & Manuel Riemer, *Motivating Pro-Environmental Behavior in an Organizational Setting: The*

nancially responsible for their energy consumption.⁸⁷ Other interventions, such as time-of-use information about usage and costs, have reduced energy use even without changes in price. For example, providing households with real-time feedback about their electricity consumption has been associated with reductions in home energy use within a range of five to fifteen percent with no accompanying rate changes.⁸⁸ Similar results have been reported with real-time fuel economy feedback in personal motor vehicles.⁸⁹

In addition to a narrow focus on price mechanisms, RCT has also induced regulators to rely on technological solutions to reduce behavioral impacts rather than strategies to modify behavior. Again, to draw on examples from the energy policy literature, raising efficiency standards for household appliances and creating price-based incentives to induce households to adopt new, more efficient appliances have been a major focus of residential energy policy initiatives.⁹⁰ Technologies that lower the energy intensity of behavior without sacrificing comfort or performance provide a solution that fits easily within the parameters of RCT. So long as individuals respond rationally to price incentives to acquire new equipment, have adequate information about the use of the equipment, and make rational decisions based on that information, these policies should achieve positive results. Each of these assumptions has serious limitations when applied to households, however, and policies that account for behavioral insights regarding technology uptake and use are in their infancy.⁹¹ Technologies designed to

Use of Feedback and Peer Education to Reduce Energy Use (2009) (unpublished abstract) (on file with author). For a dormitory example, see John E. Petersen et al., *Dormitory Residents Reduce Electricity Consumption When Exposed to Real-Time Visual Feedback and Incentives*, 8 INT'L. J. SUSTAINABILITY HIGHER EDUC. 16, 29 (2007). For a military base example, see Andrea H. McMakin et al., *Motivating Residents to Conserve Energy Without Financial Incentives*, 34 ENVTL. BEHAV. 848, 856 (2002).

87. See McMakin et al., *supra* note 86, at 849; Petersen et al., *supra* note 86, at 18; Carrico & Riemer, *supra* note 86.

88. For a review, see Wokje Abrahamse et al., *A Review of Intervention Studies Aimed at Household Energy Conservation*, 25 J. ENV'T PSYCH. 273, 278–79 (2005).

89. See, e.g., *infra* note 122 and accompanying text.

90. See Abhijit Banerjee & Barry D. Solomon, *Eco-Labeling for Energy Efficiency and Sustainability: A Meta-Evaluation of US Programs*, 31 ENERGY POL'Y 109, 111–12 (2003) (describing the purpose of various energy conservation policies).

91. See NAT'L RESEARCH COUNCIL, ENERGY USE: THE HUMAN DIMENSION 184 (1984) (explaining how individual behavior associated with energy use is

conserve energy, such as programmable thermostats or appliances with integrated energy-saving settings, are effective only to the extent to which the consumer adopts the new technologies and uses them correctly.⁹² In addition, policies designed to encourage curtailment behavior, such as reducing motor vehicle idling, lowering highway driving speeds, or setting back thermostats, have received substantially less attention.

Although policies to encourage investments in efficiency and other technological improvements offer promising solutions, measures that focus exclusively on price and technology often have limited success. For example, the occurrence of “take back effects,” in which a portion of the achievable savings from efficiency improvements are “taken back” due to an increase in the use of energy,⁹³ demonstrates the danger of neglecting the behavioral dimension of energy consumption. In many cases, efficiency gains achieved through improvements in architecture or technology have been partially or completely overcome by a population that is acquiring more goods and using them more intensively. For example, technological improvements have increased the efficiency of refrigerators by around seventy-five percent over the past few decades;⁹⁴ however, the number of U.S. households that own two or more refrigerators has also increased by roughly the same margin.⁹⁵ Behavioral measures can supplement price and technology in ways that are less like-

often not incorporated into policy analysis, but should be in new programs and policies).

92. See, e.g., Brown, *supra* note 78, at 1198 (citing a study where the majority of consumers did not purchase the energy efficient appliances, but instead purchased cheaper appliances that consumed more energy in the long run).

93. See, e.g., Mathias Binswanger, *Technological Progress and Sustainable Development: What About the Rebound Effect?*, 36 ECOLOGICAL ECON. 119, 130 (2001); Horace Herring, *Energy Efficiency—A Critical View*, 31 ENERGY 10, 12 (2006).

94. For a review, see Jack N. Barkenbus, *Putting Energy Efficiency in a Sustainability Context*, 48 ENVIRONMENT 10, 12 (2006).

95. According to surveys conducted by the Energy Information Administration, thirteen percent of households surveyed in 1987 owned two or more refrigerators compared to twenty-two percent of those surveyed in 2005. See U.S. DEPT OF ENERGY, ENERGY INFO. ADMIN., RESIDENTIAL ENERGY CONSUMPTION SURVEY, PRESENCE OF APPLIANCES (1987), available at <http://www.eia.doe.gov/emeu/recs/recspubuse87/87publicuse.html>; U.S. DEPT OF ENERGY, ENERGY INFO. ADMIN., RESIDENTIAL ENERGY CONSUMPTION SURVEY, KITCHEN APPLIANCES (2005), available at <http://www.eia.doe.gov/emeu/recs/recspubuse05/pubuse05.html>.

ly to induce consumers to simply redirect savings from efficiency to other energy-using activities.

In addition, the assumption that individuals only respond to price signals and that new technologies are only valuable when linked to monetary incentives may lead regulators to abandon the field altogether if they lack the political support to change the price of the targeted behavior. Policies that link new technology uptake to price signals in some cases can generate opposition to both. Perhaps the most striking recent example is the initial decision by the Maryland Public Service Commission to reject a utility proposal to install 1.36 million smart meters in homes.⁹⁶ The utility linked the proposal directly to peak demand pricing, which drew political fire from consumer and retiree advocates.⁹⁷

Although the use of behavioral insights often will require resisting common intuitions about behavior, when applied properly, the payoff of policies that reflect a wider range of influences on behavior can be substantial. Behavioral research on household responses to energy information suggests that a proposal to install smart meters that simply provide feedback to household energy users might have yielded substantial use reductions—although less than when coupled with a price measure—and it might face far less political resistance.⁹⁸ After consumers become more comfortable with the new smart meter technology, the peak pricing measures may generate less political resistance. In addition to reducing political or consumer backlash, incorporating behavioral insights into a wide range of household energy programs can yield success rates as much as

96. See Peter Behr, *Md.'s Veto of Advance Meter Deployment Stuns Smart Grid Advocates*, CLIMATEWIRE (June 23, 2010), <http://www.eenews.net/public/climatewire/2010/06/23/1>.

97. See *id.* (“While some state utility commissions are willing to back smart meter deployment, they are reluctant to approve new ‘dynamic’ electricity rate plans that allow prices to rise during the day when power demand peaks.”). The utility later modified the program and obtained regulatory approval. See Peter Behr, *Md. Smart Meter Plan Advances with Consumer Benefits as a Measure*, CLIMATEWIRE (Aug. 18, 2010), <http://www.eenews.net/cw/> (search “ClimateWire” for “Md. Smart Meter Plan Advances”; then follow “Grid” hyperlink) (“The commission emphasized, ‘the success of this initiative, and the likelihood that customers will actually see the benefits this project promises, depend centrally on the success of the company’s customer education and communication effort.’”).

98. See, e.g., NAT’L RESEARCH COUNCIL, *supra* note 91, at 39–41 (demonstrating how feedback on energy use, without cost savings, may be insufficient to get customers to change their energy usage).

ten times greater than poorly designed ones.⁹⁹ For example, well-designed community-based efforts in Hood River, Oregon induced eighty-five percent of eligible households to participate in a home retrofit program.¹⁰⁰ Likewise, energy trends in California reflect nearly four decades of state policy directed toward efficiency standards and demand-side management programs, and some of these programs have reflected behavioral insights.¹⁰¹ During this time, per capita electricity consumption in California remained stable while the national average grew by forty percent (i.e., the Rosenfeld Effect).¹⁰² This was achieved while California simultaneously outperformed the national average in per capita economic growth.¹⁰³ Although a host of factors contributed to this trend (e.g., urbanization and changes in fuel sources), conservative estimates suggest that at least a quarter of the difference between per capita energy consumption in the United States and California can be attributed to policy measures directed toward energy use and efficiency.¹⁰⁴ The proportion of the difference that is attributable to behavioral measures is not known, but the Rosenfeld Effect suggests the potential gains that a state can achieve from well-designed energy conservation and efficiency efforts.

99. Nearly identical incentive programs directed toward home efficiency improvements within similar geographic areas have varied by a factor of ten. For a review, see Stern, *supra* note 46, at 210–11. Differential success rates of these programs have been primarily attributed to marketing and implementation of the program. *Id.*

100. Eric Hirst, *The Hood River Conservation Project: A Unique Research and Demonstration Effort*, 13 ENERGY & BUILDINGS 3, 8 (1989).

101. For a review of California's *Flex Your Power* campaign in response to the energy crisis of 2001, see Sylvia L. Bender et al., Using Mass Media to Influence Energy Consumption Behavior: California's 2001 *Flex Your Power* Campaign as a Case Study 8.15, 8.17 (2002), available at <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.156.8308&rep=rep1&type=pdf> (examining the campaign's formulation, implementation, and strategic evolution of its themes). For a brief description of California's utility-sponsored demand side management programs, including programs targeted at promoting efficiency adoption and energy curtailment, see Elsia O. Galawish, *DSM Accomplishments in California: PG&E's Experience*, 9 RENEWABLE ENERGY 1295, 1296 (1996).

102. See Charles, *supra* note 3, at 805.

103. *Id.*

104. James Sweeney & Anant Sudarshan, Deconstructing the "Rosenfeld Curve" 1 (June 1, 2008) (unpublished manuscript), available at http://piee.stanford.edu/cgi-bin/docs/publications/Deconstructing_the_Rosenfeld_Curve.pdf.

II. AN ANALYTICAL FRAMEWORK

Given the importance of behavioral insights, the pressing question is how to integrate them successfully into regulatory analysis. Agency officials have begun to make regulatory decisions that reflect behavioral considerations.¹⁰⁵ OIRA officials, for example, have announced an intention to broaden traditional cost-benefit analysis to explicitly include such considerations and have provided initial points for agencies to consider.¹⁰⁶ But a framework has not yet emerged that can enable regulators to conduct a systematic and concrete analysis of otherwise fairly disjointed and abstract considerations.¹⁰⁷ This Part describes our initial efforts to fill that gap. Our framework seeks to capture much of the complexity of human behavior while remaining sufficiently simple to generate valuable insights for agencies at each stage in the regulatory process.

We enrich the current thinking among agencies and legal scholars in three ways. First, we add a new line of analysis based on the assumption that individuals seek to maximize utility not only through wealth or monetary outcomes, but also through social outcomes. Second, once we recognize the consideration of social outcomes, a further distinction between rational and extra-rational naturally follows, just as it does for the consideration of monetary outcomes. We specify the considerations for determining when individuals are likely to engage in extra-rational action under both assumptions, noting a considerable degree of symmetry. In this way, we are able to build a set of complementary considerations for proceeding logically through both sorts of analyses. Finally, we demonstrate that rational and extra-rational considerations should be analyzed for different populations—individual, household, local community, and so on. If individuals respond differently when they act independently rather than as a part of a larger group, agencies should consider a decision in terms of the range of influences that it is likely to exert and the range of behavioral responses that it is likely to elicit.

105. See OFFICE OF MGMT. & BUDGET, *supra* note 5, at 1.

106. See, e.g., *id.* (noting OMB recommendation to agencies to consider “behaviorally informed approaches to regulation”); 2010 OIRA Disclosure Memo, *supra* note 5, at 2–12 (providing guidance to agencies).

107. Cf. Adler, *supra* note 20, at 142–43 (noting the importance of bounded rationality for regulatory decisionmakers); Jolls et al., *supra* note 2, at 1508–45 (providing a general framework for use of behavioral economics in development of legal prescriptions).

A. UPDATING THE RATIONALITY AND MONETARY OUTCOME ASSUMPTIONS

The analytical framework we develop begins to address the problem that regulatory decisionmakers have limited time and resources available to identify desired outcomes and to understand the regulatory influences on the behavior of regulatory targets.¹⁰⁸ Our framework starts with the assumptions that individuals seek to maximize utility when considering both wealth or monetary outcomes and social outcomes. It then splits each assumption into two prongs based on whether the individual is likely to engage in rational or extra-rational decisionmaking. We diagram the analytical framework in Figure 1. Although our framework is not designed to yield a simple, quantitative outcome about the most desirable regulatory approach, it will enable agencies to engage in a more complete analysis of the influences on behavior.

Figure 1. Analytical Framework

1. Monetary Outcomes

a. Rational Action

Although utility maximization in theory may include “everything that an individual might value,”¹⁰⁹ nonmonetary fac-

108. See Adler, *supra* note 20, at 155–57.

109. LOUIS KAPLOW & STEVEN SHAVELL, FAIRNESS VERSUS WELFARE 18 (2002).

tors are difficult to account for; thus, in practice the regulatory analysis often focuses largely on wealth or monetary outcomes.¹¹⁰ A vast literature explores this approach, and we do not seek to contribute to that literature here. In this section, we emphasize the importance of not assuming that the target population has adequate information across a number of regulatory domains.

i. Inaccurate Information

Individuals often fail to act in classically self-interested ways because of incomplete or inaccurate information. For example, individuals list saving money as a primary reason for their decisions about when and how long to idle their vehicle; however, the average individual also believes she should idle for over 4 minutes before it becomes cost-effective to turn off the vehicle.¹¹¹ In fact, the Environmental Protection Agency (EPA) recommends idling for no more than thirty seconds to save gas, and to prevent vehicle wear and tear.¹¹² In many cases, agency officials have implemented policy mechanisms to ensure access to accurate and up-to-date information, such as the institution of labeling requirements or hazard warnings.¹¹³ In other cases, however, agency officials have underestimated or overlooked the knowledge deficits that exist and therefore missed opportunities for lower cost, more effective, and less invasive regulations. For example, campaigns to update idling beliefs in multiple communities have resulted in idling reductions on the order of thirty percent.¹¹⁴ Updating beliefs about idling may be far less expensive and far more politically viable than direct regulation of driving behavior or increasing the price of gasoline.¹¹⁵ Moreover, in some cases a price mechanism should

110. See Adler, *supra* note 20, at 158–59; Scott, *supra* note 55, at 1621–22.

111. Amanda R. Carrico et al., *Costly Myths: An Analysis of Idling Beliefs and Behavior in Personal Motor Vehicles*, 37 ENERGY POL'Y 2881, 2885 (2009).

112. U.S. ENVTL. PROT. AGENCY, YOUR CAR AND CLEAN AIR: WHAT YOU CAN DO TO REDUCE POLLUTION 3 (1994), available at <http://www.epa.gov/OMS/consumer/18-youdo.pdf>.

113. See Catherine M. Sharkey, *Preemption By Preamble: Federal Agencies and the Federalization of Tort Law*, 56 DEPAUL L. REV. 227, 230 (2007) (discussing mandatory agency safety requirements such as “product performance, design, labeling, warnings, and instructions”).

114. MCKENZIE-MOHR ASSOCS., ANTI-IDLING FINAL REPORT 4 (2003), available at http://www.greatersudbury.ca/content/earthcare/documents/Sudbury_finalreport.pdf.

115. OIRA recently described these types of informational regulatory tools as “summary disclosure.” 2010 OIRA Disclosure Memo, *supra* note 5, at 3–6

be combined with information to be effective. Increasing the cost of gasoline, for example, will not reduce gas use or carbon emissions from idling if individuals believe they should idle far longer than necessary to save gas and money. Of course, where barriers such as cost, access, or convenience prevent an individual from adopting a behavior, education is often necessary but not sufficient.

ii. Insufficient Information

In addition to outdated or incorrect beliefs, surveys reveal large knowledge deficits regarding opportunities for household energy efficiency.¹¹⁶ Because the breakdown of how energy is used in the home is generally invisible to homeowners, consumers often have little idea where the opportunities for efficiency and conservation exist.¹¹⁷ This problem has been analogized to the situation a shopper would face if a grocery store did not list prices on each item and only provided a total, non-itemized bill at the time of check-out.¹¹⁸ Not surprisingly, consumers overemphasize the impact of curtailment behaviors (i.e., turning off lights and appliances), which are often more visible in the consumer's mind, and underemphasize the impact of efficiency upgrades.¹¹⁹

Information in the form of real-time feedback can recouple specific behaviors with their associated energy costs, giving consumers more information about which appliances and behaviors have the greatest effect on their monthly energy bills. As discussed above, estimates suggest that home energy meters

(identifying the seven principles for agency use of summary disclosure as a regulatory tool). It may be important not only to provide more information, but also to attend to the way in which the information is provided. Jolls et al., *supra* note 2, at 1533–34.

116. NAT'L RESEARCH COUNCIL, *supra* note 91, at 36–37 (citing studies that show that most energy users are ill informed of appliance energy usage under aggregate billing systems).

117. *Id.* at 36 (explaining how energy bills are received infrequently and aggregate energy use into one total).

118. See *id.* at 36–38; Willett Kempton & Laura Montgomery, *Folk Quantification of Energy*, 7 ENERGY 817, 817 (1982). OIRA recently recognized that agencies “should take steps to provide people with relevant information when they are actually making the decision or taking the action in question.” 2010 OIRA Disclosure Memo, *supra* note 5, at 4 (stating that Principle Four is that “[d]isclosed information should be properly placed and timed”).

119. Shahzeen Z. Attari et al., *Public Perceptions of Energy Consumption and Savings*, 107 PROC. NAT'L ACAD. SCI. 16,054, at 16,055 (2010); Willett Kempton et al., *Do Consumers Know “What Works” in Energy Conservation?*, 9 MARRIAGE FAM. REV. 115, 115–33 (1985).

can reduce household energy use.¹²⁰ In a 1979 study, McClelland and Cook installed monitors in a group of households that displayed the home's energy usage in terms of cents per hour. These households reduced energy use by twelve percent relative to a control group over the course of an eleven-month period.¹²¹ Similarly, product-integrated feedback displays, such as those that provide real-time fuel economy data in vehicles, have been associated with roughly a ten-percent improvement in vehicle fuel economy due to changes in driving habits.¹²² Regulatory approaches that assume that price is the only meaningful influence on behavior may miss the opportunity to achieve those ten- to fifteen-percent gains simply through feedback. If the assumption is that price changes or direct regulation of the timing or amount of household electricity use are necessary, the resulting policies may generate a public backlash such as the one that defeated the initial smart meter proposal in Maryland.¹²³ In short, for individuals who lack adequate information, the behavioral literature may enable regulators to develop successful near-term approaches that they would otherwise miss.

b. Extra-Rational Action

The notion that individuals sometimes seek to maximize wealth or monetary outcomes but do so in extra-rational ways accounts for many of the insights of behavioral economics. To ensure that these insights are adequately reflected in regulatory analysis, scholars have translated information from a broad range of studies into key findings or lessons.¹²⁴ To assess shifts

120. See ELECTRIC POWER RESEARCH INST., RESIDENTIAL ELECTRICITY USE FEEDBACK: A RESEARCH SYNTHESIS AND ECONOMIC FRAMEWORK 2–5 (2009) (reviewing studies on various forms of monitoring and feedback for home energy consumers); Abrahamse et al., *supra* note 88, at 278 (same).

121. Lou McClelland & Stuart W. Cook, *Energy Conservation Effects of Continuous In-Home Feedback in All-Electric Homes*, 9 J. ENVTL. SYS. 169, 169–73 (1979).

122. See Jack N. Barkenbus, *Eco-Driving: An Overlooked Climate Change Initiative*, 38 ENERGY POL'Y 762, 765–66 (2010) (showing a ten-percent gain in fuel economy); Mascha van der Voort et al., *A Prototype of Fuel-Efficiency Support Tool*, 9 C. TRANSP. RES. 279, 279 (2001) (showing a sixteen-percent gain); Press Release, Scania Grp., Scania Takes Eco-Driving to a New Level with Its Latest Digital Performance Coaching Technology (Sept. 17, 2009), available at <http://www.scania.com/media/pressreleases/n09025en.aspx>.

123. See Behr, *supra* note 96.

124. See, e.g., ARIELY, *supra* note 2, at xxix–xxx; Rabin, *supra* note 2, at 13–32; Tversky & Kahneman, *supra* note 63, at 452.

in the willingness of individuals to alter their behavior in response to a price increase or signal, a regulator can incorporate these findings or lessons, asking whether the type of targeted behavior reflects the type of conditions under which individuals have been demonstrated to depart from traditional rationality assumptions. The regulator can then adjust recommendations to address these extra-rational responses. We gather some of these core findings or lessons here.

i. Hyperbolic Discounting

Despite an attractive return on investment that follows the purchase of many efficient products and appliances, such as those carrying the Energy Star label, consumers have shown a tendency to undervalue the savings associated with reduced operating costs.¹²⁵ Some have argued that this may be attributed to uncertainties in the consumer's mind about the expected savings of the product or future energy costs;¹²⁶ however, there is also evidence that individuals simply overlook operating costs altogether when not prompted to consider them¹²⁷ or miscalculate potential savings when they do.¹²⁸ Research in the social and behavioral sciences suggests that well-designed information, particularly when provided at the point of decisionmaking, can help to overcome steep discount rates or

125. See Kenneth Gillingham et al., *Energy Efficiency Economics and Policy*, 1 ANN. REV. RESOURCE ECON. 597, 605–07 (2009); Jerry A. Hausman, *Individual Discount Rates and the Purchase and Utilization of Energy-Using Durables*, 10 BELL J. ECON. 33, 50 (1979); Richard Howarth & Alan H. Sanstad, *Discount Rates and Energy Efficiency*, 13 CONTEMP. ECON. POL'Y 101, 101 (1995); Jonathan G. Koomey & Alan H. Sanstad, *Technical Evidence for Assessing the Performance of Markets Affecting Energy Efficiency*, 22 ENERGY POL'Y 826, 828–30 (1994); Peter Kooreman, *Individual Discounting, Energy Conservation, and Household Demand for Lighting*, 18 RESOURCE & ENERGY ECON. 103, 112 (1996).

126. See Adam B. Jaffe et al., *The Economics of Energy Efficiency*, in ENCYCLOPEDIA OF ENERGY 79, 85–86 (Cutler Cleveland ed., 2004); Ronald J. Sutherland, *Market Barriers to Energy-Efficiency Investments*, 12 ENERGY J. 15, 31 (1991).

127. See Daniel C. Feiler & Jack B. Soll, *A Blind Spot in Driving Decisions: How Neglecting Costs Puts Us in Overdrive*, 98 CLIMATIC CHANGE 285, 289 (2010); Owen D. Jones & Timothy H. Goldsmith, *Law and Behavioral Biology*, 105 COLUM. L. REV. 405, 444–45 (2005).

128. See Willet Kempton et al., *I Always Turn It on "Super": User Decisions About When and How to Operate Room Air Conditioners*, 18 ENERGY & BUILDINGS 177, 189–90 (1992); Kempton & Montgomery, *supra* note 118, at 826.

may prime the individual to consider operating costs when making decisions about product purchase and use.¹²⁹

ii. Cognitive Costs

An often overlooked but important example of a departure from rationality—at least as to monetary outcomes—is the remarkably high value that individuals place on cognitive costs.¹³⁰ Traditional rational-actor models tend to underestimate the cognitive costs of seeking out and evaluating information, as well as the cognitive benefit of avoiding hassles. Yet, the convenience of an action stands out as a primary predictor of whether an individual chooses to adopt it. For example, regardless of an individual's environmental values and beliefs, the availability of curbside recycling is the single strongest predictor of whether a household recycles.¹³¹ Similarly, researchers have found that simply relocating recycling bins a few feet inside of a room, rather than outside the door, can decrease the number of aluminum cans thrown in the conventional trash by half.¹³² It is probably for this reason that individuals so often revert to the status quo when making decisions. A good illustration of this can be found in rates of organ donation. The proportion of the population consenting to donate their organs is roughly sixty percent higher in countries that use an opt-out policy (where the default option is a consent to donate) rather than an opt-in policy as it is in the United States (where the default option is not to donate). The margin of difference in actual organ donation is substantially smaller, but it remains sixteen percent higher in the presence of an opt-out policy.¹³³

129. Feiler & Soll, *supra* note 127, at 289.

130. OIRA recently recognized the importance of considering cognitive costs during regulatory development. See 2010 OIRA Disclosure Memo, *supra* note 5, at 4, 10 (noting that “[p]eople have limited time and attention” and thus “may not participate in important programs simply because the required steps for participation are complex and daunting; agencies can often improve outcomes by reducing unnecessary paperwork burdens and simplifying choices”).

131. Glenda Wall, *Barriers to Individual Environmental Action: The Influence of Attitudes and Social Experiences*, 32 CANADIAN REV. SOC. & ANTHROPOLOGY 465, 477 (1995).

132. Timothy D. Ludwig et al., *Increasing Recycling in Academic Buildings: A Systematic Replication*, 31 J. APPLIED BEHAV. ANALYSIS 683, 683 (1998).

133. Eric J. Johnson & Daniel Goldstein, *Do Defaults Save Lives?*, 302 SCIENCE 1338, 1339 (2003). OIRA recently included default settings among the alternatives that agencies should consider when designing regulatory options. 2010 OIRA Disclosure Memo, *supra* note 5, at 9 (noting that regulatory

Policies and programs that recognize the importance of convenience to individuals, despite the attractiveness of the options at stake, have greater chances of success. For example, home efficiency rebate programs that require the extra step of a home energy audit to be eligible to participate are less successful than those that do not.¹³⁴ Similarly, programs that simplify the process for collecting benefits are also likely to encourage greater levels of participation.¹³⁵ Imposing paperwork burdens to ensure accountability may unintentionally dissuade participation, thereby reducing the program's overall effectiveness. For example, although the environmental impacts of the Consumer Assistance to Recycle and Save Act¹³⁶ (CARS, more commonly known as Cash for Clunkers) have been criticized,¹³⁷ from a behavioral standpoint it was a resounding success. In addition to other factors such as an attractive incentive package¹³⁸ and a highly visible marketing campaign, the CARS program offered an instantaneous rebate¹³⁹ and placed the paperwork burden on the car industry rather than the consumer.¹⁴⁰ One can compare this to state incentive programs to install photovoltaics (PV) in households, where consumers must grapple with competing technical requirements depending on the state or utility, as well as the complex task of selling certificates to collect their incentives.¹⁴¹ Not surprisingly, consumer

outcomes "sometimes . . . can be achieved by selecting appropriate starting points or 'default rules'").

134. Paul C. Stern, *Information, Incentives, and Proenvironmental Consumer Behavior*, 22 J. CONSUMER POL'Y. 461, 469 (1999).

135. Paul C. Stern et al., *The Effectiveness of Incentives for Residential Energy Conservation*, 10 EVALUATION REV. 147, 159 (1986) [hereinafter Stern et al., *Effectiveness of Incentives*]; Paul C. Stern, Gerald T. Gardner, Michael P. Vandenbergh, Thomas Dietz & Jonathan M. Gilligan, *Design Principles for Carbon Emissions Reduction Programs*, 44 ENVTL. SCI. & TECH. 4847, 4848 (2010) [hereinafter Stern et al., *Design Principles*].

136. 49 U.S.C. § 32901 (2010).

137. See, e.g., Lee Schipper, Op-Ed., *When It Comes to Being Green, Cash for Clunkers Is a Lemon*, WASH. POST, <http://www.washingtonpost.com/wp-dyn/content/graphic/2009/08/08/GR2009080802658.html> (last visited Nov. 29, 2010).

138. See 49 U.S.C. § 32901(b).

139. See *id.*

140. See *id.* § 32901(c)–(d).

141. See Michael P. Vandenbergh et al., *Implementing the Behavioral Wedge: Designing and Adopting Effective Carbon Emissions Reduction Programs*, 40 ENVTL. L. REP. 10,547, at 10,551 (2010).

responses to these programs reflect the differences in cognitive costs imposed on the consumer.¹⁴²

iii. Framing

Although traditional rational-actor models typically assume that individuals hold a stable set of preferences, work within social psychology and behavioral economics suggests that preferences can be heavily dependent on the context in which choices are presented to the individual.¹⁴³ For example, the average individual claims to prefer a hamburger that is described as “75% lean” more than one described as “25% fat.”¹⁴⁴ In many cases, frames elicit known systematic deviations from rationality. For example, Kahnemann and Tversky demonstrated the tendency for losses to loom larger than gains where individuals assign a higher subjective value to an amount that is to be lost rather than an amount that is to be gained.¹⁴⁵ For this reason, framing an efficiency investment as an opportunity to avoid losses, rather than to achieve gains (as it is more typically framed), is likely to induce more to invest. For regulators, understanding how frames influence individuals’ perceptions of costs and benefits may assist them in devising more effective policies and programs, particularly those involving public education.

2. Social Outcomes

The second assumption of our analytical framework accounts in a systematic way for insights about the importance of social outcomes from research in social psychology, sociology, and behavioral economics. We describe this line of analysis below. From a procedural perspective, our best thinking is that an agency would consider social outcomes after examining monetary outcomes.

142. For a more detailed review, see Stern et al., *Design Principles*, *supra* note 135, at 4847–48.

143. See Kahneman & Tversky, *supra* note 2, at 343–44; Tversky & Kahneman, *supra* note 63, at 453. OIRA recently noted the need for agencies to consider framing and loss aversion in the design of summary disclosure regulatory measures. See 2010 OIRA Disclosure Memo, *supra* note 5, at 4 (“[I]f a potential outcome is presented as a loss, for example, people may pay more attention than if it is presented as a gain.”).

144. Irwin P. Levin & Gary J. Gaeth, *How Consumers Are Affected by the Framing of Attribute Information Before and After Consuming the Product*, 15 J. CONSUMER RES. 374, 375–77 (1988).

145. See Kahneman & Tversky, *supra* note 2, at 342; Tversky & Kahneman, *supra* note 63, at 456.

Before we begin, we note that our description of extra-rational responses to social outcome maximization is necessarily tentative because less research exists concerning such responses. A possible reason is that the category has been largely overlooked. Because social psychologists and sociologists often use an expansive definition of rationality, they tend to mute somewhat the idea of extra-rational responses.¹⁴⁶ Similarly, economists often examine extra-rational behavior, but they tend to focus on monetary outcomes, rather than social outcomes.¹⁴⁷ Thus, consideration of extra-rational responses to social outcome maximization, though suggested by existing research, has largely fallen through the cracks.

In addition, we recognize that social outcomes are highly subjective and difficult to define, and that it is difficult to distinguish between rational and extra-rational behavior within this category. For example, social outcomes could be broadened to include the experience of psychological well-being that is associated with helping another, therefore making it rational for the individual to engage in seemingly self-sacrificial behavior with no direct social reward (e.g., making an anonymous donation). Some psychologists have taken this approach.¹⁴⁸ We do not intend to dismiss or oversimplify this issue, but it is not necessary to resolve it to offer regulators a tool for incorporating broader considerations of social outcomes into regulatory analysis. Toward this end, we define a social outcome as a social reward or punishment.¹⁴⁹ So defined, social outcomes in-

146. See, e.g., Tversky & Kahneman, *supra* note 63, at 453 ("The definition of rationality has been much debated, but there is general agreement that rational choices should satisfy some elementary requirements of consistency and coherence.").

147. See, e.g., *id.* at 454.

148. See, e.g., Robert B. Cialdini et al., *Empathy-Based Helping: Is It Selflessly or Selfishly Motivated?*, 52 J. PERSONALITY & SOC. PSYCHOL. 749, 749–50 (1987) (arguing that the empathy for another in need leads to the experience of sadness in the observer, motivating him or her to relieve that sadness through helping, and providing data to suggest that empathy is associated with sadness and those who were led to believe that helping would not reduce empathy were less likely to help others).

149. See Howard Margolis, *Free Riding Versus Cooperation*, in STRATEGY AND CHOICE 84, 90 (Richard J. Zeckhauser ed., 1991) ("[T]he possibilities . . . could come either from imposing a risk of punishment on those who fail to cooperate or offering the promise of reward for those who do."); cf. Jon Elster, *Social Norms and Economic Theory*, J. ECON. PERSP., Fall 1989, at 99, 100 (noting that social norms are "enforced by members of the general community" and are "sustained by the approval and disapproval of others" and providing several examples).

clude the expectation of negative social attention on the basis of beliefs about what is typical or approved of within a group.¹⁵⁰ They also include social status that one achieves through engaging in behaviors that have symbolic significance within a group.¹⁵¹ We believe that many regulators will find this definition intuitively appealing, even if they currently lack the information and framework to incorporate these behavioral tendencies into regulatory analysis. Providing an initial framework is our main goal here. Below we identify the types of factors that regulators should consider.

Because the extra-rational social outcome category flows from existing research, we believe that it must be included in any thorough framework for analyzing behavioral effects, even if necessarily tentative. We hope that including it in the framework will draw attention to the potential importance of this area and the need for further research.¹⁵²

a. Rational Action

To analyze rational decisionmaking as to social outcome maximization, we draw together various insights from the literature. As with our discussion of rational action in pursuit of wealth maximization,¹⁵³ we begin here with a phenomenon that arises from a lack of information or misinformation. In this case, we examine behavioral insights on how misinformation regarding others' behavior can affect the behavior of those who are seeking to maximize social outcomes. We also demonstrate how these insights can lead to regulatory innovations.

i. Inadequate Information—Pluralistic Ignorance

Individuals sometimes modify their behavior on the basis of an expected social reward or sanction that rests on misinformation about what others do or what they value. For example, pluralistic ignorance describes the situation in which the majority of individuals within a group publicly accept a social

150. See Margolis, *supra* note 149, at 90–95.

151. See, e.g., ROBERT M. AXELROD, *THE EVOLUTION OF COOPERATION* 146–54 (1984) (discussing the roles of labels, hierarchies, stereotypes, and reputation).

152. Cf. Calabresi & Melamed, *supra* note 21, at 1116 (noting how the use of a legal analytical framework identified the overlooked importance of an entitlement in the case of a polluter protected by a liability rule).

153. See *supra* notes 109–45 and accompanying text.

norm that they privately reject.¹⁵⁴ It is the incorrect perception that the majority of those around them personally accept the norm that leads to the perpetuation of the norm.¹⁵⁵ Ultimately, this motivates a behavioral response that is consistent with a widely rejected value.¹⁵⁶ Pluralistic ignorance is thought to contribute to socially undesirable behavior in a number of domains.¹⁵⁷ For example, college students report the belief that the majority of other students on campus believe that heavy drinking is considered acceptable and is a common behavior on campus.¹⁵⁸ In reality, students tend to overestimate the amount of drinking that their peers actually engage in.¹⁵⁹ The illusion of descriptive and injunctive norms for drinking has been shown to be related to actual drinking behavior on campuses, and interventions to promote a more accurate norm have been shown to reduce drinking on campuses.¹⁶⁰

ii. Descriptive Norms

Numerous social psychological studies have found that individuals often follow the crowd in the absence of strong preferences that direct them otherwise. In his classic study, Solomon Asch demonstrated that seventy-five percent of participants were willing to volunteer an obviously incorrect response to a simple question so as not to deviate from the consensus response within the group.¹⁶¹ Consistent with this finding, psychologists have revealed that calling attention to common behaviors within a population (a descriptive norm) will induce

154. DANIEL KATZ & FLOYD HENRY ALLPORT, *STUDENTS' ATTITUDES* 152–53 (1931).

155. *Id.*

156. *Id.*

157. In addition to the example of college drinking that follows, social scientists have speculated that pluralistic ignorance was responsible for the widespread public support for segregation among white Americans during the 1960's, Hubert J. O'Gorman, *Pluralistic Ignorance and White Estimates of White Support for Racial Segregation*, 39 PUB. OPINION Q. 313, 330 (1975), as well as the support of communism within the Soviet Union, TIMUR KURAN, *PRIVATE TRUTHS, PUBLIC LIES* 118–27 (1995).

158. Deborah A. Prentice & Dale T. Miller, *Pluralistic Ignorance and Alcohol Use on Campuses: Some Consequences of Misperceiving the Social Norm*, 64 J. PERSONALITY & SOC. PSYCHOL. 243, 245 (1993); Christine M. Schroeder & Deborah A. Prentice, *Exposing Pluralistic Ignorance to Reduce Alcohol Use Among College Students*, 28 J. APPLIED SOC. PSYCHOL. 2150, 2170–74 (1998).

159. Schroeder & Prentice, *supra* note 158, at 2170–74.

160. *Id.*

161. Asch, *supra* note 62, at 181–82.

other individuals to also adopt that behavior.¹⁶² For example, in two large-scale evaluations conducted in Sacramento and the Puget Sound area, researchers randomly selected customers of electric utilities to receive periodic peer feedback reports. These reports included a bar graph displaying the customer's recent monthly electricity use compared to a group of comparable neighbors as well as "efficient neighbors."¹⁶³ Individuals who received these reports used one to two percent less energy than those that did not. These savings persisted up to a year after the intervention was initiated.¹⁶⁴ Interestingly, households that used less than their efficient peers showed a slight increase in energy use, referred to as a "boomerang effect,"¹⁶⁵ reinforcing the impact of descriptive norms.

Although logical on the surface, this psychological principle flies against the instincts of many who develop programs to change behavior.¹⁶⁶ Messages are often designed to convey the scale of the problem by bringing attention to an undesirable behavior. For example, a public education campaign designed to reduce drunk driving may reference the hundreds of thousands of Americans pulled over for drunk driving each year. By doing this, however, a campaign may promote the belief that

162. Noah J. Goldstein et al., *A Room with a Viewpoint: Using Social Norms to Motivate Environmental Conservation in Hotels*, 35 J. CONSUMER RES. 472, 479–80 (2008) (finding that prescriptive norms increased participation in hotel energy conservation programs); P. Wesley Schultz, *Changing Behavior With Normative Feedback Interventions: A Field Experiment on Curbside Recycling*, 21 BASIC & APPLIED SOC. PSYCHOL. 25, 31–33 (1998) [hereinafter Schultz, *Changing Behavior*] (finding that individual feedback increased curbside recycling); P. Wesley Schultz et al., *The Constructive, Destructive, and Reconstructive Power of Social Norms*, 18 PSYCHOL. SCI. 429, 432 (2007) [hereinafter Schultz et al., *Power of Social Norms*] (finding that providing residents with normative feedback decreased home energy usage).

163. Ian Ayres et al., *Evidence from Two Large Field Experiments that Peer Comparison Feedback Can Reduce Residential Energy Usage* 5 (Nat'l Bureau of Econ. Research, Working Paper No. 15,386, 2009), available at <http://www.nber.org/papers/w15386>.

164. *Id.*

165. *Id.*; see also Robert B. Cialdini et al., *A Focus Theory of Normative Conduct: A Theoretical Refinement and Reevaluation of the Role of Norms in Human Behavior*, 24 ADVANCES EXPERIMENTAL SOC. PSYCHOL. 202, 208–09 (1991) (noting the perverse side effect of an antilittering campaign that implicitly acknowledged that many people litter).

166. Cf. Richard H. McAdams, *The Origin, Development, and Regulation of Norms*, 96 MICH. L. REV. 338, 340 (1997) (citing law and economics research that acknowledges the occasional trumping power of internalized norms over external incentives); Posner, *supra* note 69, at 1781 (acknowledging the role of internalized norms in tax compliance).

the behavior, though undesirable, is widespread. For example, Arizona's Petrified Forest National Park estimated that over a ton of petrified wood was stolen from their park per month.¹⁶⁷ In response to this problem they placed signs throughout the park reading: "Your heritage is being vandalized every day by theft losses of petrified wood of 14 tons a year, mostly a small piece at a time."¹⁶⁸ By doing this, the park was inadvertently encouraging theft by communicating the idea that defection is the norm and that one will be in the minority by adopting the desirable behavior. When the sign was changed to simply communicate that removing wood is undesirable (an injunctive norm) rates of theft declined from eight percent to just under two percent.¹⁶⁹

iii. The Attitude-Behavior Gap

Despite the large amount of attention given to attitudes in behavioral research, attitudes tend to be relatively poor predictors of behavior.¹⁷⁰ Attitudes often correlate well with intentions to act a certain way; however, there are a host of physical, structural, and psychological barriers that may prevent people from acting the way that they feel. For example, individuals may strongly value health and fitness, but these feelings may be overcome by competing influences such as time constraints, the availability of healthy food options, and socio-cultural factors that may influence food preferences and options. For these reasons, marketing a behavior is very different from marketing a product. Successful behavior-change interventions must take a systematic approach to understanding the barriers that prevent an individual from acting on his or her intentions.¹⁷¹ In cases where the primary barriers include a lack of awareness or actionable knowledge, a well-crafted education campaign may be sufficient to promote behavior change. More often than not, however, social marketing must go beyond informational approaches to also target issues such as convenience, access, safe-

167. Robert B. Cialdini, *Crafting Normative Messages to Protect the Environment*, 12 CURRENT DIRECTIONS PSYCHOL. SCI. 105, 107 (2003).

168. *Id.*

169. *Id.*

170. See, e.g., Icek Ajzen, *The Theory of Planned Behavior*, 50 ORGANIZATIONAL BEHAV. & HUM. DECISION PROCESSES 179, 180 (1991) (noting the relatively poor predictive power of dispositions as well as general attitudes in predicting specific behaviors).

171. See MCKENZIE-MOHR & SMITH, *supra* note 6, at 122-32.

ty, or psychological barriers such as perceptions of efficacy and control.¹⁷²

iv. Motivational Crowding

By focusing solely on wealth or monetary outcome maximization, agency officials can inadvertently crowd out rational processes of social utility maximization that could work in their favor. For example, a group of Israeli day care centers found that when they introduced a fine to prevent parents from arriving late to pick up their children, the number of late parents nearly doubled.¹⁷³ Applying an economic cost or benefit to a decision that is otherwise governed by moral or injunctive norms can change the subjective payoff structure, thereby reducing intrinsic motivation in lieu of external or economic motivation.¹⁷⁴ In other words, the parents in the Israeli day care example were more willing to incur the economic cost of arriving late than the social cost of inconveniencing the day care instructors.¹⁷⁵

Agency officials should be careful to avoid introducing economic incentives or penalties to change behaviors that may already be governed by injunctive norms. For example, littering in public parks or choosing to water one's lawn during a drought may be more influenced by appeals to social responsibility than by a threat of fines that, in many cases, are insufficiently large or are difficult to enforce. When economic incentives are deemed appropriate, regulators also should consider reinforcing injunctive norms surrounding the target behavior through other avenues. Studies suggest a synergistic effect when incentives or fines are paired with a public education campaign to reinforce the moral case for engaging in a behavior.¹⁷⁶ Anecdotal evidence of this can be seen in the response to

172. *Id.*

173. See Uri Gneezy & Aldo Rustichini, *A Fine Is a Price*, 29 J. LEGAL STUD. 1, 3–8 (2000).

174. See Samuel Bowles, *Policies Designed for Self-Interested Citizens May Undermine "The Moral Sentiments": Evidence from Economic Experiments*, 320 SCIENCE 1605, 1609 (2008); Edward L. Deci et al., *A Meta-Analytic Review of Experiments Examining the Effects of Extrinsic Rewards on Intrinsic Motivation*, 125 PSYCHOL. BULL. 627, 658–59 (1999); Bruno S. Frey, *Motivation as a Limit to Pricing*, 14 J. ECON. PSYCHOL. 635, 658 (1993); Ann E. Tenbrunsel & David M. Messick, *Sanctioning Systems, Decision Frames, and Cooperation*, 44 ADMIN. SCI. Q. 684, 704 (1999).

175. See Gneezy & Rustichini, *supra* note 173, at 3–8.

176. See LURA CONSULTING, *THE CARROT, THE STICK, AND THE COMBO: A RECIPE FOR REDUCING VEHICLE IDLING IN CANADIAN COMMUNITIES* 6–7 (2005),

Ireland's decision to introduce a modest tax on plastic grocery bags paired with an aggressive media campaign.¹⁷⁷ The effect on plastic bag usage far surpassed the expected cumulative effects of these policies.¹⁷⁸ Within weeks, the use of plastic bags dropped by ninety-four percent and the social stigma of being seen carrying a plastic bag was likened to that of "wearing a fur coat or not cleaning up after a dog."¹⁷⁹

b. *Extra-Rational Action*

Accounting for extra-rational responses to social outcomes is an essential area of regulatory analysis, yet one that is largely off the radar screen even for those who recognize the importance of understanding the role of extra-rational behavior in monetary outcome maximization. Studies suggest that many of the same types of departures from rationality that afflict monetary outcome maximization also afflict social outcome maximization.¹⁸⁰ Social outcome preferences are context specific, as are monetary outcome preferences.¹⁸¹ Individuals have a limited ability to process social information, as with monetary information.¹⁸² Individuals are affected by having committed verbally or in writing, even if there is no monetary or social sanction.¹⁸³ Of course, individuals also have personal norms that sometimes influence behavior in ways that are inconsistent with monetary or social outcome maximization.¹⁸⁴ For example, within a target

available at <http://oee.nrcan.gc.ca/communities-government/transportation/municipal-communities/reports/carrot-stick-combo/carrot-stick-combo.pdf> (advising that both voluntary and regulatory approaches should be used in tandem); David T. Levy et al., *The Effects of Tobacco Control Policies on Smoking Rates: A Tobacco Control Scorecard*, 10 J. PUB. HEALTH MGMT. PRAC. 338, 346–49 (2004) ("[T]he most successful tobacco control strategies appear to involve multiple policies implemented as part of a comprehensive strategy.").

177. See Rosenthal, *supra* note 13, at A3. Similarly, combining public education with regulatory measures has also been successfully used to reduce vehicle idling in a number of Canadian communities. See LURA CONSULTING, *supra* note 176, at 8–20.

178. See Rosenthal, *supra* note 13, at A3 ("And then something happened that was bigger than the sum of these parts.").

179. *Id.*

180. See *infra* Parts II.A.2.b.i–iii.

181. See discussion *infra* Part II.A.2.b.i.

182. See discussion *infra* Part II.A.2.b.ii.

183. See discussion *infra* Part II.A.2.b.iii.

184. See Susanne Göckeritz et al., *Descriptive Normative Beliefs and Conservation Behavior: The Moderating Roles of Personal Involvement and Injunctive Normative Beliefs*, 40 EUR. J. SOC. PSYCHOL. 514, 517 (2010) (describing

population such as individuals and households, the expected utility of an outcome may be a poor predictor of a behavior when there are strong injunctive norms associated with an action (e.g., littering in a public space), rather than when society views a behavior as morally neutral (e.g., idling a vehicle in a public space).

i. Framing

Framing yields examples of extra-rational behavior when individuals seek to maximize social outcomes. Frames can interact with an individual's previous experiences or ideological worldview to trigger certain responses as they do with an individual's sense of monetary value.¹⁸⁵ For example, the term *tax* triggers many negative associations among those who are ideologically conservative that the term *offset* does not. Consequently, more Republicans (and independents) are willing to purchase a more expensive product when its cost is increased due to a "carbon offset," rather than a "carbon tax."¹⁸⁶ In other words, individual preferences for monetary wealth over social wealth vary depending on the context. Similarly, framing an issue in terms of the proposed solutions can affect the perceived severity of that problem. For example, liberals tend to perceive climate change as more problematic when the solution involves environmental regulation rather than when it involves nuclear power; the opposite pattern is true of conservatives.¹⁸⁷

Given the way that humans process information using cognitive heuristics and previous experiences as a filter, it is simply impossible to avoid framing information.¹⁸⁸ Instead of attempting to avoid framing effects, regulators should consult behavioral scientists when framing information. Regulators should be careful to avoid frames that may be polarizing or prevent audience members from fully considering an argument or policy proposal. Similarly, we should not assume from an ini-

the moderating effect of personal involvement on behavioral change and information processing).

185. David J. Hardisty et al., *A Dirty Word or a Dirty World? Attribute Framing, Political Affiliation, and Query Theory*, 21 PSYCHOL. SCI. 86, 88 (2010); see also 2010 OIRA Disclosure Memo, *supra* note 5, at 4 ("Agencies should be aware of the importance of how information is presented . . .").

186. Hardisty et al., *supra* note 185, at 86, 89.

187. Dan M. Kahan et al., *The Second National Risk and Culture Study* 4–6 (Oct. 3, 2007) (unpublished manuscript), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1017189.

188. See *id.* at 2, 16.

tial negative reaction that the public is unwilling to accept certain policy measures. Reframing an issue in a way that challenges preconceived beliefs may stimulate more thoughtful consideration of an issue.

ii. Habits

Psychological research suggests that individuals often behave inconsistently with their attitudes or beliefs due to a reliance on automatic processing in decisionmaking.¹⁸⁹ Psychologists have hypothesized that many “decisions” actually occur outside the range of cognition.¹⁹⁰ A habit, in the psychological sense, is a behavior that is the result of “automatic cognitive processes” due to an “extensive repetition” of that behavior.¹⁹¹ Additional work suggests that habits often supplement the cognitive process of decisionmaking or even override attitudinal preferences and normative influences on behavior altogether, leading to outcomes that may be in conflict with social outcome maximization.¹⁹² An understanding of the role of habits is critical for anticipating the appropriate policy measure to influence behavior change. For example, anti-idling laws or public education campaigns may be ineffective for segments of the public that have been “trained” to idle their vehicles for extended periods.¹⁹³ New vehicle technologies such as integrated starter-generators provide a relatively low-cost technological solution

189. Ola Svenson, *Differentiation and Consolidation Theory of Human Decision Making: A Frame of Reference for the Study of Pre- and Post-Decision Processes*, 80 ACTA PSYCHOLOGICA 143, 145–46 (1992).

190. *Id.*

191. David L. Ronis et al., *Attitudes, Decisions, and Habits as Determinants of Repeated Behavior*, in ATTITUDE STRUCTURE AND FUNCTION 213, 219 (Anthony R. Pratkanis et al. eds., 1989). For a discussion of habits in law and economics noting the work of Kenneth Arrow and concluding that habits “can be incorporated into a theory by supposing that people choose goods with an eye towards minimizing changes in their consumption”, see Jolls et al., *supra* note 2, at 1478.

192. See Henk Aarts et al., *Predicting Behavior from Actions in the Past: Repeated Decision Making or a Matter of Habit?*, 28 J. APPLIED SOC. PSYCHOL. 1355, 1358–61 (1998); Michel Laroche et al., *The Influence of Culture on Pro-Environmental Knowledge, Attitudes, and Behavior: A Canadian Perspective*, 23 ADVANCES CONSUMER RES. 196, 196 (1996).

193. In the case of motor vehicle idling, it was once considered more cost-effective to idle for a period of time before driving or while waiting. See Carrico et al., *supra* note 111, at 2882. With improvements in modern fuel-injection engines, that is no longer the case. See *id.* However, many individuals are acting based on outdated information and old habits. See *id.*

that does not rely on the consumer to unlearn or relearn a behavior.¹⁹⁴

iii. Cognitive Dissonance

Cognitive dissonance refers to the psychological discomfort that is felt when a person holds two contradictory ideas or cognitions.¹⁹⁵ This principle also extends to an inconsistency between an attitude or belief and a behavior.¹⁹⁶ Therefore, an individual who values personal health but also regularly smokes cigarettes will likely experience a certain level of anxiety over this inconsistency.¹⁹⁷ Dissonance reduction can be achieved by modifying an attitude, belief, or behavior to create consistency.¹⁹⁸ When this is impossible or difficult, individuals will often justify the inconsistency through rationalization.¹⁹⁹ Therefore, continuing with the same example, a smoker may justify his or her behavior by downplaying the risks of smoking.²⁰⁰

Behavior change programs can take advantage of the need for consistency by highlighting discrepancies between an individual's attitudes, beliefs, and behavior.²⁰¹ This is true even when one's behavior is not directly observed. For example, students on a college campus that were reminded that they had made a commitment to take shorter showers were more likely to follow through with their pledge.²⁰² Clearly, it is not feasible from a policy perspective to use this approach on a macro level; however, studies have shown that simply asking individuals to make an upfront commitment can also be an effective way to encourage action, particularly when that commitment is made publicly.²⁰³ This is a principle that fundraising organizations

194. For a discussion of this technology, see *id.* at 2887.

195. See LEON FESTINGER, A THEORY OF COGNITIVE DISSONANCE 2–3 (1957).

196. See *id.* at 3.

197. See *id.* at 2.

198. See *id.* at 18–23.

199. See *id.* at 2.

200. See *id.*

201. See Chris Ann Dickerson et al., *Using Cognitive Dissonance to Encourage Water Conservation*, 22 J. APPLIED SOC. PSYCHOL. 841, 852 (1992); S.J. Kantola et al., *Cognitive Dissonance and Energy Conservation*, 69 J. APPLIED PSYCHOL. 416, 421 (1984).

202. See Dickerson et al., *supra* note 201, at 841.

203. See Richard D. Katzev & Theodore R. Johnson, *Comparing the Effects of Monetary Incentives and Foot-in-the-Door Strategies in Promoting Residential Electricity Conservation*, 14 J. APPL. SOC. PSYCHOL. 12, 24–25 (1984); Michael S. Pallak & William Cummings, *Commitment and Voluntary Energy Conservation*, 2 PERSONALITY & SOC. PSYCHOL. BULL. 27, 27, 29 (1976).

have utilized in large numbers.²⁰⁴ Similarly, bringing attention to one's behavior even in the absence of a public commitment can also be effective. In the case of environmental policy, feedback indicating that an individual can do more to reduce environmental harm may induce dissonance among those who value environmental protection if they cannot otherwise rationalize their actions.²⁰⁵

As we suggest at the beginning of this section, this analysis identifies the importance of developing new lines of research within social psychology and sociology to complement behavioral economics.²⁰⁶ This work should focus on the social outcome maximization analog to monetary outcome maximization: Are there predictable extra-rationalities in how individuals respond to social outcomes? In the meantime, the analysis in this area should proceed cautiously and incrementally.

B. ACCOUNTING FOR MULTIPLE LEVELS OF INFLUENCE

We have described two lines of analysis based on two different assumptions about individual behavior (the consideration of monetary outcomes and social outcomes) and, within each, two types of individual responses (rational and extra-rational). The analytical framework we have described so far incorporates behavioral insights by providing not a mathematical formula with a quantitative outcome, but a structured set of factors that agencies should consider when developing regulatory options and should add to the quantitative process when conducting regulatory review. But so far the framework suggests that agencies should consider the effect of regulatory actions on individuals without considering whether their behavior changes when viewed in terms of the groupings that subsume them—social networks, local communities, and national constituencies.²⁰⁷ Drawing on the methodology of social

204. See Elizabeth G. Warner, *Ask the Experts: Monthly Pledge Systems—A Fundraising Idea for Nonprofits?*, NONPROFIT WORLD, May–June, 1994, 4, 4–5 (explaining how monthly pledge systems can be easily set up and provide significant increases in revenue and core donor involvement).

205. See Clive Seligman & John M. Darley, *Feedback as a Means of Decreasing Residential Energy Consumption*, 62 J. APPLIED PSYCHOL. 363, 366–67 (1977).

206. See discussion *supra* Part II.A.2.b.

207. OIRA has recently noted the importance of understanding the effects of informational regulatory tools on subpopulations. For example, it has noted that with regard to default rules it may be important for agencies to “distinguish among, and to suit the diverse situations of, members of the affected group. For example, geographic or demographic information (such as age)

psychology and sociology, in this section we suggest an additional round of analysis that accounts for these influences on individual behavior.

Behavioral scientists have relied heavily on socio-ecological frameworks (SEF) for organizing the set of influences on individual behavior and the interrelationships among these influences.²⁰⁸ Although not a cohesive model used to make and test predictions, SEFs are conceptual and organizational tools that can focus regulators on different points of influence on behavior, including but not limited to economic influences. Typically, SEFs represent multiple nested layers of influence such as individual-level factors, community-level factors, and others.²⁰⁹ The number and specificity of the layers that are represented depend on the context within which the SEF is used.²¹⁰ Agencies can begin with a framework that includes four levels of influence and expand where appropriate. The four levels include: the individual, the immediate social environment (including family, friends, and work), the community environment (including neighborhoods, cities, and states), and the broader national and policy environment.

A sample SEF specific to the decision to invest in an energy efficient product is provided in Figure 2. Factors such as the financial capability to purchase a new product as well as the need for a new product are included as individual-level factors, as are knowledge of product options and beliefs about the importance of efficiency. Factors such as vicarious experiences with efficient products (i.e., via a friend or colleague) are represented in Level 2, along with social norms regarding energy efficiency or environmentalism. The presence of vendors that sell efficient products, the intermediaries that affect these deci-

might be taken into account if it helps to increase the likelihood that the default rule will be suited to the situations of those to whom it applies.” 2010 OIRA Disclosure Memo, *supra* note 5, at 11.

208. Socio-ecological frameworks have been relied upon by researchers working in the areas of developmental psychology, community psychology, health psychology, and public health. *See, e.g.*, URIE BRONFENBRENNER, *THE ECOLOGY OF HUMAN DEVELOPMENT* (1979) (applying an ecological framework to the field of developmental psychology). For an example in public health literature applying an ecological framework in identifying environmental influences on physical activity, see James F. Sallis et al., *An Ecological Approach to Creating Active Living Communities*, 27 ANN. REV. PUB. HEALTH 297 (2006).

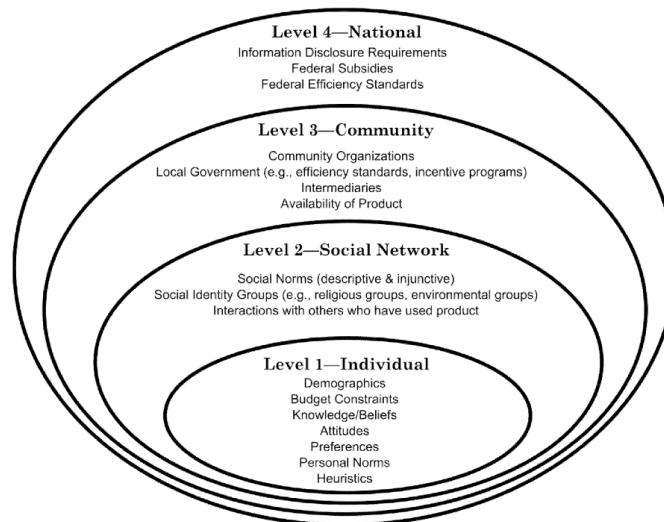
209. *See, e.g.*, BRONFENBRENNER, *supra* note 208, at 3–4 (describing his conceptual framework as “a set of nested structures, each inside the next, like a set of Russian dolls”).

210. *Id.*

sions, and local policies that may affect these purchases (e.g., state efficiency requirements) are included in Level 3. Finally, federal policy and the presence of cultural values and norms are reflected in Level 4.

A factor within one level will interact with factors at other levels. For example, federal policy, local policy, and peer networks will provide relevant information to the consumer about his or her decision. Broader societal norms in Level 4 may contradict more group-specific social norms in Level 2 such as the potential contradiction between materialism and environmentalism. Some factors may interact in synergistic ways such as a policy to tax plastic bags which may reinforce a social norm to use reusable bags.²¹¹

Figure 2. Example of Social Ecological Framework Applied to Residential Efficiency Investments



This framework provides a systematic way in which agencies can consider the different levels of influence on behavior and can look for opportunities where those influences may be convergent and where they may conflict. An agency may recognize, for example, that resources spent on campaigns to promote public transportation in an effort to reduce ozone pollution are poorly allocated in communities that have no public transportation infrastructure to support such behavior. Assum-

211. See *supra* notes 177–79 and accompanying text.

ing sufficient statutory authority, the agency may decide to allocate more funding to infrastructure development or to campaigns that target behaviors that are more malleable such as motor vehicle idling, other driving behavior, or vehicle maintenance.²¹² Returning to the example of an energy efficient purchase, an agency may realize that federal programs to offset the cost of a more efficient product may be bolstered by a similar program that incentivizes intermediaries to sell these products, therefore encouraging intermediaries to provide the relevant information regarding the operating costs that are often missed due to extra-rational patterns of behavior. An agency also may recognize that using a campaign to connect efficient purchases to societal goals such as energy security or environmental protection may make social or personal norms more salient when purchase decisions are made.

Because regulation is, by its nature, generalized, an agency may not be able to take account of responses at all scales. But regulatory analysis is incomplete unless it at least considers behavioral influences at multiple scales. At a minimum, agencies will be better positioned to prioritize factors that have the greatest potential leverage on behavior or that may lead to policy failures if not addressed. Agencies also will be better positioned to enlist other regulators, such as state or community-level entities, to tailor policies and messages in ways that are more appropriate for those populations. For example, a public education campaign centered on the juxtaposition of energy security and environmental protection may resonate differently in different communities.

III. ENERGY EXAMPLES

In this Part, we illustrate our framework by applying it to concrete energy-use examples. We demonstrate how the framework will operate and the findings it will yield. We refer to energy and environmental studies wherever possible, but we also draw on studies from other fields where the research is particularly relevant and transferable. We first examine the important role that our analytical framework might play in improving regulatory decisionmaking regarding electric cars, and

212. See, e.g., *Congestion Mitigation and Air Quality (CMAQ) Improvement Program*, FED. HIGHWAY ADMIN., <http://www.fhwa.dot.gov/environment/cmaqpgs/> (last modified Sept. 22, 2009) (discussing the traffic-grant program, which includes guidelines limiting spending to areas such as carpooling that have high-technical potential but low-behavioral plasticity).

we then turn to tankless water heaters. Although our examples are drawn from the energy and environmental contexts, we believe that other areas of intense regulatory and political concern, such as antitrust, securities fraud, pension benefits, and health care, are susceptible to the same sorts of considerations.²¹³

Some background on the issue of energy use is helpful to demonstrate the relevance of behavioral analysis. Regulations and policies that reduce energy demand will be a critical component of any successful U.S. energy policy or climate mitigation strategy,²¹⁴ and the household sector is one of the most promising areas for low-cost, prompt reductions in energy use and carbon emissions.²¹⁵ The sector accounts for roughly forty percent of U.S. carbon emissions as well as a comparable per-

213. See, e.g., J. Thomas Rosch, Comm'r, Fed. Trade Comm'n, Behavioral Economics: Observations Regarding Issues That Lie Ahead, Address at the Vienna Competition Conference (June 9, 2010), available at <http://ftc.gov/speeches/rosch/100609viennaremarks.pdf> (discussing the case for using principles of behavioral economics in antitrust merger review). For commentary on Rosch's speech, see Geoffrey Manne, *Commissioner Rosch's Really Weak Case for "Behavioral Antitrust,"* TRUTH ON MARKET (July 16, 2010, 12:46 PM), <http://truthonthemarket.com/2010/07/16/commissioner-roschs-really-weak-case-for-behavioral-antitrust/>. See also EMP. BENEFITS SEC. ADMIN., U.S. DEP'T OF LABOR & IRS, AUTOMATIC ENROLLMENT 401(K) PLANS FOR SMALL BUSINESSES 3 (Feb. 2010), available at <http://www.dol.gov/ebsa/pdf/automaticenrollment401kplans.pdf> (describing incentives for small businesses to switch to automatic enrollment of employees in 401(k) plans, with opt-out provisions); William Samuelson & Richard Zeckhauser, *Status Quo Bias in Decision Making*, 1 J. RISK & UNCERTAINTY 7, 26–31 (1988) (identifying status quo bias in health insurance purchases); Edmund L. Andrews, *Obama Outlines New Initiatives Intended to Make It Easier to Save for Retirement*, N.Y. TIMES, Sept. 6, 2009, at A20, available at 2009 WL 17481341. In this Part, we apply the monetary and social prongs of our proposed framework to electric car recharging and tankless water heater purchases, but in the interest of brevity we do not apply a social ecological framework to these actions.

214. See Nathan S. Lewis, Powering the Planet, Keynote Speech at the California Clean Innovation Conference (May 11, 2007), in 2 ENGINEERING & SCI. 12, 19 (2007) ("[L]owering demand . . . is going to pay off much sooner than clean energy supplies."); S. Pacala & R. Socolow, *Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies*, 305 SCIENCE 968, 969 (2004) ("Improvements in efficiency and conservation probably offer the greatest potential . . .").

215. See, e.g., FLORIAN BRESSAND ET AL., MCKINSEY GLOBAL INST., CURBING GLOBAL ENERGY DEMAND GROWTH: THE ENERGY PRODUCTIVITY OPPORTUNITY 57 (2007) (noting that the residential sector provides the "largest energy productivity opportunities" globally); HANNAH CHOI GRANADE ET AL., MCKINSEY & CO., UNLOCKING ENERGY EFFICIENCY IN THE U.S. ECONOMY 10 (2009) ("The residential sector . . . offers a slightly disproportionate thirty-five percent of the end-use efficiency potential.").

centage of total U.S. energy consumption.²¹⁶ A recent analysis concludes that behavioral measures targeting household conservation and efficiency could reasonably be expected to reduce total U.S. emissions by over seven percent by 2020.²¹⁷ This amount is larger than the total emissions of France and exceeds the combined emissions from several of the largest-emitting industrial sectors.²¹⁸ Additional analyses suggest that efficiency and conservation are among the quickest and least expensive alternatives available.²¹⁹

Although the household sector accounts for roughly forty percent of U.S. energy use and carbon dioxide emissions, the laws and policies directed at reductions from this sector often reflect strong assumptions about the influence of price and thus often overlook other influences on behavior. Despite the opportunity in the household sector and the increasing focus on energy efficiency and conservation at the federal, state, and local levels,²²⁰ recent regulatory and policy efforts are only beginning to tap the potential of this sector. A lack of information about the most effective behavior change measures may contribute to a surprising barrier: the tendency to focus on behaviors that involve the greatest energy use or carbon emissions (i.e., technical potential). Instead, behaviors should be evaluated based not only on technical potential, but also behavioral plasticity.²²¹ High technical potential means that modest changes

216. See Shui Bin & Hadi Dowlatabadi, *Consumer Lifestyle Approach to U.S. Energy Use and the Related CO₂ Emissions*, 33 ENERGY POLY 197, 197 (2005); Gerald T. Gardner & Paul C. Stern, *The Short List: The Most Effective Actions U.S. Households Can Take to Curb Climate Change*, 50 ENVIRONMENT, no. 5, 2008 at 12, 16; Michael P. Vandenbergh & Anne C. Steinemann, *The Carbon-Neutral Individual*, 82 N.Y.U. L. REV. 1673, 1694 (2007).

217. Dietz et al., *supra* note 33, at 18,452.

218. *Id.* at 18,452–53.

219. See BRESSAND ET AL., *supra* note 215, at 57; Allcott & Mullainathan, *supra* note 6, at 1204–05; Michael P. Vandenbergh et al., *Individual Carbon Emissions: The Low-Hanging Fruit*, 55 UCLA L. REV. 1701, 1758 (2008).

220. For a summary of the household energy efficiency measures in the American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115, which incorporates the Energy Improvement and Extension Act of 2008, Pub. L. No. 110-343, 122 Stat. 3807, see U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-10-383, RECOVERY ACT: PROJECT SELECTION AND STARTS ARE INFLUENCED BY CERTAIN FEDERAL REQUIREMENTS AND OTHER FACTORS (2010), available at <http://www.gao.gov/products/GAO-10-383>.

221. See Richard York et al., *Bridging Environmental Science with Environmental Policy: Plasticity of Population, Affluence, and Technology*, 83 SOC. SCI. Q. 18, 31 (2002) (“Plasticity is a tool for bridging science with policy.”).

in behaviors have a substantial impact.²²² High behavioral plasticity means that the behaviors are relatively easy to change.²²³ Areas of high technical potential but low plasticity are important, but a growing body of research demonstrates that many behaviors have high technical potential and high behavioral plasticity.²²⁴ They should be the initial focus of policy, and our electric car and tankless water heater examples demonstrate the potential for regulators to use behavioral insights to affect these areas.²²⁵

A. ELECTRIC CARS

The electric car example demonstrates how even early in the development of regulations and policies rational action assumptions can begin to frame the regulatory options to exclude behavioral insights. The emissions reduction potential and cost of operating electric vehicles depend heavily on when individuals choose to charge those vehicles.²²⁶ Drivers are most likely to plug in their vehicles when they return home in the evening.²²⁷ This timing coincides with peak-load energy use in the late afternoon and evening, when less efficient sources of electricity generation are used to meet peak load demands.²²⁸ Depending on the mix of generating sources (coal, nuclear, gas, or renewable sources), recharging during peak periods may substantially increase the carbon emissions and costs associated with electric vehicles.²²⁹ Recharging during peak periods also could increase

222. See Vandenberg et al., *supra* note 141, at 10,551.

223. Too much of the discussion to date has focused on behaviors that have high-technical potential but low plasticity, such as shifting from individually driven cars to carpooling. See Dietz et al., *supra* note 33, at 18,453.

224. See discussion *infra* Part III.A and Part III.B.

225. Cf. Vandenberg et al., *supra* note 141, at 10,551.

226. A. ELGOWAINY ET AL., ARGONNE NAT'L LAB. CTR. FOR TRANSP. RESEARCH, ENERGY SYS. DIV., WELL TO WHEELS ENERGY USE AND GREENHOUSE GAS EMISSIONS: ANALYSIS OF PLUG-IN HYBRID ELECTRIC VEHICLES 7 (2009) (discussing greenhouse gas emissions).

227. RYAN W. MCCARTHY ET AL., UNIV. OF CAL., DAVIS INST. OF TRANSP. STUDIES, INTERACTIONS BETWEEN ELECTRIC-DRIVE VEHICLES AND THE POWER SECTOR IN CALIFORNIA 7 (2009) (discussing greenhouse gas emissions and demand for energy by time of day).

228. See ELGOWAINY ET AL., *supra* note 226, at 7; MCCARTHY ET AL., *supra* note 227, at 7; NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., TRANSITIONS TO ALTERNATIVE TRANSPORTATION TECHNOLOGIES—PLUG-IN HYBRID ELECTRIC VEHICLES 2 (2010) (discussing costs and power transmission capacity).

229. See, e.g., BETTINA KAMPMAN ET AL., CE DELFT, GREEN POWER FOR ELECTRIC CARS 41–42 (2010) (noting the importance of recharging time for capacity and other impacts); K. PARKS ET AL., NAT'L RENEWABLE ENERGY

the costs and intrusiveness of power lines and other aspects of electric transmission systems.²³⁰ In short, recharging at the most convenient times could make the electric car policy less efficient than it would otherwise be, or worse, less efficient than other entirely different regulatory choices such as developing different types of low carbon cars or mass transportation systems. If instead agency officials could devise a policy to induce individuals to charge their vehicles during off-peak hours (e.g., midnight to 7 a.m.) in many regions of the United States, they may increase the environmental benefits of an electric vehicle fleet, decrease the costs, or both. Table 1 identifies regions of the country in which efforts to recharge vehicles at night rather than in the evening may substantially reduce CO₂ levels.

LAB., COSTS AND EMISSIONS ASSOCIATED WITH PLUG-IN HYBRID ELECTRIC VEHICLE CHARGING IN THE XCEL ENERGY COLORADO SERVICE TERRITORY 24 (2007) (concluding that the costs and air pollution emissions of recharging plug-in hybrids varies substantially based on the time of charging).

230. See, e.g., Smart Grid Policy, 74 Fed. Reg. 13,152, 13,156 (Mar. 26, 2009) (to be codified at 18 C.F.R. ch. 1) ("If charging takes place during peak periods it could require a large investment in new generation, demand response resources and/or transmission capacity to meet the resulting higher peak loads. However, charging off-peak could actually improve the operation of the electric system, for example by improving existing generation asset utilization or by providing an electricity storage solution to address the potential for over-generation by variable resources in off-peak periods.").

Table 1. Regional Variations in CO₂ Emissions from Recharging²³¹

CO ₂ (million ton)		Year: 2020			Year: 2030			Source
Region	Gasoline-fueled HEVs	PHEVs charged from grid		Gasoline-fueled HEVs	PHEVs charged from grid			
		night	evening		night	evening		
ECAR	4.3	6.1	6.1	11.1	13.8	13.6	Table 13	
ERCOT	2.5	1.8	2.2	1.5	2.3	4.2	Table 16	
MACC	3.1	3.4	3.4	8.0	8.5	8.5	Table 19	
MAIN	3.3	5.1	4.8	8.4	10.4	10.0	Table 22	
MAPP	1.2	1.7	1.2	3.2	3.9	3.1	Table 25	
NPCC-NY	1.7	2.2	2.2	4.3	3.1	4.1	Table 28	
NPCC-NE	1.8	1.6	2.0	4.7	3.6	4.6	Table 31	
FRCC	2.1	1.6	2.3	5.5	6.4	4.6	Table 34	
SERC	6.0	7.5	5.4	15.4	20.7	14.3	Table 37	
SPP	0.8	0.6	0.8	0.5	2.2	2.1	Table 40	
WECC-NW	1.8	1.7	1.7	4.7	3.1	3.1	Table 43	
WECC-RPM/ANM	1.2	1.1	0.9	3.1	4.9	3.1	Table 46	
WECC-CA	4.6	3.3	3.9	11.7	9.3	10.2	Table 49	
Total	34.4	37.7	36.9	82.1	92.2	85.5		

1. Monetary Outcomes

a. *The Rational Actor*

If regulators assume that individuals are cost-minimizing, rational actors, they are likely to arrive at time-of-use pricing schemes to increase the cost of on-peak electricity use or to remove the choice from the individual by adopting a technology-based solution that controls the timing of vehicle recharging

231. Table 1 is based on data presented in STANTON W. HADLEY & ALEXANDRA TSVETKOVA, OAK RIDGE NAT'L LAB., POTENTIAL IMPACTS OF PLUG-IN HYBRID ELECTRIC VEHICLES ON REGIONAL POWER GENERATION 18–19, 48–50 (2008). The regions identified in the left-hand column of the table are as follows: ECAR—East Central Area Reliability Coordination Agreement; ERCOT—Electric Reliability Council of Texas; MAAC—Mid-Atlantic Area Council; MAIN—Mid-America Interconnected Network; MAPP—Mid-Continent Area Power Pool; NPCC-NY—Northeast Power Coordinating Council/NY; NPCC-NE—Northeast Power Coordinating Council/New England; FRCC—Florida Reliability Coordinating Council; SERC—Southeastern Electric Reliability Council; SPP—Southwest Power Pool; WECC-NW—Western Electricity Coordinating Council/Northwest Power Pool Area; WECC-RMP/ANM—Western Electricity Coordinating Council/Rocky Mountain Power Area and Arizona-New Mexico-Southern Nevada Power Area; WECC-CA—Western Electricity Coordinating Council/California. *See id.* at xiv, xvi fig.ES-1 (noting that the regions are as specified by the Energy Information Administration in the *Annual Energy Outlook 2007*).

without regard to the time the vehicle is plugged into the grid. Not surprisingly, much of the initial regulatory response to the time-of-recharge problem appears to be proceeding along these lines.²³² Although regulatory policy directed at electric vehicle recharging is in the early stages of development and ultimately will involve a complex mix of federal, state, and local actions, the initial focus appears to be on the use of price and technology to steer recharging behavior.²³³ For example, some early reports on recharging appear to assume that the optimal approach is simply to increase household electricity prices during the evening-peak-use period.²³⁴ Other reports discuss new technologies that will automatically shift recharging to off-peak periods regardless of when the driver plugs the car into the recharger.²³⁵

Our framework requires consideration of these options, but it does not stop there. Our framework highlights the need for regulators to consider whether individuals will have adequate information to respond to the prices or new technologies. To deal with information problems, regulators may use general public information campaigns to educate consumers about variable pricing structures, although these campaigns have had limited success.²³⁶ Immediate feedback devices and information distributed through trusted local sources may be more effective. Regulators could require electric vehicle or recharger manufacturers to provide a feedback mechanism that indicates the recharging cost or cost per unit of electricity on a real-time display that is visible at the time the vehicle is charged.²³⁷

232. See, e.g., *Do You Own an Electric Vehicle (EV)?*, S. CAL. EDISON, <http://www.sce.com/CustomerService/rates/residential/electric-vehicles.htm> (last visited Nov. 29, 2010) (offering time-of-use rates for electric vehicle users); *Residential Electric Vehicle Services*, L.A. DEP'T WATER & POWER, <http://www.ladwp.com/ladwp/cms/ladwp002056.jsp> (last visited Nov. 29, 2010) (offering a discounted rate for off-peak electric vehicle charging).

233. See, e.g., *Do You Own an Electric Vehicle (EV)?*, *supra* note 232 (using such a strategy).

234. See, e.g., HADLEY & TSVETKOVA, *supra* note 231, at 23 (concluding that "simple time-of-day charging could easily place all end-of-day charging requirements into peak periods").

235. See, e.g., *id.* (noting the potential for "smart chargers"); PARKS ET AL., *supra* note 229, at 8 (discussing use of timing devices to move charging to off-peak hours).

236. Abrahamse et al., *supra* note 88, at 276–77.

237. See *id.* at 278–81 (discussing the use of immediate feedback on motor vehicle and residential energy use).

Beyond ensuring that price or technology-based measures are workable if selected, our framework opens up the possibility of other alternatives. Utility models based on wealth considerations offer a valuable perspective, but an exclusive focus may constrain the options to price or technology-based ones. Even assuming a first preference for such options, additional alternatives are important for realizing the full potential of electric cars, especially if some price- and technology-based measures are not politically viable. In fact, there is a substantial risk of consumer backlash against higher prices during peak periods.²³⁸ If consumers or voters reject new pricing schemes, additional measures will be necessary, although the support for regulatory changes and the credibility of regulators at that point may be damaged.

Similarly, consumers have reacted negatively to the loss of control associated with some new household technologies thus far,²³⁹ and similar reactions may occur if the technological options take control over the timing of recharging out of consumers' hands. For example, research on programmable thermostats has demonstrated that many individuals prefer the manual function and ultimately use less energy when they are able to override the automatic setting on a programmable thermostat.²⁴⁰ These findings suggest that more nuanced, behaviorally sensitive options, such as including override devices with rechargers, may have a better chance of succeeding and therefore increasing the benefits of electric cars.

238. See FARUQUI & WOOD, *supra* note 12, at 21 (suggesting both that consumers are often satisfied after being introduced to variable pricing due to greater savings and that greater education prior to implementation may help consumers to adopt such pricing schemes); Behr, *supra* note 96 (discussing troubles with recent Maryland variable pricing and its smart meter initiative); see also Guy R. Newsham & Brent G. Bowker, *The Effect of Utility Time-Varying Pricing and Load Control Strategies on Residential Summer Peak Electricity Use: A Review*, 38 ENERGY POL'Y 3289, 3294–95 (2010) (concluding that the effectiveness of variable pricing schemes may be improved by targeting consumers more likely to respond to such schemes and by offering them greater support services).

239. Behr, *supra* note 96 (discussing troubles with even less intrusive efforts).

240. Kempton et al., *supra* note 128, at 190; see also Monica J. Nevius & Scott Pigg, Programmable Thermostats That Go Berserk? Taking a Social Perspective on Space Heating in Wisconsin 8.233, 8.241, Paper presented at the American Council for Energy-Efficient Economy Summer Study on Energy Efficiency in Buildings: Washington DC (Aug. 23–28, 2000), available at <http://www.ecw.org/ecwresults/berserk.pdf> (noting that a large proportion of individuals interviewed were not interested in using the programmable features of their thermostat, and many considered these features to be a hassle).

b. The Extra-Rational Actor

Using our framework, regulators also would consider the research on extra-rational patterns of monetary-outcome-maximizing behavior early in the regulatory development process. For example, individuals may place a remarkably high value on convenience and may be willing to pay a higher price than expected for the convenience of charging during on-peak hours. Due to a tendency to use hyperbolic discounting, individuals may devalue the savings they will realize in their energy bills at the end of the month if they recharge at off-peak hours.²⁴¹ To overcome these behavioral tendencies, agencies may need to consider requiring the feedback devices and built-in delayed start mechanisms with the override capabilities discussed above.²⁴² It also may be valuable to provide information on the economic implications of recharging times to new electric vehicle owners at the time of the vehicle purchase.²⁴³ This information could reflect the insights of behavioral work on message frames to overcome hyperbolic discounting, loss- versus gain-frames, and other phenomena. These measures may augment the effect of the time-of-use pricing and technology schemes at low cost, thereby increasing the net benefits of the electric car.

2. Social Outcomes

a. The Rational Actor

If regulators focus solely on monetary outcome considerations, however, they may overlook additional means of influencing the time of charging or the use of a built-in delayed start mechanism. The social outcome prong of our framework suggests the need to explore additional behavioral insights. In short, individuals may be willing to incur the economic cost of on-peak charging, but considering the social cost in their decision will change the payoff structure for many.²⁴⁴ It may be possible to design reward programs or disseminate information in other ways to enable individuals to signal to their neighbors

241. Cf. Stern, *supra* note 46, at 208–09 (discussing empirical studies of how consumers implicitly discount future values).

242. See Abrahamse et al., *supra* note 88, at 278–82 (discussing the effectiveness of feedback techniques on behavior).

243. See *id.* at 276–77 (discussing the effectiveness of information to promote proenvironmental behavior).

244. Ayres et al., *supra* note 163, at 14–15.

that they are recharging at low-impact times. Descriptive norm influences may then create increased incentives for the desired behavior, as individuals respond to the range of reasons why individuals tend to act the way others do. Information indicating that many others have chosen to recharge during off-peak periods may induce some to change their behavior even if they are not personally concerned about climate change, pollution, or recharging costs.²⁴⁵

The behavioral research (e.g., the Israeli child care study) also suggests that regulators should take care about the content of the information provided in public information campaigns.²⁴⁶ For example, for some subpopulations, providing information focused solely on price may crowd out other motives for recharging at off-peak periods. Making individuals aware of the social costs may change the subjective payoff structure for individuals who are concerned about issues such as climate change and air pollution, particularly those who identify with environmental groups.²⁴⁷ If properly targeted, this information can reinforce economic measures and may lead to impacts that are greater than the sum of their parts.

b. The Extra-Rational Actor

In addition, if regulators recognize that individuals sometimes behave in extra-rational ways when considering social outcomes, they may incorporate a number of steps into recharge-related regulations and policies. For example, they may require information to be framed in ways that reduce hyperbolic discounting of the social benefits of reduced carbon and air pollution. This may be done by framing social costs and benefits in terms of losses rather than gains, or presenting information in units that are meaningful to the individual (i.e., presenting reduction in carbon emissions in units of equivalent trees planted or the equivalent number of vehicles removed from the road).²⁴⁸ If the social benefits information is provided or primed

245. See *id.* (concluding that such information changed behavior in other energy-saving contexts).

246. See Gneezy & Rustichini, *supra* note 173, at 15–16 (cautioning that the production of information to consumers does not always have the intended consequences on behavior).

247. See Newsham & Bowker, *supra* note 238, at 3294–95 (arguing that similarly targeted strategies have worked to change the behavior of these kinds of people).

248. See Tversky & Kahneman, *supra* note 63, at 456 (noting that framing a problem in terms of loss is more likely to change behavior).

at the time of decisionmaking, it may prevent many individuals from rationalizing a decision to charge during on-peak hours by invoking cognitive dissonance over this behavior. This result would be particularly heightened if the individual had previously committed to charge during off-peak hours, such as at the time he or she purchased the vehicle.²⁴⁹ As a result, a program that induces new electric car owners to commit to recharging at off-peak hours, even if only lightly enforced, may have an important effect on behavior. By focusing on individuals who have just purchased an electric vehicle, a program also may induce individuals to form new habits, including the habit of recharging at off-peak hours or using a delayed-start mechanism. Encouraging good habits at the time a new behavior is adopted may be far easier than seeking to undo old habits later.

B. TANKLESS WATER HEATERS

Our second case study involves the analysis of policies designed to induce individuals to purchase more efficient appliances. We consider the purchase of a tankless water heater (TWH) here. As with the electric car example, the TWH example enables us to evaluate nearly every aspect of our framework and to do so in the order that we envision.

1. Monetary Outcomes

a. *The Rational Actor*

Assuming a rational actor who considers only monetary outcomes, the most viable policy approach may be to offset the cost of the purchase of a TWH via tax rebates or low-interest loans. Indeed, this approach is likely to increase adoption among eligible households, and participation rates are likely to increase as the size of the incentive increases.²⁵⁰ The behavioral literature emphasizes the importance of considering the information barriers and beliefs that may prevent an individual from participating in the program and ultimately purchasing a TWH.²⁵¹ Individuals must be aware of TWHs as a substitute for traditional water heaters, they must be aware of this at the

249. See Abrahamse et al., *supra* note 88, at 275–76 (discussing the successful use of commitment techniques to alter behavior).

250. Stern, *supra* note 134, at 468 (discussing the success of such incentives in inducing consumers to invest in their homes).

251. *Id.* (cautioning that such barriers can prevent acting on socially desirable behaviors).

time that they are looking to purchase a new water heater, and they must be aware of the incentive programs that could subsidize the cost of this purchase. Similarly, the consumer also must believe that the TWH will deliver the promised cost savings. This requires a level of trust in the product label, the vendor, and the individual who installs the product.²⁵²

An incentive program that is marketed using established marketing principles²⁵³ will bring this product and incentive information to the consumer's attention. Additional information that is provided at the time of purchase through product labels and well-educated intermediaries will ensure that the consumer has the appropriate information when the decision is made. The inclusion of reputable vendors, well-respected product manufacturers, and a guarantee of product efficiency will increase levels of trust that the product will, in fact, achieve the advertised monetary outcomes.²⁵⁴ As consumers encounter more and more individuals in their social interactions who have used TWHs, levels of trust will also rise.²⁵⁵ Even when the incentive package is highly attractive to the consumer, trust in intermediaries and the program as well as product visibility are likely to be more important influences on the individual's decision to purchase a TWH.²⁵⁶ An incentive program that neglects these factors, therefore, may fail altogether or be no more successful than a program that offers a less attractive incentive.

b. The Extra-Rational Actor

Because individuals are not fully rational in their consideration of monetary outcomes,²⁵⁷ they are likely to act inappropriately on information relative to the minimization of costs.

252. *Id.* at 467–68 (noting that credibility can be an important factor in getting behavior to change).

253. This includes principles of product marketing as well as social marketing. For a detailed discussion of the utility of social marketing techniques, see MCKENZIE-MOHR & SMITH, *supra* note 6, at 82–92.

254. For a discussion of nonmonetary factors in encouraging participation on home efficiency incentive programs, including issues such as trust and credibility, see Stern, *supra* note 134, at 467–68, and Stern et al., *Effectiveness of Incentives*, *supra* note 135, at 161–63.

255. See John M. Darley & James R. Beniger, *Diffusion of Energy-Conserving Innovations*, 37 J. SOC. ISSUES 150, 159–66 (1981) (discussing the role of social networks in one's decision to adopt certain technologies).

256. In fact, this is the case particularly when the incentive package is attractive. See Stern et al., *Effectiveness of Incentives*, *supra* note 135, at 162.

257. *Id.* at 160.

Regulators using our framework would design information disclosure programs that recognize that an individual in the market for a new water heater may underestimate the cost of operating it or fail to consider operating costs altogether.²⁵⁸ When information about operating costs is brought to their attention they are likely to discount those savings at a rate well above market value because individuals tend to assign greater value to immediate outcomes than to future outcomes.²⁵⁹ Because losses loom larger than gains in consumers' minds, they may see greater value in avoiding a cost than achieving savings, even when the net value is identical.²⁶⁰

Agencies should not rely on consumers to process and synthesize information accurately. Well-designed labels that include information about operating costs and returns on investment will provide necessary information to assist consumers in making decisions to maximize monetary outcomes. If the decision to purchase a hot water heater is framed as an opportunity to avoid future losses rather than to achieve future gains, the individual is likely to be more compelled to make the investment.²⁶¹ In short, the design of a label is less a matter of engineering than of behavioral science.

Agencies also should consider that consumers may assign cognitive costs a much greater value than the estimated monetary value of those costs.²⁶² If the incentive program is easy to use, the consumer is more likely to use it. Once the consumer is made aware of the existence of an incentive to purchase a TWH, the ease or difficulty of participating in that program will play a surprisingly large role.²⁶³ Consumers may be turned off if they do not know where to go to find out the details of the program, if they cannot easily determine their eligibility, if

258. See Stern, *supra* note 46, at 208–09 (discussing “anomalous” implications of consumer adoption decisions and offering possible explanations for such decisions).

259. See Feiler & Soll, *supra* note 127, at 289 (concluding that consumers ignore costs both when they are decoupled from benefits and when they are hard to keep track of).

260. Tversky & Kahneman, *supra* note 63, at 456.

261. See Paul C. Stern, *Psychological Dimensions of Global Environmental Change*, 43 ANN. REV. PSYCHOL. 269, 291 (1992) (citing S. Yates, Using Prospect Theory to Create Persuasive Communications About Solar Water Heaters and Insulation (Jan. 1, 1982) (unpublished doctoral dissertation) (on file with University of California, Santa Cruz)) (noting the past success of framing investment decisions in terms of loss avoidance in changing investment behavior).

262. Stern et al., *Design Principles*, *supra* note 135, at 4848.

263. *Id.*

there is a large paperwork burden involved in participating, or if they do not know where to go to purchase the product and how to have it installed.²⁶⁴ For these reasons, programs that are simple and that regulators communicate in clear, concise, and easy to understand language will be more successful. A program interface that offers this information as well as accompanying information about vendors that sell TWHs and install them will encourage greater participation. Finally, a program that places the administrative burden on the vendor and requires minimal effort of the consumer will attract more participants.²⁶⁵ Regulators may find that these efforts to reduce cognitive costs will make their program more vulnerable to abuse; however, this drawback is likely to be outweighed by the increased participation in the program. In short, cognitive costs may not appear in models that examine monetary costs, but they may be equally important to a regulatory program's success.

2. Social Outcomes

a. *The Rational Actor*

Because individuals seek to maximize social outcomes, factors other than direct monetary outcomes will have important influences on their decisions. Individuals value social inclusion and seek approval from significant others in their social environment.²⁶⁶ Behaviors that exemplify the principles held by those individuals and groups reap social rewards that have great value in the calculation of expected costs and benefits.²⁶⁷ For example, an individual who identifies as an environmentalist and associates with other environmentalists may gain status within his or her group by purchasing a hybrid vehicle, which has great symbolic significance but may not necessarily be economically cost-effective. For this reason, an individual

264. See, e.g., *id.* (noting the importance of low cognitive costs for effective household energy efficiency programs).

265. Cf. *id.* (indicating that the less consumers have to do to effectuate a program, the more likely it will be successful).

266. For work on social identity theory, see Henry Tajfel & John Turner, *An Integrative Theory of Intergroup Conflict*, in *SOCIAL PSYCHOLOGY OF INTERGROUP RELATIONS* 33, 40–47 (William G. Austin & Stephen Worchel eds., 1979).

267. See, e.g., JOHN C. TURNER, *SOCIAL INFLUENCE* 163 (1991) (noting that people are more influenced by ingroups to which they categorize themselves as belonging, and engage in behavior that exemplifies those ingroup norms).

may be more likely to purchase a TWH if it is considered relevant to the principles valued by an important social group. Information that connects water heater purchases, or appliance purchases in general, to a social identity may trigger individuals to consider the social costs and benefits of that decision in the same way that many consider the decision to purchase a fur coat to be a faux pas.²⁶⁸

Even when the individual is not motivated by the symbolic significance of an action, the desire to fit in with a group or to avoid negative social attention is known to be a powerful predictor of behavior. For this reason, individuals will take steps to fit in with those around them even when it may be inconvenient or carries an economic cost.²⁶⁹ By communicating information to suggest that a behavior such as a TWH purchase is widespread or is becoming widespread (i.e., a descriptive norm), agency officials can signal to consumers that not adopting an action will be seen as out of the norm. Similarly, by communicating to consumers that certain behavior is disapproved of or approved of (i.e., an injunctive norm), regulators can signal to consumers that a behavior carries with it social costs and benefits.²⁷⁰ Information provided through education campaigns or intermediaries can communicate social norms in potentially powerful ways.

Regulators who ignore the social costs and benefits of a behavior may cause counterproductive effects. As with electric car recharging at off-peak periods, marketing a hot water heater purchase as an economic decision without addressing its social significance may inadvertently crowd out nonmonetary motives for that decision for many individuals. Framing a decision that was once based on social outcome maximization as one that is based on monetary outcome maximization can trigger the consumer to consider a different set of costs and benefits that may not produce the socially optimal outcome.²⁷¹ In addition, energy

268. See *id.* (noting that identification with an ingroup makes it more likely for an actor to behave in conformance with group norms).

269. See Cass R. Sunstein, *Social Norms and Social Roles*, 96 COLUM. L. REV. 903, 915 n.41 (1996).

270. For work on normative messaging and its impact on behavior, see Goldstein et al., *supra* note 162, at 482; Schultz, *Changing Behavior*, *supra* note 162, at 36; Schultz et al., *Power of Social Norms*, *supra* note 162, at 434.

271. See Bowles, *supra* note 174, at 1605 (arguing that economic incentives that induce selfishness can be counterproductive); Gneezy & Rustichini, *supra* note 173, at 10 (finding that when actors frame their actions in terms of eco-

savings realized from efficiency may be taken back if the consumer uses the monetary savings from use of a TWH on other energy expenditures. Similarly, individuals who have adopted a TWH may be less motivated to conserve water, and therefore increase their shower time and hot water usage. These take-back effects may be reduced by establishing goals and providing energy-use feedback to that individual.²⁷² Likewise, providing comparative feedback that contrasts a household's energy use with other efficient households may increase motivation to curtail energy use even after new technologies have been adopted.

b. The Extra-Rational Actor

Just as there is evidence that individuals behave extra-rationally in their consideration of economic costs and benefits, extra-rational patterns also exist with respect to the goal of social outcome maximization.²⁷³ Individuals may act to maximize social outcomes even when they do not directly experience the payoffs. This may occur when behavior cannot be observed by others.²⁷⁴ For this reason, the social status one would gain by purchasing a TWH may operate even when an individual's peers may not know about this purchase. Emphasizing the social costs and rewards associated with a behavior may have benefits even when that person does not perform a behavior in the public eye.²⁷⁵

Individuals also may respond to a social norm that they do not necessarily endorse due to pluralistic ignorance.²⁷⁶ Although this may not be directly related to appliance purchases, it may be highly relevant in other contexts such as decisions regarding lawn care or the purchase of used goods. Individuals may incorrectly believe that their peers would look down on

conomic consequences, they tend to act in ways that ignore the social consequences of those actions).

272. See Abrahamse et al., *supra* note 88, at 276 (discussing the successful use of goal-setting techniques in changing behavior).

273. See *supra* Part II.A.2.b.

274. For example, providing normative information in energy bills led to a reduction in energy use even though levels of energy consumption could not be directly observed by one's peers. Ayres et al., *supra* note 163, at 14–15.

275. See Vandenberg, *supra* note 45, at 1105–06 (suggesting that personal norms may influence behaviors in situations where peers do not observe the harmful behavior).

276. See Hubert J. O'Gorman, *The Discovery of Pluralistic Ignorance: An Irony Lesson*, 22 J. HIST. BEHAV. SCI. 333, 333–35 (1986) (discussing pluralistic ignorance and its potential effects).

them for choosing not to use pesticides, for purchasing a used product, or for choosing a product based on its efficiency rather than its appearance.²⁷⁷ Information to overcome normative misperceptions can send more accurate social signals about what others consider acceptable or desirable behavior.

Similarly, an individual may adopt personal norms even outside of the context of a group to reward or punish that behavior. Personal norms may be based on broader societal values such as fairness, patriotism, or environmental protection. Individuals may choose to internalize these values as personal norms as a function of their own disposition or personal experiences. Individuals are often motivated to act consistently with a personal norm out of a desire for consistency or to reduce the cognitive dissonance that results from behaving inconsistently with a personal norm or belief.²⁷⁸ A public education campaign that makes widely held personal values or norms salient (i.e., energy security or environmental protection) can trigger dissonance-reducing behavior and encourage efficient investments.²⁷⁹ For example, a campaign that connects TWH and other appliance selections to environmental outcomes or energy security may motivate individuals to invest in this product when it is time to replace an old appliance. Furthermore, if this message is present at the time of decisionmaking (when the individual is purchasing the appliance), it is likely to be most successful. Requesting a commitment to purchase a more efficient water heater or other appliance the next time the individual is eligible can also prevent individuals from rationalizing or explaining away their decision to act inconsistently with a personal norm.²⁸⁰ Regulators may need to conduct these initiatives in a more community-based approach, and the difficulties of coordination may be outweighed by increased levels of success.

CONCLUSION

The framework that we present continues the process of transforming behavioral insights into concrete considerations,

277. See *id.* at 334 (citing analogous examples).

278. John Thøgersen, *A Cognitive Dissonance Interpretation of Consistencies and Inconsistencies in Environmentally Responsible Behavior*, 24 J. ENVTL. PSYCHOL. 93, 94 (2004).

279. Cf. *id.* (indicating that individuals would prefer to act in conformance with such norms).

280. See Abrahamse et al., *supra* note 88, at 275–76 (discussing commitment strategies).

thereby enabling agencies to improve the efficacy and efficiency of regulation. It also will discourage agencies from allowing ad hoc considerations to reduce the rationality of regulation. More broadly, our framework will facilitate judicial review of regulation, which is an important corrective for arbitrary agency action. In addition, it will enhance presidential and congressional oversight, improving the political accountability of regulation. Our framework also will enable interested parties to evaluate the effect of behaviorally informed regulatory analysis on regulation across government and will spur further study to improve that analysis, filling gaps in our understanding of behavioral responses.

In some senses, our framework is both too complicated and not complicated enough. It is more complicated than the existing model of regulatory analysis, but that result is inevitable once we acknowledge the importance of behavioral insights to effective regulation. At the same time, it does not provide a model that will generate quantitative results or a comprehensive set of instructions on how to incorporate behavioral insights. The field is still developing and further theoretical and applied research will need to be done. In fact, we may need a new cross-discipline of social behavioral psychology. We also may need sociologists and social psychologists to sit alongside the economists within agencies and OIRA.²⁸¹ In the meantime, our framework is likely to improve the success of regulations aimed at individual and household behavior—which is to say much of the regulation that agencies contemplate in the regulatory state.

Likewise, our examples from the energy-use context are not conclusive. For example, sufficient holes remain in our understanding of behavioral plasticity to warrant policies to target a host of behaviors. Individuals may be unwilling to modify some behaviors for unanticipated reasons while others may be more flexible. Thus, continued research and evaluation will develop our understanding of where the most cost-effective opportunities exist for agency officials to develop policies that hone in on the most promising opportunities for emissions reductions in the future. The limitations on the available data are not a bar

281. OIRA recently noted that it is important to use “[s]cientifically valid experiments” along with market surveys and focus groups to test the effects of summary disclosure, and that “[c]onsultation with experts can also be a valuable supplement to focus group testing.” 2010 OIRA Disclosure Memo, *supra* note 5, at 5.

to progress in this area, but rather they suggest that the use of behavioral insights in regulatory development and review is at an early stage of development, just as was economic analysis of regulatory activity several decades ago.

Entering the behavioral era means looking at regulation through a new lens. It reflects frank recognition that regulation cannot work effectively or efficiently if it does not consider how targeted populations respond. Cost-benefit analysis has developed through practical application and theoretical consideration, and we now know much more about the rational-actor model on which it is based. We expect the same for behavioral insights. By providing a framework for incorporating such insights into regulatory analysis, we aim to take a critical step in that direction.