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**“Regulation from the Inside Out: Nudges and Price
Instrument Theory for Internalities and Externalities”**

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SCHEDULE FOR 2013 NYU TAX POLICY COLLOQUIUM

(All sessions meet on Tuesdays from 4-5:50 pm in Vanderbilt 208, NYU Law School)

1. January 22 – David Kamin, NYU Law School, “Are We There Yet?: On a Path to Closing America's Long-Run Deficit.”
2. January 29 – Edward McCaffery, USC Law School, “Bifurcation Blues: The Perils of Leaving Redistribution Aside.”
3. February 5 – Jake Brooks, Georgetown Law School, “Taxation, Risk, and Portfolio Choice: The Treatment of Returns to Risk Under a Normative Income Tax.”
4. February 12 – Lilian Faulhaber, Boston University School of Law, “Tax Expenditures, Charitable Giving, and the Fiscal Future of the European Union.”
5. February 26 – Peter Diamond (with Emmanuel Saez), MIT Economics Department, “The Case for a Progressive Tax: From Basic Research to Policy Recommendations.”
6. March 5 – Darien Shanske, University of California at Hastings College of Law, “Modernizing the Property Tax.”
7. March 12 – Dhammika Dharmapala, U. of Illinois Law School, “Competitive Neutrality among Debt-Financed Multinational Firms.”
8. March 26 – Leslie Robinson, Tuck Business School at Dartmouth, “Internal Ownership Structures of Multinational Firms.”
9. April 2 – Alan Viard, American Enterprise Institute, “Progressive Consumption Taxation: The Choice of Tax Design.”
10. **April 9 – Brian Galle, Boston College Law School, “Regulation from the Inside Out: Nudges and Price Instrument Theory for Internalities and Externalities.”**
11. April 16 – Sarah Lawsky, University of California, Irvine School of Law, “Modeling Uncertainty in Tax Law.”
12. April 23 – Larry Bartels, Department of Political Science, Vanderbilt University, “Inequality as a Political Issue in the 2012 Election.”
13. April 30 – Itai Grinberg, Georgetown Law School, “A Governance Structure to Mediate the Battle Over Taxing Offshore Accounts.”
14. May 7 – Raj Chetty, Harvard Economics Department, “Active vs. Passive Decisions and Crowd-Out in Retirement Savings Accounts: Evidence from Denmark.”

**Regulation from the Inside Out:
Nudges and Price Instrument Theory for
Internalities and Externalities**

Brian Galle*

Abstract

This Article compares for the first time the relative merits of “nudges” and other forms of behaviorally-inspired regulation against more common policy alternatives, such as taxes, subsidies, or traditional quantity regulation. Environmental economists and some legal commentators have dismissed nudge-type interventions out of hand for their failure to match the revenues taxes can provide. Similarly, writers in the law and economics tradition argue that fines are generally superior to non-pecuniary punishments. Drawing on prior work in the choice-of-instruments literature, and contrary to this popular wisdom, I show that nudges may out-perform fines, other Pigouvian taxes, or subsidies in some contexts. I also add to the existing literature by extending choice-of-instrument theory to the regulation of internalities---instances where individuals do harm to their own future selves. I then apply these lessons to a set of contemporary policy controversies, such as New York City’s cap on beverage portion sizes, cigarette labeling, retirement savings, and charitable contributions.

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Introduction

It wasn't anyone's first choice. Diabetes, hyper-tension, and heart attacks were all on the rise in New York, and with them the City's costs of care.¹ The mayor's office explored a "sin tax" on soda and fatty foods, but food and beverage industry lobbyists went to Albany and blocked the tax in the State Legislature.² So the City leaders searched for other ways to confront its citizens with the true costs of unhealthy lifestyles. They came up with the cap: No covered establishment could sell sugary beverages over 16 ounces in volume.³ New York would become the City of Refills.

Critics were legion. Some complained that the city was setting up a "nanny state" to protect New Yorkers from themselves.⁴ Others, perhaps unaware of the legal maneuverings that preceded the cap, argued something of the opposite: if the City wanted to make beverages scarcer, it should have just imposed a tax.⁵ Yet others doubted the cap would have any effect at all.⁶ Despite the many skeptics, and as of this writing a set-back in the New York trial court, the idea has proven popular in other municipalities, several of whom are reportedly studying versions of their own.⁷

The beverage cap arrives after a decade of debate over "nudges" and other forms of behaviorally-informed regulation. As Thaler and Sunstein, Ian Ayres, and others have ably summarized, evidence shows us that innocuous little speed bumps, like the nuisance of getting back up to fetch another cup of cola, or of filling out a form to start saving for retirement, can have surprising impact on individual behavior.⁸ Choice architecture, the timing and context in which options are presented, matters.⁹ That ice-cold Coke is a lot more tempting when we can

¹ Notice of Public Hearing, Opportunity to Comment on the Proposed Amendment of Article 81 (Food Preparation and Food Establishments) of the New York City Health Code, found in Title 24 of the Rules of the City of New York, June 5, 2012, at 2; New York City Dep't of Health & Mental Hygiene, *Diabetes Among New York City Adults*, 8 NYC VITAL SIGNS 1, 3 (2009).

² Michael M. Grynbaum, *New York Plans to Ban Sale of Big Sizes of Sugary Drinks*, N.Y. TIMES, May 30, 2012

³ *Id.*

⁴ Nick Gillespie, *3 Cheers for Coercive Paternalism--Or, Why Rich, Elected Officials Really are Better than You*, REASON, Mar. 25, 2013; Katrina Trinko, *Soda Ban? What About Personal Choice?*, USA TODAY, Mar. 10, 2013.

⁵ Sarah Kliff, *Why Ban Soda When You Can Tax It?*, WASH. POST WONKBLOG, posted June 1, 2012; Nathan Sadeghi-Nejad, *NYC's Soda Ban is a Good Idea, But a Tax Would Be Better*, FORTUNE, Sept. 13, 2012; Matthew Yglesias, *A Soda Tax Would Be Smart, Banning Big Cups is Dumb*, SLATE.COM, posted June 1, 2012; *see also* Robert H. Lustig et al., *The Toxic Truth About Sugar*, 482 NATURE 27, 28 (2012) (describing taxes as "the most effective" policy for curbing excess sugar consumption).

⁶ Jacob Sullum, *The Benefit of Bloomberg's Big Beverage Ban*, REASON, June 20, 2012.

⁷ Brock Parker, *Cambridge Mulling Soda Ban Similar to New York Proposal*, BOSTON GLOBE, June 18, 2012; Mark Segraves, *Some on D.C. Council Favor Restricting Sugary Drinks*, WTOP, broadcast Oct. 23, 2012, available at <http://www.wtop.com/41/3088930/DC-Council-considers-restricting-sugary-drinks>. In addition, many jurisdictions have already imposed some kind of tax on unhealthy food or drink. Michael F. Jacobson & Kelly D. Brownell, *Small Taxes on Soft Drinks and Snack Foods to Promote Health*, 90 AM. J. PUB. HEALTH 854, 855 tbl.1 (2000); Alberto Alemanno & Ignacio Carreno, *Fat Taxes in the EU: Between Fiscal Austerity and the Fight Against Obesity*, 2 EUR. J. RISK REG. 571, 571 (2011).

⁸ IAN AYRES, *CARROTS AND STICKS* 3--44 (2010); RICHARD H. THALER & CASS R. SUNSTEIN, *NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS* 74--102 (rev'd ed. 2009).

⁹ THALER & SUNSTEIN, *supra* note 8, at 83--102.

see it fizzing sweetly beneath our thirsty lips than when it's stowed around the corner.¹⁰ Time will tell, but there are now many good reasons to think the cap will work better than some have predicted.

Many other policy designers have taken those lessons to heart. The Food & Drug Administration is in litigation over its effort to force tobacco sellers to print frighteningly vivid images on the sides of cigarette packs.¹¹ Efforts are already under way to cue families about their energy usage, to display healthy cafeteria foods in ways that are more appealing to kids, to make organ donations psychologically easier, and to make abortions more “informed” but emotionally more difficult.¹² Some noted economists have hinted recently at replacing the entire \$125 billion in U.S. tax incentives for retirement savings with a system in which individuals will have to opt out of saving rather than the most common current default, which is opt-in.¹³

Theorists and academics are quickly falling behind the policy makers. We know that nudges often can work, but debate over whether they *should* be used is less developed.¹⁴ Critics have scored some very effective points. For example, a major selling point of nudges is that they represent “libertarian paternalism” or “regulation for conservatives” or are otherwise not “coercive” in the sense of traditional government regulation: People always retain the freedom to defy the government’s preferences, and in many cases the costs of defiance are quite small.¹⁵ But as the Harvard economist Ed Glaeser argues, the same is true of taxes.¹⁶ A soda tax can readily be avoided by skipping the sipping, and abstinence is easy for those without a sweet tooth. Yet it seems unlikely that libertarians or other opponents of regulation could learn to love taxes imposed with a regulatory aim, as perhaps was illustrated by conservative reactions to the Affordable Care Act’s tax on the failure to purchase insurance.¹⁷

¹⁰ For overviews of the evidence that portion sizes affect consumption, see BRIAN WANSINK, *MINDLESS EATING* 17--19, 47--52 (2006), and Pierre Chandon, *How Package Design and Packaged-Based Marketing Claims Lead to Overeating*, 35 *APP. ECON. PERSPECTIVES & POL’Y* 7, 14--18 (2013).

¹¹ *R.J. Reynolds Tobacco Co. v. Food & Drug Administration*, 696 F.3d 1205, 1208 (D.C. Cir. 2012).

¹² THALER & SUNSTEIN, *supra* note 8, at 231--39; Hunt Allcott et al., *Externalities, Internalities, and the Targeting of Energy Policy*, NBER Working Paper No. 17977, manuscript at 33--40 (Apr. 2012).

¹³ Raj Chetty et al., *Active vs. Passive Decisions and Crowd-Out in Retirement Savings Accounts: Evidence from Denmark*, NBER Working Paper No. 18565, manuscript at 43 (Dec. 2012).

¹⁴ Pierre Schlag, *Nudge, Choice Architecture, and Libertarian Paternalism*, 108 *MICH. L. REV.* 913, 919 (2010) (offering this critique of the nudge framework).

¹⁵ Colin Camerer et al., *Regulation for Conservatives: Behavioral Economics and the Case for ‘Asymmetric Paternalism’*, 151 *U. PA. L. REV.* 1211, 1212 (2003); Cass R. Sunstein & Richard H. Thaler, *Libertarian Paternalism is Not an Oxymoron*, 70 *U. CHI. L. REV.* 1159, 1160--62 (2003) [hereinafter Sunstein & Thaler, *Libertarian Paternalism*].

¹⁶ Edward L. Glaeser, *Paternalism and Psychology*, 73 *U. CHI. L. REV.* 133, 135 (2006).

¹⁷ *Cf.* On Amir & Orly Lobel, *Stumble, Predict, Nudge*, 108 *COLUM. L. REV.* 2098, 2120--22 (2008) (suggesting that nudges are not value neutral); Gregory Mitchell, *Libertarian Paternalism is an Oxymoron*, 99 *N’WESTERN UNIV. L. REV.* 1245, 1260--61 (2005) (arguing that libertarians would not be persuaded by Sunstein & Thaler’s welfarist claims).

I don’t mean to rule out political opportunism as an alternative explanation for reactions to the ACA.

What is more, as Glaeser also argues, taxes may be more economically efficient than nudges.¹⁸ Both change people's behavior. Taxes also bring in revenues, though, which can be used to improve the lives of those who are inconvenienced by the regulatory policy. This same advantage of taxes over other forms of regulation has become an important part of debates over the best way to regulate greenhouse gasses and other forms of pollution.¹⁹

For those who would adopt New York City's beverage portion cap, and for implementers of the burgeoning group of nudges like it, the greatest challenges are therefore theoretical rather than practical. Is there any reasonable argument for nudges over taxes or other forms of monetary "sticks"? So far, nudge proponents have not squarely confronted that question.²⁰

This Article does. I accept for the sake of argument the claim that nudges and their ilk are no less of a government imposition than taxes or other regulatory "price instruments." Given that nudges are just another form of price, which form is the better tool for any given policy challenge?

In a sense, these questions can be, and in some limited ways have already been, raised about other regulatory alternatives to taxation. At least since Gary Becker's seminal 1968 article, punishment theorists have argued over whether fines are a better enforcement tool than prison, with "shaming" and other collateral sanctions more recently joining the mix.²¹ My analysis here adds something to those debates, as well. But I will also explain the distinctive features of nudges that might separate them from prison and the other alternatives to fines.

I argue here that nudges can be evaluated using tools that are mostly already familiar in the price instrument literature. Prior authors, including this one, have debated government's choice between two other kinds of prices.²² On the one hand are sticks, which can include taxes and other kinds of subjective changes for the worse.²³ On the other are carrots, which can include subsidies, or perhaps just relief from a currently-expected cost. Although these instruments usually have very similar marginal effects, they also can differ importantly from one

¹⁸ Glaeser, *supra* note 16, at 150.

¹⁹ Gloria E. Helfand et al., *The Theory of Pollution Control*, in 1 HANDBOOK OF ENVTL. ECON. 249, 287 (Karl-Goran Maher & Jeffrey R. Vincent eds., 2003); Ian W.H. Parry & Wallace Oates, *Policy Analysis in the Presence of Distorting Taxes*, 19 J. POL'Y ANAL. & MGMT. 603, 608--10 (2000).

²⁰ See Chetty et al., *supra* note 13, at 43 (noting that normative comparison of defaults and price instruments would be "a natural next step" for the literature).

²¹ Gary Becker, *Crime and Punishment: An Economic Approach*, 76 J. POL. ECON. 169, 196--99 (1968); A. Mitchell Polinsky & Steven Shavell, *The Theory of Public Enforcement of Law*, in 1 HANDBOOK OF LAW & ECONOMICS 405, 408--09 & n.10 (A. Mitchell Polinsky & Steven Shavell eds., 2007); Eric Rasmussen, *Stigma and Self-Fulfilling Expectations of Criminality*, 39 J.L. & ECON. 519, 520 (1996); Dan M. Kahan & Eric A. Posner, *Shaming White-Collar Criminals: A Proposal for Reform of the Federal Sentencing Guidelines*, 42 J.L. & ECON. 365, 366--68 (1999).

²² Giuseppe Dari-Mattiacci & Gerrit De Geest, *Carrots, Sticks, and the Multiplication Effect*, 26 J.L. ECON. & ORG. 365 (2009); Brian Galle, *The Tragedy of the Carrots: Economics and Politics in the Choice of Price Instruments*, 64 STAN. L. REV. 797, 813--40 (2012); Jonathan Baert Wiener, *Global Environmental Regulation: Instrument Choice in Legal Context*, 108 YALE L.J. 677, 701-96 (1999)

²³ For discussion of the points in this paragraph, see *infra* Part I.A.

another in their impact on actors' preferences, in their incentives for future behavior, in their distributive consequences, and in their politics. Choosing between the two often requires balancing between these considerations.

Nudges, I'll argue, represent a hybrid or middle ground between sticks and carrots, and thus offer yet a third set of possible tradeoffs.²⁴ For example, it is true that the beverage cap brings in no revenue for New York. But at the same time it may also have better distributive consequences than a soda tax, and produce less social waste, or "deadweight loss," than the stick.²⁵ Whether the cap is an attractive policy depends on the weights attached to these alternative consequences. Similarly, many other nudges can be compared directly to tort liability, taxes, or subsidies. The FDA's cigarette labeling policy is potentially a defensible complement to price-based tobacco regulation.²⁶ At the same time, nudge enthusiasts may want to do some additional calculations before rushing to scrap the U.S. retirement incentive system.

I also add to the existing literature by extending traditional price instrument theory to the regulation of "internalities." Until now, choice-of-instrument theory has been applied exclusively to externalities---the burdens or benefits we create for each other that have no direct impact on ourselves.²⁷ Internalities are harms we do to our future selves.²⁸ I argue that a crucial

²⁴ I don't mean to suggest that the three are mutually exclusive. See Michael P. Vandenbergh et al., *Regulation in the Behavioral Era*, 95 MINN. L. REV. 715, 719 (2011) (proposing "pairing price-[based] approaches with behavioral approaches").

²⁵ Prior legal analyses of "sin taxes" have tended to emphasize instead philosophical questions about the government's role in regulation, Gary Lucas, Jr., *Saving Smokers from Themselves: The Paternalistic Use of Cigarette Taxes*, 80 U. CIN. L. REV. 693, 698--742 (2012), or questioned whether government should share in the profits from bad deeds, Andrew J. Haile, *Sin Taxes: When the State Becomes the Sinner*, 82 TEMPLE L. REV. 1041, 1053--63 (2009). The substantial literature on the regulation of obesity does already raise some questions about the best methods for regulating, but has not yet attempted to compare nudges to more traditional alternatives. See E. Katherine Battle & Kelly D. Brownell, *Confronting a Rising Tide of Eating Disorders and Obesity: Treatment vs. Prevention and Policy*, 21 ADDICTIVE BEHAV. 755, 762 (1996); Tom Marshall, *Exploring a Fiscal Food Policy: The Case of Diet and Ischaemic Heart Disease*, 320 BRIT. MED. J. 301, 301 (2000); Katherine Pratt, *A Constructive Critique of Public Health Arguments for Anti-obesity Soda Taxes and Food Taxes*, 87 TULANE L. REV. 73, 114--39 (2012); Jeff Strnad, *Conceptualizing the "Fat Tax": The Role of Food Taxes in Developed Economies*, 78 S. CAL. L. REV. 1221, 1294--1322 (2005); Stephen D. Sugarman & Nirit Sandman, *Fighting Childhood Obesity Through Performance-Based Regulation of the Food Industry*, 56 DUKE L.J. 1403, 1429--90 (2007).

²⁶ As with obesity, there is a well-developed literature on the regulatory responses to the externalities and internalities of smoking and other addictive substances. For overviews, see Frank J. Chaloupka & Kenneth E. Warner, *The Economics of Smoking*, in 1B HANDBOOK OF HEALTH ECON. 1539 (Anthony J. Culyer & Joseph P. Newhouse eds., 2000); Philip J. Cook & Michael J. Moore, *Alcohol*, in 1B HANDBOOK OF HEALTH ECON. 1629 (Anthony J. Culyer & Joseph P. Newhouse eds., 2000); Jonathan Gruber, *Tobacco at the Crossroads: The Past and Future of Smoking Regulation in the United States*, 15 J. ECON. PERSP. 193, 202--06 (2001). Some authors, especially Jon Hanson, have also written on the behavioral dimensions of that regulatory policy. E.g., Jon D. Hanson & Douglas Kysar, *Taking Behavioralism Seriously: Some Evidence of Market Manipulation*, 112 HARV. L. REV. 1420, 1470--1552 (1999). But Hanson calls for enterprise liability as his main solution, *id.* at 1555--70; as far as I can discern no commentators have directly compared behavioral to price-based regulation of tobacco.

²⁷ Prior authors have of course discussed the possibility of penalizing or rewarding those who don't serve themselves well. For example, Bankman and Weisbach note that reducing the taxation of savings may help irrational under-savers. Joseph Bankman & David A. Weisbach, *The Superiority of an Ideal Consumption Tax Over an Ideal Income Tax*, 58 STAN. L. REV. 1413, 1447--48 (2006). But what these prior works have not done is to compare

limitation on sticks in the externality context does not hold for internalities. In particular, environmental economists have seriously undermined the “double dividend” or “revenue recycling” arguments for a carbon tax---that is, the tax’s potential to both clean the air and improve the economy.²⁹ Under reasonable assumptions, though, there can be a real double dividend in the internality context: taxes that help us to control our own behavior may in fact be free money.³⁰ I additionally examine how the remaining elements of price instrument theory play out differently in the internality and externality contexts.

Part I of the Article sketches some background for readers new to these concepts. Part II argues that nudges can be compared directly to other forms of price regulation. Part III begins that comparison, showing how each of the traditional elements of price theory, plus some new elements distinctive to nudges, could affect our choice between carrots, sticks, and nudges. Part III also explains how price-instrument theory can be translated from the externality to the internality context. Part IV then applies these general principles to a series of (hopefully) illuminating examples, including soda and tobacco as well as retirement savings, charity, and others.

I. Background

Before beginning a detailed price-instrument analysis of nudges, it may be useful for some readers to have a brief introduction to price-instrument theory. Readers who already can tell their carrots from their sticks may wish to skip to Part I.B., which summarizes briefly the concept of and evidence for “internalities” and other failures of human decision making. Readers who know that story, too, may still want to read Part I.C., which attempts to parse the social welfare claims offered by nudge expositors.

I.A. Price Instrument Theory

Modern economic theories of government regulation begin with the premise that markets sometimes fail.³¹ Externalities are a classic example.³² An externality, simply put, is a harm or benefit that affects someone other than the actor making an economic decision.³³

explicitly subsidies against penalties, let alone either of the two against nudges. *Cf. id.* at 1448 (noting that the authors’ analysis does not consider whether forced savings would be superior alternative to tax subsidy).

²⁸ Jonathan Gruber & Botond Köszegi, *Is Addiction ‘Rational’? Theory and Evidence*, 116 Q.J. ECON. 1261, 1263 (2001).

²⁹ A. Lars Bovenberg & Lawrence H. Goulder, *Environmental Taxation and Regulation*, 3 HANDBOOK OF PUBLIC ECONOMICS 1471, 1497--1507 (Alan Auerbach & Martin Feldstein eds., 2003).

³⁰ In this respect I extend earlier work by Ted O’Donoghue & Matthew Rabin, *Optimal Sin Taxes*, 90 J. PUB. ECON. 1825, 1834--35 (2006), who find a similar result in settings where the effects of taxes on labor supply are negligible---that is, “as long as th[e] tax is not too large.” My results do not depend on the size of the tax.

³¹ JONATHAN GRUBER, PUBLIC FINANCE AND PUBLIC POLICY 3(3d ed. 2011).

³² *Id.* at 4.

³³ *Id.* at 122--23.

Economists offer a two sets of standard solutions to the externalities problem. A first is regulation or prohibition, sometimes called “quantity regulation.”³⁴ Price instruments form a second broad category.³⁵ These include measures familiar from first-year law courses, such as tort liability, as well as “Pigouvian” taxes and subsidies, named for the economist most strongly associated with them. So, for example, speed and blood-alcohol limits are common quantity regulations aimed at the dangers of the road, while tort lawsuits and tolls are price instruments aimed at the same problem.

Once policy makers decide to rely on a price instrument, they have a choice between rewarding or penalizing, between carrots and sticks. Both options have similar effects on the marginal incentives of externality producers.³⁶ Whether producers are rewarded, or non-producers fined, giving an additional dollar saves donors money relative to not giving.³⁷ Each instrument can be priced so that the marginal cost of an additional unit of production is equal to the marginal damage suffered by society, so that in effect the producer “internalizes” the full social cost of her decision. However, the two mechanisms vary in a number of other important ways. Which option is the better choice for a particular policy depends largely on these other factors.³⁸

Sticks are, except in unusual circumstances, the more efficient tool for reigning in the social over-production of some negative-externality laden good.³⁹ Sticks earn the government money, while carrots drain the treasury, wasting hard-won tax revenues.⁴⁰ Revenue is critical because raising taxes is costly: in addition to paying the tax, many people will also change their behavior to minimize taxes, causing what economists call “deadweight loss.” In addition, carrots give producers more resources to create the unwanted good. Similarly, in many cases, as individuals get wealthier, they demand more of the undesirable product, a phenomenon known as the “income effect.”⁴¹ Carrots are also wasteful if producers plan to cut back on their activities anyway. And over-producers who know they will be paid to curtail their activities in the future have an incentive to begin over-producing, while the opposite is true of sticks.

In contrast, carrots are more defensible for encouraging the production of a good with positive externalities, where we would expect social under-production.⁴² In that case, the fact that carrot recipients have more resources is desirable, since we want them to produce or demand

³⁴ *Id.* at 137.

³⁵ STERNER, *supra* note 22, at 214--15.

³⁶ Helfand et al., *supra* note 19, at 277--78.

³⁷ *Id.* at 278.

³⁸ Galle, *supra* note 22, at 809--13.

³⁹ For development of the points in this paragraph, see *id.* at 813--31.

⁴⁰ The revenue benefit of sticks depends, however, on some assumptions about how the revenues are deployed. Bovenberg & Goulder, *supra* note 29, at 1497--1507. For development of this point, see *infra* Part III.A.1.

⁴¹ GRUBER, *supra* note 31, at 36. For example, poorer commuters may take the bus, while richer ones may prefer to drive.

⁴² *Id.* at 43--50 (noting that unregulated market tends to underproduce goods with positive externalities).

more of the good.⁴³ On the other hand, it is still the case that the expectation of future carrots has unwanted incentive effects, encouraging producers to delay producing the good until the government agrees to pay them. And carrots remain costlier, especially when factoring in the possibility that some might altruistically produce the good without subsidy. So though carrots are less clearly dominated by sticks in the positive externality setting, there remains a question whether they are worth the cost.

Let me emphasize the limits of what this “choice of instruments” kind of analysis can accomplish. The goal is measure the relative efficacy of each choice, given an arbitrary baseline: Our world looks like this, what should we do now? So the claim is not that sticks are always efficient, only that they are usually *more* efficient than carrots, all else equal.⁴⁴ Kaplow argues that differences between the two instruments would disappear if either was enacted together with a perfectly offsetting tax or tax cut.⁴⁵ I don’t disagree, and even agree that such perfect offsets might often be theoretically ideal.⁴⁶ My goal is only to consider the second-best outcomes in the absence of optimal offsets. That is, I analyze the implementation of the price instrument in isolation from any such offsets, which after all so far have not been observed in practice.

I.B. Internalities

As we’ve just seen, harms done to others are a classic economic rationale for government regulation, but what about harms done to self? Most readers likely know that a large body of literature now suggests that individuals make decisions---or fail to make them---in ways that in the long run likely do not maximize their own subjective well-being.⁴⁷ Some commenters, seizing on the externality analogy, have dubbed these kinds of mistakes “internalities”: costs that the deciding self inflicts on its temporal successors.⁴⁸

⁴³ Galle, *supra* note 22, at 832.

⁴⁴ See Helfand et al., *supra* note 19, at 270; cf. Daniel Shaviro, *The Minimum Wage, the Earned Income Tax Credit, and Optimal Subsidy Policy*, 64 U. CHI. L. REV. 405, 415 (1997) (explaining that departures from status quo can be analyzed without attributing any special normative status to existing rules).

⁴⁵ See LOUIS KAPLOW, *THE THEORY OF TAXATION AND PUBLIC ECONOMICS* 13--35, 151--78 (2008) for general discussion, and Louis Kaplow, *Taxes, Permits, and Climate Change*, NBER Working Paper No. 16268 (2010) for analysis specifically in the carbon tax context.

⁴⁶ ROGER COLINVAUX, BRIAN GALLE, & EUGENE STEUERLE, *EVALUATING THE CHARITABLE CONTRIBUTION DEDUCTION AND PROPOSED REFORMS* 10 (June 2012), available at <http://www.urban.org/publications/412586.html>.

⁴⁷ For reviews, see B. Douglas Bernheim & Antonio Rangel, *Behavioral Public Economics: Welfare and Policy Analysis with Nonstandard Decision Makers*, in *BEHAVIORAL ECONOMICS AND ITS APPLICATIONS* 7, 10--65 (Peter Diamond & Hannu Vartiainen eds., 2008); Stefano DellaVigna, *Psychology and Economics: Evidence from the Field*, 47 J. ECON. LITERATURE 315 (2009).

⁴⁸ The term is generally attributed to Herrnstein et al., *Utility Maximization and Melioration: Internalities in Individual Choice*, 6 J. BEHAV. DECISION MAKING 149, 149 (1993).

For doubts about whether government can accurately diagnose some preferences as errors, see Claire Hill, *Anti-Anti-Anti-Paternalism*, 2 N.Y.U. J. L. & LIB. 444, 445--48 (2007), and for arguments that even then regulation may be inappropriate---for example, because the costs of regulation exceed the costs of obtaining private correctives, see Jeff Rachlinski, *The Uncertain Psychological Case for Paternalism*, 97 N’WESTERN UNIV. L. REV.

Because a good deal of my later discussion will turn on the details of how humans go wrong, it's worth highlighting some aspects of the empirical literature here. One key finding is that we are overwhelmingly creatures of the present, and only through exercises of our limited pool of willpower can we force ourselves to take sufficient account of the future.⁴⁹ Relatedly, we tend to focus our attention on facts that are readily available to us or on items in plain sight, reacting automatically and emotionally to those immediate stimuli.⁵⁰ Only with some effort do we turn our attention to the distant and the hidden, and engage our reasoning powers to reach better decisions.⁵¹ We “anchor” on information we've already received, and interpret new data selectively to fit with what we already know or want to be true.⁵² In all of these areas evidence suggests that individuals vary considerably in their susceptibility to the behavior.⁵³

The consequences of these human tendencies can be seen all around us. Few human institutions, from families up through the federal government, make adequate plans for their financial future.⁵⁴ We procrastinate or give in to temptation, then build costly structures to overcome our tendencies, and then incur even more costs to unwind them.⁵⁵ People smoke too much, don't exercise enough, eat to excess. Many of us, even trained experts, make decisions based on only a fraction of the information available to us, choosing poor investments and neglecting “hidden” costs that in actuality are easily calculable.⁵⁶

Importantly for my later analysis, evidence so far suggests that some of us are more self-aware of these failings than others. Consider the example of the mutual bank. Mutuals offer credit cards with relatively higher interest rates but promise “no hidden fees.”⁵⁷ That combination of features seems most plausibly aimed at customers who know their own tendency to fall for the tricks played by other banks.⁵⁸ Mutuals command a small sliver of the credit market, however. Similarly, many households report that they let the government keep too much in tax withholding each year so that they will face the temptation to spend that money too soon---

1165, 1219--25 (2003). I don't intend to take a position on the merits of regulating internalities here; instead, I simply assume that internalities exist and analyze how they might be regulated.

⁴⁹ For overviews of the literature, see Lee Anne Fennell, *Willpower Taxes*, 99 GEO. L.J. 1371, 1375--94 (2011); Shane Frederick et al., *Time Discounting and Time Preference: A Critical Review*, in ADVANCES IN BEHAVIORAL ECONOMICS 162, 166--79 (Colin F. Camerer et al. eds., 2007).

⁵⁰ Daniel Kahneman, *Maps of Bounded Rationality: Psychology for Behavioral Economics*, 93 AM. ECON. REV. 1449, 1451--57 (2003).

⁵¹ *Id.* at 1467--69.

⁵² JONATHAN BARON, THINKING AND DECIDING 203--24, 263--70 (4th ed. 2008)

⁵³ Ted O'Donoghue & Matthew Rabin, *Self-Awareness and Self-Control*, in TIME AND DECISION: ECONOMIC AND PSYCHOLOGICAL PERSPECTIVES ON INTERTEMPORAL CHOICE 217, 219--20 (George Loewenstein et al. eds., 2003).

⁵⁴ Shlomo Benartzi & Richard Thaler, *Heuristics and Biases in Retirement Savings Behavior*, 21 J. ECON. PERSP. 81, 82--84 (2007);

⁵⁵ Frederick et al., *supra* note 49, at 172--79.

⁵⁶ John R. Graham & Campbell R. Harvey, *The Theory and Practice of Corporate Finance: Evidence from the Field*, 60 J. FIN. ECON. 187, 188--243 (2001); Aradhna Krishna et al., *A Meta-Analysis of the Impact of Price Presentation on Perceived Savings*, 78 J. RETAILING 101, 101--18 (2002);

⁵⁷ Ryan Bubb & Alex Kaufman, *Consumer Biases and Mutual Ownership*, NYU Law & Economics Working Paper 11-35, at 18--27 (Oct. 2011), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1945852.

⁵⁸ *Id.* at 4.

and then, ironically, some of these same households later pay very high fees to get access to their money a few weeks early.⁵⁹ Though other interpretations are possible, a reasonable inference is that our understanding of our own frailty, even if present, is often imperfect.

I.C. Nudges

Regulation can not only correct “internalities” but also make use of the mental processes that underlie them. If we know that individuals are slow to switch away from a default choice initially made for them, government can use defaults in place of commands.⁶⁰ Similarly, minor obstacles such as having to fill out a form or wait in a line can at times replace prescriptive regulation.⁶¹ To the extent that the framing and presentation of information influences how we choose, government can influence the public towards more desirable outcomes without the need for law enforcement.⁶² As readers likely know, Sunstein & Thaler call these “nudges,” and offer a long list of examples; for instance, they suggest painting roads to encourage more cautious driving---and (if that fails) making organ donation the default choice on drivers’ licenses.⁶³

Nudge proponents recommend these strategies on two main bases, one largely rhetorical and the other fairly technical. On the rhetorical side, the claim is that by shifting from commands to nudges, the government can offer “libertarian paternalism,” or, as other proponents similarly put it, “regulation for conservatives.”⁶⁴ That is, because nudges leave individuals free to disregard the government’s suggestions, they preserve individual choice in a way that traditional command and control regulation supposedly cannot.⁶⁵

As others have observed, though, all government regulation is optional to the extent that the individual is willing to endure the cost of defying it.⁶⁶ What distinguishes nudges for their

⁵⁹ Michael S. Barr & Jane K. Dokko, *Third-Party Tax Administration: The Case of Low- and Moderate-Income Households*, 5 J. EMPIRICAL L. STUDIES 963 (2008).

⁶⁰ Nudge proponents have mostly focused on internalities, but some scholars have extended their work to externalities or other regulatory goals as well. E.g., Ian Ayres, *Regulating Opt-Out: An Economic Theory of Altering Rules*, 121 YALE L.J. 2032, 2086 (2012); Anuj C. Desai, *Libertarian Paternalism, Externalities, and the “Spirit of Liberty”*: How Thaler and Sunstein are Nudging Us Toward an “Overlapping Consensus”, 36 L. & SOC. INQUIRY 263, 270 (2011); Russell Korobkin, *Libertarian Welfarism*, 97 CAL. L. REV. 1651, 1653 (2009); Matthew A. Smith & Michael S. McPherson, *Nudging for Equality: Values in Libertarian Paternalism*, 61 ADMIN. L. REV. 323, 335--39 (2009).

⁶¹ Brian Galle & Manuel Utset, *Is Cap-and-Trade Fair to the Poor? Shortsighted Households and the Timing of Consumption Taxes*, 79 GEO. WASH. L. REV. 33, 84--87 (2010).

⁶² Camerer et al. *supra* note 15, at 1230--37.

⁶³ THALER & SUNSTEIN, *supra* note 8, at 83--104, 231--39, 257--68. See Korobkin, *supra* note 60, at 1662--64, for a pithy summary of the available tools.

⁶⁴ Sunstein & Thaler, *Libertarian Paternalism*, *supra* note 15, at 1160; Camerer et al. *supra* note 15, at 1212.

⁶⁵ Korobkin, *supra* note 60, at 1684; Sunstein & Thaler, *Libertarian Paternalism*, *supra* note 15, at 1170, 73; see Ayres, *supra* note 60, at 2085 (“[T]he purpose of the higher-cost altering rules is to enhance user autonomy by increasing the chance they make informed choices to choose the option that they really want.”). Sunstein & Thaler also argue that the way choices are structured inevitably influences how people decide, so that there is no difference in the coerciveness of market and government choice structures. *Id.* at 1166.

⁶⁶ Glaeser, *supra* note 16, at 150--51; Mitchell, *supra* note 17, at 1275.

proponents is that the objective costs of overcoming the nudge in many cases are small.⁶⁷ Of course, in the moment that individuals face the nudge---when they are waiting on hold as “Girl from Ipanema” plays tinnily through their phone’s speaker---its costs appear too large to bear. So the claim that nudges are different depends on an assumption about the proper measure of individuals’ utility: evidently we should count costs and benefits according to the perspective the individual would take in a temporally remote, “reflective” setting.⁶⁸ Seen from this point of view, the cost of waiting on the phone for a few minutes should look tiny.

The more technical version of the argument is that nudges differ from standard regulation in their ability to more closely approximate people’s real preferences. Traditionally, critics of regulation claim that uniform government rules aimed at correcting people’s own mistakes will necessarily impose a “one size fits all” regime, forcing some people to change for the worse.⁶⁹ Social security, for instance, can be described as a form of forced savings that may reduce the subjective welfare of those who prefer to consume all their income immediately,⁷⁰ though probably a more complete description is that it is simply another form of tax-funded social insurance.⁷¹

Nudge defenders argue that asymmetric paternalism mitigate this problem because those who feel strongly about their own choices can easily overcome the government’s default.⁷² Although they acknowledge that for some people nudges can be hard to overcome, they suggest that asymmetric regulation is most defensible in those cases where the personality traits that make nudges tough to fight are the same traits that produce the behaviors the government is combating.⁷³ Impatient people won’t opt out of default savings plans, but the impatient are also the most likely to be saving too little. Therefore even if nudges *are* costly for some people, these are generally the people who on net benefit from that cost.⁷⁴

In this Article I will mostly pursue this second line of argument. As I will develop more in the next Part, critics argue persuasively that nudges should be seen as closely equivalent to

⁶⁷ THALER & SUNSTEIN, *supra* note 8, at 252--54; Camerer et al. *supra* note 15, at 1219, 1222; *see also* Ayres, *supra* note 60, at 2087 (describing costs of sticky defaults as “intermediate” between commands and free contract).

⁶⁸ THALER & SUNSTEIN, *supra* note 8, at 12; Sunstein & Thaler, *Libertarian Paternalism*, *supra* note 15, at 1191. A more developed version of this argument is Eyal Zamir, *The Efficiency of Paternalism*, 84 VA. L. REV. 229, 237--84 (1998). *But cf.* Camerer et al. *supra* note 15, at 1253--54 (suggesting that nudges are preferable to traditional paternalistic regulation because of “uncertainty” about whether consumer choices are really mistakes).

⁶⁹ *E.g.*, Richard Epstein, *The Neoclassical Economics of Consumer Contracts*, 92 MINN. L. REV. 803, 806--07 (2008); Mario J. Rizzo & Douglas Glen Whitman, *The Knowledge Problem of New Paternalism*, 2009 B.Y.U. L. REV. 905, 909.

⁷⁰ Theodore R. Groom & John B. Shoven, *Deregulating the Private Pension System*, in *THE EVOLVING PENSION SYSTEM* 123 (William G. Gale et al. eds., 2005).

⁷¹ Desai, *supra* note 60, at 277.7

⁷² Ayres, *supra* note 60, at 2091--92; Camerer et al. *supra* note 15, at 1222.

⁷³ Allcott et al., *supra* note 11, at 2, 23; *see* Camerer et al. *supra* note 15, at 1225--26.

⁷⁴ *Id.* at 1222.

other government efforts to impose costs on those who differ from the government's view.⁷⁵ But this leaves open the possibility that nudges are a better way to design those costs. Thus the asymmetric regulation claim, it seems to me, is not that nudges are fundamentally different than other forms of regulation, but rather only that they tend to be better targeted. Since poor targeting is an important component of the libertarian critique of government, this is a key move.

But the possibility that nudges may be better targeted than other regulation raises the question whether there are other factors that also should factor into our choice between regulatory regimes, a question I take up in Parts III and IV. In particular, I want to use the traditional tools of regulatory-instrument design to compare nudges to other, more traditional, possibilities.

Targeting also serves to distinguish nudges from other forms of what we could call dollar-less prices. Many regulatory burdens could be translated into dollar terms. Some of my analysis here will apply to these kinds of burdens. But the asymmetric aspect of nudges gives them some extra potential advantages, as we will see.

II. A Nudge is a Price

Critics of nudges and related forms of regulation argue that nudges carry many of the down sides of price instruments without all of the benefits. In this Part I'll explain that argument briefly, and then add that nudges resemble prices even more closely than others have noted. This close resemblance raises the possibility that nudges might actually be a form of price instrument, albeit one with some distinctive features.

In his critique of "nudges" and similar behavioral forms of regulation, Glaeser suggests that they, like taxes, create deadweight loss, but bring in no off-setting revenues.⁷⁶ Perhaps graphic images of the harms of cigarette smoking printed on the sides of packs would be repulsive enough that the smokers switch to cigarillos or pipe tobacco, which are nearly as harmful but which they enjoy less. Or perhaps some smokers cannot quit, but also suffer added pain as a result of the imagery.⁷⁷ Further, unlike a cigarette tax, the graphic images don't bring in any revenues that could be used to improve the lives of smokers or anybody else. Workers

⁷⁵ In saying that the critics are persuasive, I don't mean to suggest that I reject Sunstein & Thaler's claim that the best measure of welfare outcomes are the reflective choices of fully-informed actors. Indeed, for my purposes here I attempt to take no position at all on the best measure of welfare. For an overview of the alternatives, see THOMAS M. SCANLON, *WHAT WE OWE TO EACH OTHER* 108--43 (1998).

⁷⁶ Glaeser, *supra* note 16, at 135, 150; *see also* Korobkin, *supra* note 60, at 1669; Lucas, *supra* note 25, at 726--30; Mitchell, *supra* note 17, at 1268, 1274; Rizzo & Whitman, *supra* note 69, at 960--61.

"Deadweight loss" in this context is simply the lost utility resulting from government-driven changes in behavior. Maybe I like oranges better than grapefruit. If Massachusetts imposes a new tax on orange things but not pink ones, I may switch to grapefruit. The state collects no new revenue from me, but I am still unhappier. That shift in my satisfaction is deadweight loss.

⁷⁷ Andrew Caplin, *Fear as a Policy Instrument*, in *TIME AND DECISION: ECONOMIC AND PSYCHOLOGICAL PERSPECTIVES ON INTERTEMPORAL CHOICE* 441, 452 (George Loewenstein et al. eds., 2003); *see* Fennell, *supra* note 49, at 1415 (making this point about imperfectly targeted nudges generally).

who are defaulted into a savings program, who are unwilling to pay the costs of the opt-out mechanism, and who genuinely would prefer not to save, are worse off than in the absence of the nudge.⁷⁸ A number of other economists have recently made a similar point about the preferability of a carbon tax over other regulatory alternatives: regulations change consumption patterns, creating deadweight loss, but bring in no offsetting dollars.⁷⁹

Glaeser's point echoes a much older debate over the most efficient form of punishment for crimes. Becker, and later Polinsky and Shavell, have argued that in many situations fines are superior to imprisonment.⁸⁰ Both reduce the utility of the offender. The fines, though, can be used to transfer that loss to someone else, resulting in greater overall social welfare.⁸¹

I'll argue later that these stories about the superiority of taxes or fines to nudges need some additional nuance, but for now let's extend the comparison a bit further. As both examples so far suggest, dollars and other forms of dissuasion can be alternative tools for changing individuals' behavior. In theory, any form of punishment can be "priced" and used in an optimal deterrence framework.⁸² For example, recent work in cost-benefit analysis has shown how regulators can use observations about park-goers' willingness to drive and hike long distances to see threatened species as a way of estimating the satisfaction the park-goers get from government's preservation efforts.⁸³ Advances in "happiness" and other forms of satisfaction surveys also add an additional measure of precision to the estimated utility "cost" or "value" of various human experiences.⁸⁴ Thus, regulators could begin a default portion-size program by surveying consumers about how much they would pay to be able to buy the soda size they want, or set up "taste tests" to observe actual willingness to pay for an unconstrained volume of tasty beverage.

⁷⁸ Jeff Rachlinski, *Cognitive Errors, Individual Differences, and Paternalism*, 73 U. CHI. L. REV. 207, 224--25 (2006); cf. Shlag, *supra* note , at 917 (noting that nudges may have more dramatic effects on behaviors than "command and control" regulation).

⁷⁹ Ayres, *supra* note 60, at 2091; Helfand et al., *supra* note 19, at 287; Ian Parry et al., *When Can Carbon Abatement Policies Increase Welfare? The Fundamental Role of Distorted Factor Markets*, 37 J. ENVTL. ECON. & MGMT. 52, 52 (1999). However, Ayres also notes the potential targeting advantages of using what he calls "sticky defaults." Ayres, *supra* note 60, at 2091--92.

⁸⁰ Becker, *supra* note 21, at 196--99; Polinsky & Shavell, *supra* note 21, at 407--20.

⁸¹ Becker, *supra* note 21, at 182; Polinsky & Shavell, *supra* note 21, at 408. Becker credits an early version of this point to Bentham. Becker, *supra* note 21, at 197 n.40.

⁸² Becker, *supra* note 21, at 182; Rasmussen, *supra* note 21, at 538.

⁸³ ROBERT CAMERON MITCHELL & RICHARD T. CARSON, USING SURVEYS TO VALUE PUBLIC GOODS: THE CONTINGENT VALUATION METHOD 2--3 (1989); W. Michael Hanemann, *Valuing the Environment Through Contingent Valuation*, 8 J. ECON. PERSP. 19, 22--32 (1994); for cautionary notes see Peter A. Diamond & Jerry A. Hausman, *Contingent Valuation: Is Some Number Better than No Number?*, 8 J. ECON. PERSP. 45 (1994); Robert W. Hahn & John A. Hird, *The Costs and Benefits of Regulation: Review and Synthesis*, 8 YALE J. ON REG. 233, 241--43 (1991).

⁸⁴ Matt Adler, *Welfare Polls: A Synthesis*, 81 N.Y.U. L. REV. 1875, 1888--1935 (2006); John Bronsteen et al., *Welfare as Happiness*, 98 GEO. L.J. 1583, 1595--1600, 1635 (2010).

Put another way, a nudge is a price. It is a cost that the individual must incur to go her own way.⁸⁵ The fact that the utility loss from that cost would be perceived differently by the same individual at other times, or by contemporaneous others, makes it no less of a cost: each of these is equally true of prices denominated in dollars. In theory, social science should be able to compare a person's nudge responsiveness to her dollar responsiveness. If defaults of a particular degree of difficulty prevent, say, 50% of the population from opting out, what dollar amount would produce an equal 50% switch? We can think of that equivalent dollar amount as the shadow price of the nudge. This shadow price can, like a traditional price, be set at the optimal level by matching it to the marginal social cost of the internality or externality.⁸⁶

To be sure, these measures are imprecise and may vary widely across individuals.⁸⁷ For that reason some criminal-law scholars seem skeptical that alternatives to fines, such as jail or shaming, can be fit seamlessly into the optimal deterrence framework. Variations in individuals' vulnerability to harms in prison, in their adaptability to adverse circumstances, and in their subjective experiences of punishment, can make it difficult to determine an average "cost" of jail time.⁸⁸

I don't want to diminish these criticisms, but in many respects they can also be said of instruments denominated in dollars.⁸⁹ As tax scholars have explored, government generally knows relatively little about the utility value of a marginal dollar for any given individual.⁹⁰ We can observe that on average people who already have lots of dollars don't get much satisfaction from one more, while those with few dollars to their name seem to value each one pretty highly.⁹¹ But there are also venal, hyper-competitive billionaires and monks who've taken a vow

⁸⁵ Fennell, *supra* note 49, at 1415. I assume here for the sake of argument that individuals may have a meaningful sense of their own preferences that is exogenous to the government's intervention. Sunstein & Thaler argue instead that many preferences are inchoate in the abstract, and are influenced by the form and setting in which individuals make their choices. Sunstein & Thaler, *Libertarian Paternalism*, *supra* note 15, at 1182--83. For my purposes it isn't important to be able to distinguish between these two cases. Sunstein & Thaler's argument can be translated into my framework as a very low price: there is little gap between the individual's preferences and the government's.

⁸⁶ In some cases optimal prices diverge from the marginal social value of the externality. Helfand et al., *supra* note 19, at 262--74.

⁸⁷ See Hahn & Hird, *supra* note 83, at 241--43; Hill, *supra* note 48, at 453.

⁸⁸ John Bronsteen et al., *Happiness and Punishment*, 76 U. CHI. L. REV. 1037, 1046--55 (2009); Adam Kolber, *The Subjective Experience of Punishment*, 109 COLUM. L. REV. 182, 187--96 (2009). For a different take on the relevance of these data, see Dan Markel & Chad Flanders, *Bentham on Stilts: The Bare Relevance of Subjectivity to Retributive Justice*, 98 CAL. L. REV. 907, 959--88 (2010).

⁸⁹ See Vandenbergh et al., *supra* note 24, at 735--36 (arguing that impact of psychological or social factors may be more predictable than effect of prices).

⁹⁰ Walter J. Blum & Harry Kalven, Jr., *The Uneasy Case for Progressive Taxation*, 19 U. CHI. L. REV. 417, 477 (1952); Sarah B. Lawsky, *On the Edge: Declining Marginal Utility and Tax Policy*, 95 MINN. L. REV. 904, 942--49 (2011).

⁹¹ On this basis scholars recommend progressive punitive damages awards---that is, awards that scale up when the defendant is wealthier and defendants cannot adequately insure. Jennifer Arlen, *Should Defendants' Wealth Matter?*, 21 J. L. STUDIES 413, 415 (1992); A. Mitchell Polinsky & Steven Shavell, *Punitive Damages: An Economic Analysis*, 111 HARV. L. REV. 869, 913 (1998). But this approach still requires an assumption that utility curves for individuals of similar wealth are similar.

of poverty. Thus a stick of \$1,000 might be a very large incentive for some actors and tiny one for others. By choosing a single price for its Pigouvian tax, government is necessarily hoping that the *average* utility among those who face it will match the marginal utility of the damage inflicted.⁹²

A related source of uncertainty is that individuals may have widely varying liquidity, discount rates, and access to credit. Suppose Huey is poor now but knows he will soon inherit millions from his rich uncle McDuck. The marginal utility of a dollar for Huey should be quite small; if he needs a few thousand here or there, he just puts it on his credit card until the riches roll in. Evidence from the contemporary U.S., though, is that access to credit of this kind is limited, especially among households that are currently poor.⁹³ Other evidence suggests that even some families with the ability to save & borrow nonetheless treat present costs as much larger than a similar cost in the future---that is, they act as though the rate of interest they could earn is much, much greater than the market rate.⁹⁴ In both these situations, people may display an apparent marginal utility of money that seems to differ considerably from what others with similar lifetime wealth would.

If the marginal utility curve were fairly flat across the population, these variations might not matter much: big errors in either direction wouldn't result in much change in utility.⁹⁵ It is likely, though, that marginal utility curves are quite steep for some populations. Among the very poor, where a few dollars can make the difference between homelessness or not, small changes in living standards can mean big changes in standards of living.⁹⁶

Individuals can also adapt to their financial situation. Just as those in prison can experience "hedonic adaptation" in which they find the experience of punishment is not as severe as they expected,⁹⁷ so too can households grow accustomed to their wealth. Researchers who study happiness argue fiercely over whether greater wealth correlates with greater happiness.⁹⁸ Hedonic adaptation to household wealth levels seems at least a plausible explanation for why it is so difficult to demonstrate this correlation: humans can find joy in whatever we have, and perhaps grow blasé with familiar wealth.⁹⁹

⁹² Matthew D. Adler & Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 YALE L. J. 165, 191 (1999).

⁹³ See Galle & Utset, *supra* note 61, at 48--52, for a review of recent findings.

⁹⁴ Frederick et al., *supra* note 49, at 166--79.

⁹⁵ Richard Posner, *An Economic Theory of the Criminal Law*, 85 COLUM. L. REV. 1193, 1207 (1985) (noting that excess utility cost of fines for some defendants derives from the fact that humans are risk averse -- that is, that there is diminishing marginal utility of wealth).

⁹⁶ *Cf.* Shaviro, *supra* note 44, at 470 (noting that poor households have more tax-elastic response because of the greater marginal utility of each dollar for them).

⁹⁷ Bronsteen et al., *supra* note 88, at 1045--46.

⁹⁸ See Richard A. Easterlin et al., *The Happiness-Income Paradox Revisited*, 107 PROCEEDINGS OF THE NAT'L ACAD. SCI. 22463, 224630--68 (2010); Mike Morrison et al., *Subjective Well-Being and National Satisfaction: Findings from a Worldwide Survey*, 22 PSYCH. SCI. 166, 166--71.

⁹⁹ Thomas D. Griffith, *Progressive Taxation and Happiness*, 45 B.C. L. REV. 1363, 1389--90 (2004).

Lastly on this issue, dollars could be less predictable than other forms of regulation to the extent that they are more or less salient. Of course, an incentive is usually only effective when people are aware of it. A growing body of real-world evidence suggests that consumers and other actors are not always fully attentive to dollar prices.¹⁰⁰ Math, and our understandable desire to avoid the pain of having to think about it, may help explain why people neglect prices.¹⁰¹ Presumably that would be less of an obstacle for regulations that confront individuals with experiences or sensations rather than numbers. On the flip side, some researchers also find that dollar-denominated incentives are at times so visceral that they crowd out other, less-tangible motivations,¹⁰² which could make dollar-denominated sticks *more* salient than policy makers intend.

It's also worth noting that, as the cost-benefit analysis literature illustrates, the problem of translating utility into dollars arises not only for assessing the efficacy of the regulator's incentive.¹⁰³ Recall that an optimal stick poses the polluter with a marginal price equal to the marginal social damage her actions cause. This means that both the stick and the marginal social damage must be measured in some common currency. In some instances it will straightforward to calculate the social damage in dollars, such as when the externality is the higher premiums imposed on fellow insureds by a particularly unhealthy member of a insurance pool. But in many others, pollution included, there is instead some non-fiscal harm that has to be translated into dollars.¹⁰⁴ So there is frequently a translation problem even for pure price instruments,¹⁰⁵ though admittedly it may be that translating both sides of the equation compounds the problem.

All these considerations also suggest that nudges are more closely analogous to traditional price instruments than they are to what is sometimes called "quantity regulation."¹⁰⁶ The New York City beverage limit looks at first glance like a quantity limit: 16 ounces per cup. But the distinguishing feature of quantity regulations is that they (putatively) allow for firm limits on the amount of harmful activity, while nudges and prices allow individuals to decide whether to exceed those limits if it's worth it for them to do so.¹⁰⁷ That is, the cup-size limit

¹⁰⁰ Raj Chetty et al., *Saliency and Taxation: Theory and Evidence*, 99 *Am. Econ. Rev.* 1145, 1153--56 (2009); Krishna et al., *supra* note 56, at 101--18.

¹⁰¹ See Brian Galle, *Hidden Taxes*, 87 *WASH. UNIV. L. REV.* 59, 81--85 (2009) for a discussion of the uncertain basis for the low saliency of some taxes.

¹⁰² John Condry & James Chambers, *Intrinsic Motivation and the Process of Learning*, in *THE HIDDEN COSTS OF REWARDS: NEW PERSPECTIVES ON THE PSYCHOLOGY OF HUMAN MOTIVATION* 61, 61--66 (Mark R. Lepper & David Green eds., 1978); see Stephanie J. Byram, *Cognitive and Motivational Factors Influencing Time Prediction*, 3 *J. EXPERIMENTAL PSYCHOL.: APPLIED* 216, 233 (1997) (reporting that financial incentives for speed of performance exacerbate biased performance).

¹⁰³ Matthew D. Adler & Eric A. Posner, *Happiness Research and Cost-Benefit Analysis*, 37 *J. LEGAL STUD.* S253, S278--80 (2008).

¹⁰⁴ Vandenberg et al., *supra* note 24, at 742--43.

¹⁰⁵ Charles F. Sabel & William H. Simon, *Minimalism and Experimentalism in the Administrative State*, 100 *GEO. L.J.* 53, 66--67 (2011).

¹⁰⁶ Helfand et al., *supra* note 19, at 275.

¹⁰⁷ Cameron Hepburn, *Regulation by Prices, Quantities, or Both: A Review of Instrument Choice*, 22 *OXFORD REV. ECON. POL'Y* 226, 241--43 (2006). The distinction between price and quantity regulation may be somewhat

allows unlimited quaffing, as long as the consumer is willing to incur the costs of a refill. So it is this element of choice, subject to cost, that makes nudges look more like prices than like simple quantity limits.

Ultimately, regardless of whether nudges are exactly the same as prices, or whether instead they are just somewhat comparable to them, my point remains the same. Nudges are a form of regulation that can be evaluated according to conventional yardsticks for evaluating different regulatory instruments. Further, by estimating a shadow price for the nudge, we can posit a directly analogous price instrument, which should allow us in turn to consider what features are offered by the two rivals.

III. Carrots, Sticks, or Nudges?

Assuming then that nudges can be laid side to side with traditional price instruments, how do nudges stack up against the more familiar choices, carrots and sticks? Most economists so far seem agreed that sticks are generally superior to nudge-like instruments.¹⁰⁸ But I'll argue here that the question is considerably more nuanced than these critics seem to have assumed. Though the economists are right that nudges bring in less revenue than would a stick, nudges are different from sticks in other ways, too. I'll argue in this Part that in some ways, nudges are something of a hybrid between carrot and stick. In the next Part I'll try to show that there are times when this hybrid result is more appealing than either alternative.¹⁰⁹

A. Revenue

The revenue impact of a nudge is probably worse than a stick, and clearly better than a carrot. But my story is complicated by the fact that most prior commentators seem to have focused only on externalities, and ignored the internality scenario.¹¹⁰ Once we extend the standard framework to internalities, or to goods that produce both internalities and externalities, the presumed superiority of the stick is less obvious. In setting out this framework, I will follow some standard assumptions about the nature of individual preferences: that they are clearly

overstated in any event. Ultimately, government's ability to enforce a quantity limit typically depends on its ability to enforce its rules. Therefore considerations of the cost and benefit of compliance are still at play for the regulated party. Additionally, price instruments can be designed in ways that would in effect also impose a hard cap on unwanted activity: for instance, by varying the penalty so that its per-unit price above a certain amount of activity increases to prohibitive levels. Louis Kaplow & Steven Shavell, *On the Superiority of Corrective Taxes to Quantity Regulation*, 4 AM. L. & ECON. REV. 1, 7--10 (2002).

¹⁰⁸ Glaeser, *supra* note 16, at 150; *see also* sources cited *supra* note 79.

¹⁰⁹ For simplicity's sake, when describing the effects of price instruments I assume here that individuals respond rationally to the instrument. Obviously that is not necessarily so, especially in the internality context. For discussion of price instruments with irrational agents, see Brian Galle, *Carrots, Sticks, & Salience*, 66 TAX L. REV. ___ (forthcoming 2014); Garth Heutel, Optimal Policy Instruments for Externality-Producing Durable Goods Under Time Inconsistency, NBER Working Paper No. 17083 (May 2011), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1854185.

¹¹⁰ Allcott et al., *supra* note 11, examine the use of Pigouvian pricing to correct internalities. But they explicitly do not consider the effect of the cost of public funds, *id.* at 10 n.5, which is to say that they omit the revenue issue I'm examining here.

defined in the absence of government intervention, and that in the presence of behaviors such as willpower failure the consumer's "true" preferences are frustrated.¹¹¹ While both of these points can be disputed, the discussion here is simplified considerably if we take these two points as common ground.

1. Are Sticks Better than Nudges?: The Case of Externalities

To understand fully the comparison between nudges and sticks, we must take a short detour into the economics of taxation. Recall that virtually all taxes produce "deadweight loss," or economic waste resulting from changes in actors' behavior in response to the tax. But computing the net loss of a Pigouvian tax or stick is a bit complicated, although in the case of externalities it's now been thoroughly examined by economists.¹¹² Like any tax on a specific commodity, the stick changes people's decisions about what goods to put in their market basket. It can also reduce their "real" returns to labor. That is, when laborers decide whether to get out of bed and go to work, they implicitly are deciding whether the utility payoff of their salary is worth the opportunity cost of more pillow time. Since taxes on goods reduce the utility payoff from salary, economists typically predict that a consumption tax will also affect this labor/leisure decision; this effect is sometimes called the "tax-interaction" effect, because it is compounded in the presence of existing taxes on labor itself.¹¹³

In the case of Pigouvian taxes, the stick funds can be "recycled" by using them to cut other, distortionary taxes.¹¹⁴ Depending on how well that recycling is targeted, the gains from offsetting other taxes may or may not exceed the deadweight losses the stick produces.¹¹⁵ And, of course, when consumers switch away from the taxed good, they reduce harmful externalities for others. It might be helpful to think of the various effects as the terms of a simple equation:

$$U_s = E - L - C + R$$

That is, the utility effect of the stick includes E, externality gains; losses from the tax-interaction effect on labor, L; losses from changes in consumption choices, C; and gains from revenue recycling, R.¹¹⁶

¹¹¹ Markus Haavio & Kaisa Kotakorpi, *The Political Economy of Sin Taxes*, 55 EUR. ECON. REV. 575, 578 (2011). See Heutel, *supra* note 109, at 16--20, for discussion of the modeling complexities if these assumptions are varied.

¹¹² For an accessible overview, see Parry & Oates, *supra* note 19, at 604--10, and for a more technical summary, see Bovenberg & Goulder, *supra* note 29, at 1486--1507.

¹¹³ Parry & Oates, *supra* note 19, at 605--06. It is also likely that there are tax interaction effects for taxes on capital, but these have not been thoroughly explored in the existing literature.

¹¹⁴ Parry & Oates, *supra* note 19, at 606--07.

¹¹⁵ Bovenberg & Goulder, *supra* note 29, at 1497--1507.

¹¹⁶ This equation follows from, but simplifies, the calculations in Bovenberg & Goulder, *supra* note 29, at 1486--1503.

In my view the assumption that there are distortions in the commodities market, modeled here as the quantity C, should be controversial. The claim seems to be that consumers have clearly formed preferences prior to imposition of the tax, and that the tax distorts these. But arguably the tax itself shapes or helps consumers to revise preferences, as was reportedly the case of the Washington, D.C.-area tax on shopping bags. For evidence on that

Recall, too, that environmental economists argue that even regulations that do not explicitly put a price on behavior can also cause deadweight losses, especially when those regulations are enacted in the context of an existing income tax. But unlike the stick, the regulation does not bring in any new funds. In effect, the regulation gives us a utility result:

$$U_n = E - L - C$$

Prior commentators therefore argue that the stick is unambiguously better by the amount of the quantity, R .¹¹⁷ That is the logic that seems to be motivating critics who complain that New York's soda-cup default is a worse policy than a soda tax.

2. Sticks vs. Nudges: Internalities

Although prior commentators have not attempted to extend their analysis to internalities, it seems a similar story could hold there as well. Let's think first about the welfare impact of using a stick to help consumers overcome internalities. For now, let us assume that the stick is perfectly targeted, such that only those who would benefit from it are subject to it.¹¹⁸ Arguably, then, there is no longer any "C" term for consumption distortions. Indeed, the exact point of the stick is to correct an existing distortion in the basket of goods the consumer chooses. Once this error is overcome, the consumer now is choosing optimally among her options.¹¹⁹ On this basis, O'Donoghue and Rabin argue that internality-correcting taxes can be Pareto-improving: that is, they make some people better off without costing society anything, and may even generate "free" revenues.¹²⁰

O'Donoghue and Rabin simplify their task, though, by assuming away any effects on labor supply, so let us try now to fill that gap.¹²¹ Assuming the price or shadow price is high enough to impact work decisions, effects on labor supply are a bit tricky to predict, because they likely depend on how consumers perceive the price instrument.

In the simplest case, let us posit that the consumer is aware of the new price. On the one hand, the consumer's real returns to labor are now smaller, since some of the things she buys

point, see Tatiana A. Homonoff, *Can Small Incentives Have Large Effects? The Impact of Taxes Versus Bonuses on Disposable Bag Use*, manuscript at 3 (Oct. 26, 2012). If so, it isn't clear that this effect should count as a distortion. Rather than take a definitive position on the question, I will simply assume for now that these changes should count as welfare losses.

¹¹⁷ See sources cited *supra* note 79.

¹¹⁸ In fact, a major potential advantage of nudges over sticks is their superior targeting. I return that point in Part III.A.5, *infra*.

¹¹⁹ Cf. Allcott et al., *supra* note 11, at 3 (arguing that "when consumers undervalue energy costs...a carbon tax can actually increase consumer welfare, independent of the reduction in externalities"). In making this claim, I don't mean to suggest that the nudge is subjectively costless, or that the costs should not be counted, only that on net the combination of the nudge and its costs increases consumer welfare. Since the time in which the consumer is better off is much longer than the period in which the cost of the nudge is experienced, it is relatively easy to argue that the nudge is subjectively welfare-improving. See Haavio & Kotakorpi, *supra* note 111, at 578, and O'Donoghue & Rabin, *supra* note 30, at 1828--30, for more discussion.

¹²⁰ O'Donoghue & Rabin, *supra* note 30, at 1833--38.

¹²¹ *Id.* at 1834.

cost more.¹²² On the other hand, the consumer’s experience with the confusing product may not be fully “separable” from her labor supply.¹²³ For example, suppose that we’re talking about a tax on alcohol. Our consumer---let’s call her Lindsay---now drinks less. This may allow her to work more, both because her health is better and because she may enjoy her leisure time less when sober.¹²⁴ Let’s call these two possible labor effects, the real-returns change and the non-separability effect, L1 and L2, which would make our utility equation for internality-correcting sticks:

$$U_s = I - L1 + L2 + R$$

A nudge employed for the same purpose might have a similar impact. The nudge eliminates distortions in the consumer product market, generating a benefit, I. To the extent that these corrections increase labor supply, there is also a benefit in the labor market, L2.¹²⁵ However, we could also think of the nudge as forcing the consumer to face the real cost of her choices. Maybe Lindsay wanted more liquor, but graphic liquor labeling made her queasy whenever she reached for the bottle. She therefore perceives that the real returns to her labor are lower, since she now is recognizing the long-term health effects of her drinking habit. If so, then implementing the nudge reduces both Lindsay’s gains from labor and the positive externalities Lindsay’s work provided for others, a loss of L1.¹²⁶ That would suggest that, just as in the externality case, the internality-correcting nudge is strictly worse than a stick in the amount of the R term,¹²⁷ since the utility of the nudge would be:

$$U_n = I - L1 + L2$$

Arguably the L1 term is not a pure loss, and may even be a gain. From Lindsay’s perspective, her old labor supply was a mistake. She thought she was getting, say, 100 units of utility (“utils”) from every hour she showed up on the set. But instead it was really only 80,

¹²² Or, equivalently, the consumer switches from the taxed good to a substitute good that provides her with lower utility.

¹²³ See Parry & Oates, *supra* note 19, at 607 n.4 (noting that separability of externality and utility from leisure can affect welfare analysis of Pigouvian taxes).

¹²⁴ See Bovenberg & Goulder, *supra* note 29, at 1506 (noting that if carbon tax falls on a leisure complement, it effectively creates a labor-tax cut).

¹²⁵ In assigning a negative sign to the L1 effect, I assume that the substitution effect of decreased returns to labor exceed any income effects. That is, as Lindsay becomes wealthier she may demand more leisure, and accordingly assign a higher opportunity cost to working. This effect in theory could exceed the incentive impact of lower effective per-hour wages. But the typical modeling assumption is either to ignore income effects (because they are “compensated” for by an offsetting government expenditure) or to assume that substitution effects are usually more important. I follow the latter approach here.

¹²⁶ For instance, Lindsay’s employer may enjoy a surplus from employing Lindsay rather than the next-best substitute. See Stephen Rodrick, *How to Catch a Falling Star*, N.Y. TIMES MAGAZINE, Jan. 13, 2013 (“Lindsay said she couldn’t make it today, and I told her that . . . I have an actress in Paris waiting by the phone.”).

¹²⁷ By assumption we are positing a nudge whose effects can be compared to a stick of a given price, which in this context means that the nudge’s effect on Lindsay’s labor supply are identical under either instrument. Therefore, if we are also assuming (as we are, so far) that Lindsay’s decisions to consume and to work reflect considered decisions of the costs and benefits, the L1 term should be identical under either.

taking into account the true costs of her consumption. Her pre-nudge labor/leisure allocation was not the optimal balance for her. By reducing her labor supply, she increases her own utility. We could reflect this by adding a new term, IL, to reflect the internality benefits of correcting Lindsay's supply of labor. This effect likely isn't unique to nudges, though. Internality-correcting sticks, too, could help to optimize Lindsay's labor effort. If so, then sticks remain superior by the amount of the R term:

$$[U_n = I + IL - L1 + L2] < [U_s = I + IL - L1 + L2 + R]$$

One possibility that would make the choice between nudge and stick ambiguous is if Lindsay doesn't even notice the nudge. Suppose, for example, that our nudge takes the form of a simple default, such as a mandated reduction in the size of vodka bottles. Let's stipulate that Lindsay always drinks one bottle of vodka each morning, such that changing her portion size diminishes her consumption. With some effort, Lindsay could focus on the change in consumption, and alter her behavior in response --- say, by going back to the bodega for another bottle. Again, that's what makes the default similar to a price. But what if Lindsay doesn't exert the mental energy to focus on her change in consumption? There is an internality benefit, I. And there is increased labor supply from the more-sober Lindsay, L2. Is there any decline in Lindsay's perceived returns to labor, resulting in a drop in labor supply, IL - L1? Arguably not. Then the nudge is a better choice if $L1 > IL + R$, since the utility from the nudge is simply $I + L2$:

$$I + L2 > I + IL - L1 + L2 + R?$$

Finally, Lindsay may perceive herself as being happier with her new consumption bundle. Perhaps she knew she was throwing her money away on booze but lacked the willpower to resist finishing the bottle in front of her.¹²⁸ When the government nudges her to reduce alcohol expenditures, she has more money left for things that she *really* wants. If she recognizes this effect at the time she makes her labor/leisure decision, her labor supply should actually increase.

But this possibility may also be true of an internality-correcting stick. If so, then again sticks are the superior choice. Indeed, in that scenario, sticks would have achieved the true "double dividend" that was first touted, and then later partly debunked, as a benefit of the carbon tax. The welfare results of the stick would be:

$$I + L1 + L2 + R$$

In effect, the government is getting free money. A nudge would be similar, but would lack the "free money" component, R.

¹²⁸ *But see* George Loewenstein, *Out of Control: Visceral Influences on Behavior*, 65 *ORG. BEHAV. & HUMAN DECISION PROCESSES* 272, 272--92 (1996) (hypothesizing and offering evidence that individuals in a "cold" state only poorly predict their lack of willpower in a later "hot" state).

3. Sticks vs. Nudges: Internality + Externality

The attentive reader may now be expecting me to move on to a story about goods that produce both internalities and externalities, but I've actually already covered that scenario. Remember that the L2 term in the simple equations above represents gains from increased labor supply Lindsay enjoys when she is healthier. These gains can accrue both to Lindsay and also to her employer, among others. So we can re-write L2 as $IL2 + E$, internality gains from labor plus externality gains. Adding externalities doesn't appear to change the results for a good with internalities.

Adding internalities may change the results for a good we thought of as having only externalities, though. Allcott et al. offer the example of energy consumption.¹²⁹ Excess energy use is not only bad for the environment, but also bad for the budgets of households that are too inattentive to their bills, or who lack the willpower to lower them.

Under the set of assumptions most favorable to nudges, nudges might actually come out ahead of sticks for correcting these dual market failures. Suppose that the optimal stick or nudge "price" for correcting the externality is also close to the optimal stick or nudge price for correcting the internality.¹³⁰ Then, because the internality-correction is improving consumer choices, there is no deadweight loss from the consumer product market, C. The utility effect of a stick could therefore be given as:

$$U_s = E + I - L1 + R$$

I argued just before that it is possible that "unnoticed" nudges have minimal direct impact on labor supply, L1. We could then state the utility of the nudge as simply:

$$U_n = E + I$$

These two equations imply that if the benefits from a stick's revenue recycling effect are greater than the losses the stick causes by discouraging labor, the stick is a better choice than the nudge. But otherwise the nudge is better. Again, though, we had to rely on a series of relatively strong assumptions to get to that point.

4. Nudges and Carrots

Perhaps surprisingly, nudges may also be inferior to carrots on per-unit revenue terms, although the superior targeting of the nudge may more than make up for this impact. To begin, the deadweight loss of motivating a single individual through either nudge or carrot could be very similar. In the externality case, we can give the utility of offering a carrot as:

$$U_c = E - C - R_c$$

¹²⁹ Allcott et al., *supra* note 11, at 2--3.

¹³⁰ For example, household consumption of a unit of energy might cost others \$100, and also cost the household \$100 more than the effective price they behave as though they pay.

where E and C are the same as before, and R_c is the deadweight loss associated with increasing income or other taxes to pay for the carrot.¹³¹ Since the welfare effect of the nudge is still just $E - L - C$, we have the result that the relative efficiency of the two instruments depends on which loss is greater, R_c or L .

At first glance it looks as though R_c will be much less than L , which would imply carrots are superior. Suppose we have a carrot with a price of \$100, paid for with an income tax, and a nudge with shadow price of \$100. The per-unit deadweight loss of the carrot will be much lower, because the \$100 per unit cost can be spread across the entire population, such that rates will rise only by a small amount, and thus the real returns to labor decline by a similarly small margin. In contrast, the entire nudge cost falls on the externality emitter, in effect diminishing her returns to labor by a good bit.¹³²

In all likelihood, though, the per-unit cost of the carrot must be paid many more times than the per-unit cost of the nudge. As Dari-Mattiacci and De Geest argue, all carrot beneficiaries will typically claim their carrot, regardless of whether the carrot changes the claimant's behavior.¹³³ The cost of the nudge is only incurred, though, for those who would not otherwise have complied. For example, if government paid people not to steal, it would have to pay almost the entire population, while if it nudged them away from theft, only the lightest-fingered of the population would feel much burden. I'll add that this large potential difference in total "price" also affects the size of the R_c term: when there are more carrot claimants, the tax rate needed to pay for them also rises, with exponential effects on the resulting welfare loss.¹³⁴

¹³¹ Note that I assume that the subsidy creates a loss, C , from distortion in the product market because, like the penalty, it changes consumers' preferences. The subsidy creates no labor effect among marginal agents because by assumption the amount of the subsidy is just enough to leave them indifferent. If the subsidy is less than this amount it is never collected. If it is more than this amount, then it would increase real returns to labor, but it also would be pure waste from the perspective of the government -- in our equation, a more positive L term would be offset by a diminished E term. Of course, it is still possible that the pure exchange of higher taxes on some in return for increased labor for others could be welfare-enhancing; that is arguably the case for the EITC. Cf. Gregory Acs & Eric Toder, *Should We Subsidize Work? Welfare Reform, the Earned Income Tax Credit, and Optimal Transfers*, 14 INT'L TAX & PUB. FIN. 327, 332 (2006) (observing that EITC offsets the negative work incentives of the payroll tax). But that would take us away from the Pigouvian tax setting that is my focus here.

¹³² Cf. GUIDO CALABRESI, *THE COST OF ACCIDENTS* 39 (1970) (noting welfare gains from distributing costs of accidents across population). This argument is also similar to the general claim that "revenue recycling" doesn't work: if both revenue gains and tax-interaction effects are dependent on the income tax, and tax-interaction effects are much more concentrated, it will be difficult to come out ahead by swapping the latter for the former. Bovenberg & Goulder, *supra* note 29, at 1498--1503. That is less true if revenue gains can be made in a tax more distortive than the income tax, such as the corporate tax. *Id.* at 1505--07. Similarly here, if the government can pay for its carrots using a tax *less* distortive than the income tax, nudges are even less appealing.

Note also that Bovenberg & Goulder's analysis can produce the surprising result that carrots may be preferable to sticks on per-unit revenue terms. Using my simplified terms, if $L > R + R_c$, then the carrot produces lower deadweight loss per unit.

¹³³ Dari-Mattiacci & De Geest, *supra* note 22, at 369--76.

¹³⁴ For similar reasons, it is unlikely that carrots are actually better than sticks on revenue terms, even if the per-unit welfare cost would be lower for the first carrot unit.

The internality case is similar. Relative to nudges, carrots still add to labor supply but draw down revenues. A notable difference from the comparison between nudges and sticks is that consumer ignorance of the nudge isn't as favorable for nudges. Again, we can say in that situation that $U_n = I + L_2$. But here, the utility of the carrot is $I + IL + L_c + L_2 - R_c$, implying that the per-unit carrot gains are preferable when $IL + L_c > R_c$.¹³⁵ Once more, because the carrot's revenue costs are greatly inflated by the obligation to pay for infra-marginal actors, the overall cost of carrots is still likely to be higher, but that is less clear because of the added benefit of the internality effect on labor supply.

B. Income Effects

Nudges also fall in between sticks and carrots when it comes to income effects. For correcting externalities, it seems obvious that where sticks reduce the wealth of payors, and carrots increase it, nudges do neither.¹³⁶ Though it is an obvious point, it is also potentially a very significant one, and one that no other commentators seem to have focused on. Income effects often present (assuming that there is no offsetting tax or expenditure that washes them away) some of the strongest arguments for choosing between carrots and sticks.¹³⁷ As we will see, the availability of a third option with intermediate income effects will often open new and potentially more efficient policy possibilities.

Once more, though, internalities present a more complex picture. Although nudges of course don't transfer any cash to internality sufferers, they do help individuals to better allocate their own spending. The consumer now can buy more of her highest-priority goods. In effect, her budget has expanded. Or, alternately, we can think of the internality-correction as having provided the consumer with a free service, such as credit counseling or a "commitment device," that is, a reliable way of helping people commit not to spend foolishly.¹³⁸ Evidence suggests that many households are willing to pay considerable amounts for commitment devices.¹³⁹

¹³⁵ The term L_c captures the increase in labor supply deriving from the after-subsidy rise in real returns to labor --- in effect, the product subsidy works as a matching grant for labor supply. Cf. Parry & Oates, *supra* note 19, at 610 & n.10 (suggesting that subsidies for labor complements can increase labor effort). Prior authors sometimes suggest that subsidies for labor are distorting because they over-incentivize work, Acs & Toder, *supra* note 131, at 335. But this appears to assume a net subsidy from the tax system overall; subsidies from a Pigouvian price system may instead partially offset downward distortions from other taxes. Louis Kaplow, *Optimal Income Transfers*, 14 INT'L TAX & PUB. FIN. 295, 305, 312 (2006). In part because of this term, the carrot formula also implies, somewhat surprisingly, that in the internality context carrots could plausibly be superior on revenue terms to sticks. I develop that point separately elsewhere.

¹³⁶ Or at least nudges do neither to the extent that the utility from the nudged good is separable from the utility our consumer receives from other goods.

¹³⁷ Galle, *supra* note 22, at 832--38.

¹³⁸ Cf. Haavio & Kotakorpi, *supra* note 111, at 580 ("[S]ophisticated consumers might value sin taxes as a way of committing to a lower level of consumption...").

¹³⁹ Nava Ashraf et al., *Tying Odysseus to the Mast: Evidence from a Commitment Savings Product in the Philippines*, 121 Q.J. ECON. 635, 636--37 (2006); David Laibson, *Life-Cycle Consumption and Hyperbolic Discount Functions*, 42 EUR. ECON. REV. 861, 868 (1998).

In the case of normal goods, this income effect can somewhat offset the substitution effect on the consumer's consumption of the internality good. For example, once Lindsay is no longer spending as much money each month on her morning vodka, she can more easily pay rent.¹⁴⁰ With her housing stable, it is rational for her to consume more of the less-important items in her budget, including the occasional glass of wine with dinner.

Although the nudge does therefore have some potential income effects, that effect is still an intermediate position between sticks and carrots. An internality-correcting carrot would have an even larger income effect: it would both expand the household's budget and also improve its allocation. And internality-correcting sticks would have both positive and negative income effects (better allocation, less money), such that it is unclear which dominates in any particular instance. But since the positive income effect of correcting the internality (improved allocation) seems identical no matter the price instrument, the stick's propensity to increase demand would be unambiguously less than those of the nudge.

For pure internalities, though, the income effect of a government correction may not matter much. By assumption, society's only interest is in helping the household get to its unbiased preferred consumption of each good. The household's demand for the internality does not drop as far as it would in the absence of income effects. But the new level of consumption is still the efficient level for the household, given its new wealth and preferences.

The income effects of correcting an internality are most clearly problematic in the case of goods with both internalities and externalities.¹⁴¹ Imagine that the Shvitz household has an old, inefficient air conditioning unit. They receive a government subsidy to buy a new one. Though they will spend less on energy consumption keeping cool, they also will be able to afford to run their air conditioner more often. If they had instead been threatened with a fine, and self-financed the purchase of a new a/c, they would have had less money to run the new unit. Also note in the energy case that households with higher wealth can consume other goods that produce externalities. Even though the Shvitzes are subjectively better off with their new unit, they also now have more money to drive around or heat their house in winter.

C. Distributive Effects

Next, carrots and sticks differ considerably in the way they redistribute wealth, and that difference is important for many commentators.¹⁴² Carrots move money from taxpayers to

¹⁴⁰ Cf. Raj Chetty et al., *Salience and Taxation: Theory and Evidence*, 99 AM. ECON. REV. 1145, 1173--74 (2009) (discussing income effect of improved allocation of consumer choices).

¹⁴¹ Cf. Alcott et al., *supra* note 12, at 11--24 (modeling effects of subsidies for energy-efficient durable goods on marginal energy consumption).

¹⁴² See Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089, 1121 (1972).

externality producers, while sticks do the opposite.¹⁴³ Nudges, in contrast, are distributively neutral. That seemingly banal distinction has some potentially important policy consequences.

For one, I've argued before that the distributive consequences of sticks may be a reason to prefer carrots when programs affect poorer households.¹⁴⁴ Transferring funds away from taxpayers who are already indigent runs contrary to basic distributive justice principles. Indeed, the logic of redistribution seems to have driven the design of both the Affordable Care Act and the cap-and-trade climate change bill passed by the U.S. House of Representatives in 2009. Both legislative schemes relied primarily on a stick to control externalities. The ACA, famously, imposes a penalty tax on households that fail to purchase insurance, while the cap-and-trade bill required businesses to purchase licenses to emit greenhouse gases.¹⁴⁵ Each, though, made exceptions for low-income families. The ACA exempts households that cannot find "affordable" insurance from its mandate, while the climate change legislation offered lump-sum refunds to each household, which in effect converted its stick to a carrot for the poorest taxpayers.¹⁴⁶

Many law & economics scholars argue that regulatory policy should leave aside distributive concerns,¹⁴⁷ but those claims are not fully persuasive in the price-instrument context. The basic argument is that any unwanted redistributive effects of regulation can be counter-acted with an offsetting adjustment to the income tax.¹⁴⁸ Though redistribution through the tax system triggers economic distortions (of the sort I've already discussed in Part III.A.1.), the argument is that redistribution through regulatory policy causes both those exact same distortions as well as inefficient changes in the legal rules themselves. But that is less the case if we switch from sticks to carrots for distributive reasons: the marginal impact on externality producers is the same either way, meaning that there may well be no inefficient changes in regulatory policy.¹⁴⁹

Kaplow & Shavell, the leading expositors of the "redistribute only through the tax system" argument, do acknowledge that wealth can be relevant to regulatory policy in some instances. In particular, they note that imposing liability on households that might be unable to afford to pay the full stick price would blunt the incentive effects of the price instrument.¹⁵⁰ If

¹⁴³ *Id.*

¹⁴⁴ Galle, *supra* note 22, at 817--20.

¹⁴⁵ 26 USC § 5000A; American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (2009).

¹⁴⁶ 26 U.S.C. §5000A(e)(1); H.R. 2454 § 431.

¹⁴⁷ Louis Kaplow & Steven Shavell, *Why the Legal System Is Less Efficient than the Income Tax in Redistributing Income?*, 23 J. LEGAL STUD. 667, 669 (1994); David A. Weisbach, *Should Legal Rules Be Used to Redistribute Income?*, 70 U. CHI. L. REV. 439, 446-53 (2003).

¹⁴⁸ Kaplow & Shavell, *supra* note 147, at 669--74.

¹⁴⁹ Of course, in some cases the switch from stick to carrot may have undesirable income or incentive effects.

¹⁵⁰ Louis Kaplow & Steven Shavell, *Property Rules Versus Liability Rules: An Economic Analysis*, 109 Harv. L. Rev. 713, 739--40 (1996); *see also* Helfand et al., *supra* note 19, at 297 (noting that judgment-proof firms are also difficult to adequately deter); Posner, *supra* note 95, at 1208 (suggesting that non-monetary penalties for crimes can be justified where defendant has resources to pay fine but those resources are illiquid).

insurance is unavailable, the implication is that a different regulatory option may be necessary to ensure that poorer households face the correct marginal incentives.¹⁵¹

Carrots, then, are often a better choice than sticks for changing the preferences of low-income households, but nudges are arguably even better. The nudge, like the carrot, is fully effective even against households that could not afford to pay the optimal stick price. Unlike carrots, or sticks for that matter, the incentive effects of many forms of nudge are not dependent on the marginal utility of dollars. That is an important consideration when regulating the very poor, for whom the marginal utility of wealth curve is relatively steep. As I discussed in Part II, price instruments whose effects are calculated for the average household will often miss their mark for households in the steepest part of the curve.¹⁵² Nudges also do not further impoverish the already-indigent, allowing the government to avoid the costs of additional redistribution through the tax system. And depending on its other features, such as the revenue and income effects I've already discussed and the incentive effects I'll mention shortly, the nudge may avoid some of the traditional costs carrots bear.

On the other hand, as I mentioned briefly in *The Tragedy of the Carrots*, and as Eyal Zamir discusses at length in his recent work, sticks may be more effective than carrots because of the way that humans perceive redistribution.¹⁵³ Some evidence suggests that we tend to respond more strongly to events we perceive as losses than we do to events framed as gains.¹⁵⁴ I posited that, because these framing effects are often manipulable and may be temporary,¹⁵⁵ they likely should not be a central component of price instrument policy. Zamir, though acknowledging the manipulability of framing, suggests that loss aversion is nonetheless pervasive enough to be the source of important moral intuitions, such as tort law's differential treatment of negligent injury and negligent failure to rescue.¹⁵⁶

Whether Zamir is closer to right than I am or not, nudges could potentially represent a middle path of loss aversion. As far as I am aware, there is no clear evidence on whether individuals perceive the cost of overcoming defaults or other non-monetary inconveniences as "losses." But given that we know some actors do not even notice that defaults have changed their behavior, it would be surprising if *on average* individuals viewed defaults as being as costly

¹⁵¹ Kaplow & Shavell, *supra* note 150, at 740. See Polinsky & Shavell, *supra* note 21, at 411--12, 420--22, for development of this idea in the criminal enforcement context.

¹⁵² See *supra* text accompanying notes 89--96.

¹⁵³ Eyal Zamir, *Loss Aversion and the Law*, 65 VAND. L. REV. 829, 843--85 (2012).

¹⁵⁴ *Id.* at 834--43. For skepticism about some but not all of this evidence, see Charles R. Plott & Kathryn Zeiler, *The Willingness to Pay—Willingness to Accept Gap, the "Endowment Effect," Subject Misconceptions, and Experimental Procedures for Eliciting Valuations*, 95 AM. ECON. REV. 530, 537--38 (2005) and Gregory Klass & Kathryn Zeiler, *Against Endowment Theory: Experimental Economics and Legal Scholarship* 27--42 (unpublished manuscript, Feb. 2013).

¹⁵⁵ Galle, *supra* note 22, at 808--08; see also Yuval Feldman, *The Complexity of Disentangling Intrinsic and Extrinsic Compliance Motivations: Theoretical and Empirical Insights from the Behavioral Analysis of Law*, 35 WASH. UNIV. J.L. & POL'Y 11, 38--39 (2011).

¹⁵⁶ Zamir, *supra* note 153, at 887--90. For recent evidence that the framing of policies as tax or subsidy matters, see Homonoff, *supra* note 116, at 3.

as explicit prices of similar magnitude. Nudges therefore offer policy makers a third option in the loss aversion continuum. Loss aversion presents policy makers with a tradeoff. With lower loss aversion, they may get less deterrence per dollar of penalty.¹⁵⁷ But they also get less bitter political opposition from incumbent producers. Therefore nudges might not be as effective as sticks, but they might be more politically achievable.¹⁵⁸

D. Games & Mitigation

A fourth set of major differences between nudges and other prices is their respective effect on incentives for future behavior. Once more, nudges look like a hybrid, offering some of the features of each alternative.

Most dramatically, nudges avoid what for prior commentators is carrots' fatal flaw: their tendency to encourage new harms by producers who want to be paid to stop.¹⁵⁹ Similarly, in the case of positive externalities, carrots can "crowd out" good behavior or encourage strategic delays, as the producer dawdles until the government agrees to pay.¹⁶⁰ In contrast, the nudge is largely neutral for would-be producers. Pure externality producers will perceive the nudge as either neutral or costly, giving them no reason to delay good deeds or strategically begin bad ones. And though nudges can look like a gain for consumers of goods that also include internalities, it is hard to see a scenario where consumers would start harming themselves more to secure the government's assistance in lessening the harm.

At the same time, the nudge may be less effective than sticks at accelerating producers' internalization of harms. In general, a producer who anticipates that her activity will be punished has good reasons to take steps to mitigate her harm in advance.¹⁶¹ Think of the factory considering whether to replace its worn-out widget-maker with a greener production process. If there is a carbon tax in the near future, better to invest now in the cleaner process than to have to scrap a new dirty one and replace it once the tax goes into effect.¹⁶² The threat of possible regulation thus allows the government to achieve more-efficient outcomes even for producers

¹⁵⁷ For discussion of whether it would ever be optimal for producers to perceive prices as being in excess of their true cost, see Galle, *supra* note 109, at 31--33 (short answer: probably not).

¹⁵⁸ Another way in which nudges might be more politically viable is if internality sufferers are aware of their own problems but under-estimate them. Then demand for an internality-correcting stick will be low. Strnad, *supra* note 25, at 1257. But these same households would also presumably also under-estimate the cost of a future nudge, which could allow for a much costlier nudge than would be possible if the commitment device were structured as a monetary penalty. Cf. Katrina Kuh, *When Government Intrudes: Regulating Individual Behaviors that Affect the Environment*, 61 DUKE L.J. 1111, 1175--76 (2012) (noting that individuals may not oppose regulations that impose costs on them only indirectly); Michael P. Vandenbergh, *Order Without Social Norms: How Personal Norm Activation Can Protect the Environment*, 99 NW. U. L. REV. 1101, 1103--04 (2005) (arguing that changing conservation norms through information and other informal regulatory devices is more politically viable than price-based mandates).

¹⁵⁹ Wiener, *supra* note 22, at 726.

¹⁶⁰ See Cass R. Sunstein, *Television and the Public Interest*, 88 CAL. L. REV. 499, 546--47 (2000) (examining incentive effects of subsidies for public-interested broadcasting).

¹⁶¹ Saul Levmore, *Changes, Anticipations, and Reparations*, 99 COLUM. L. REV. 1657, 1663 (1999).

¹⁶² See Eirik Romstad & Henk Folmer, *Green Taxes*, in PRINCIPLES OF ENVIRONMENTAL AND RESOURCE ECONOMICS 529, 544--46 (Henk Folmer & H. Landis Gabel eds., 2d ed. 2000).

that are engaging in harms it can't observe. Of course, a third option is for the producer to conceal her activities. But sticks can be adjusted for this possibility, such as by imposing retroactive liability and extra fines for concealment: if the maker knows that if her widget-sludge emissions are detected in 2014 she will be liable for emissions in 2013, and the liability will be adjusted upwards to account for a less than 100% chance of detection, her incentives are to reduce sludge rather than continue to emit.¹⁶³

It's unclear whether nudges can have these effects on ex ante incentives. Obviously a key requirement is that producers must be able to recognize in advance that they will consider the nudge to be costly. As we've seen, that isn't always the case. For most nudges it is also difficult to see how the regulator could implement retroactive punishment. Perhaps some kinds of dollar-less penalties could be scaled up to account for past wrongs and the likelihood of detection. Imprisonment is a well-known example, although even there some scholars have recently observed that would-be criminals may also be unable to estimate in advance the true utility cost of jail time.¹⁶⁴ In the case of sticky defaults and the like, there is no obvious way to scale up the perceived costliness of the default without affecting marginal incentives going forward, which would itself be a costly distortion.

It might be argued in favor of nudges that the ex ante incentive effects of sticks are somewhat oversold. There are many reasons present actors might not fully account for the expected future costs of a stick.¹⁶⁵ Firm managers and politicians have limited terms in office.¹⁶⁶ Individuals may excessively discount future costs for psychological reasons, may plan to relocate to a less-regulated jurisdiction, or may treat present consumption subject to future costs as a kind of income-smoothing in which they are borrowing against expected future income.¹⁶⁷ In some instances other market mechanisms mitigate these problems. For example, Ben-Shahar & Logue argue that the cost of insurance premiums for actors who are incurring future insurable liabilities rises to reflect those expected costs, in effect shifting the stick from future to present.¹⁶⁸ Gary Wagner argues that credit ratings can have similar effects for government officials.¹⁶⁹ But insurance carries transaction costs; there is currently no insurance market for many varieties of stick, such as taxes or takings; and credit ratings are a very rough estimator of later expenses.

Lastly on the incentives front, nudges also split the difference between carrots and sticks when it comes to the incentives of victims. Efficient laws generally give victims the incentive to

¹⁶³ See Polinsky & Shavell, *supra* note 21, at 445--46 (analyzing optimal penalties for efforts to deceive government enforcement).

¹⁶⁴ Bronsteen et al., *supra* note 88, at 1046--55.

¹⁶⁵ See Heutel, *supra* note 109, at 6--13 (modeling Pigouvian tax with impatient agents).

¹⁶⁶ Robert P. Inman, *Public Debts and Fiscal Politics: How to Decide?*, 80 AM. ECON. REV. 81, 84 (1990).

¹⁶⁷ Brian Galle & Jonathan Klick, *Recessions and the Social Safety Net: The Alternative Minimum Tax as a Countercyclical Stabilizer*, 63 STAN. L. REV. 187, 200--01 (2010).

¹⁶⁸ Omri Ben-Shahar & Kyle Logue, *Outsourcing Regulation: How Insurance Reduces Moral Hazard*, 111 MICH. L. REV. 197, 233 (2012).

¹⁶⁹ Gary A. Wagner, *Political Control and Public Sector Savings: Evidence from the States*, 109 PUB. CHOICE 149, 155--57 (2001).

mitigate their own exposure to harm when they are the “least cost avoider.”¹⁷⁰ For example, in the famous *Carroll Towing* case many readers will have encountered in their torts class, Learned Hand and his colleagues held that the owner of a damaged barge had an obligation to minimize the barge’s vulnerability to accidental damage, and ruled that the owner could not recover fully against the tortfeasor because the owner had failed to do so.¹⁷¹ *Carroll Towing* was a stick applied to the tort victim: a withholding of an expected payment to cause him to internalize the costs his negligence imposed on other boat-owners. That aligned incentives properly, but it left an injured victim poorer and without redress. What if the government had used a nudge to encourage barge safety instead?

Outside the accident-law context, I’ve argued before that carrots can be more effective at encouraging mitigation than sticks because of the way that the money flows.¹⁷² In the case in which victims pay for carrots, such as through their tax dollars, each victim internalizes some of society’s costs of paying to prevent the harm. Therefore each victim has a financial incentive to lower the costs of that harm, so that the resulting carrot can be cheaper. The reverse is true of sticks. If sticks are paid into the treasury, they are in effect paying the victims to be hurt, which reduces their incentive to avoid injury. Both of these effects of course are more important when the revenues are large and the pool of victim/taxpayers who share them small.

Nudges, being revenue-neutral, fall in between. For example, and contrary to the results I mentioned earlier from Becker and Polinsky & Shavell, shaming or prison may be more efficient punishments than fines where victim mitigation is very important. Again, Becker argued that fines allow wealth to be transferred back to society, while prison is simply a harm to the victim.¹⁷³ Wittman adds that, as long as fines or punitive damages are paid to the government, rather than victims, they would not undermine victim incentives to avoid being harmed.¹⁷⁴ But we see now that is not fully so, assuming the victim benefits from government spending or reduced tax burdens. Accordingly, the dollar-less price offers a tradeoff between revenue and mitigation; in some instances mitigation may well be more important.¹⁷⁵

At the same time, the nudge is likely not as effective as a carrot at encouraging victims to internalize the costs of preventing harms. Again, there is a revenue/mitigation tradeoff, but in the opposite direction: carrots are costlier but provide victims with better incentives. Admittedly some dollar-less prices, such as imprisonment, can also be costly to construct and administer. But the carrot is typically more efficient because if set optimally its total cost is equal to the total

¹⁷⁰ POSNER, *supra* note 90, at 220.

¹⁷¹ U.S. v. *Carroll Towing Co.*, 159 F.2d 169, 174 (2d Cir. 1947).

¹⁷² Galle, *supra* note 22, at 824--27.

¹⁷³ Becker, *supra* note 21, at 182.

¹⁷⁴ Donald Wittman, *Liability for Harm or Restitution for Benefit?*, 13 J. L. STUDIES 57, 67--68 (1984).

¹⁷⁵ Note, however, that society may also have costs of administering and imposing the nudge or other dollar-less punishment. See Polinsky & Shavell, *supra* note 21, at 430--31, for further discussion of the impact of enforcement costs on optimal punishment.

harm, while the cost of the prison system is essentially random, and therefore could greatly over- or under-incentivize mitigation.

E. Targeting

A final important area where the three price instruments may diverge is their ability to be targeted or “tagged” most precisely. As others have shown, true nudges can help to resolve serious targeting problems in the regulation of externalities. I add here that this same targeting feature is also potentially useful for positive externalities, where a similar problem arises.

1. Targeting Externalities

As I noted earlier, targeting has been the main intellectual selling point for nudges.¹⁷⁶ When individuals vary in their propensity for errors and willpower lapses, a uniform price or regulation may inefficiently distort incentives or otherwise create deadweight loss.¹⁷⁷ For example, taxes on cigarettes might help some smokers who want to quit to steady their resolve. But other smokers might be “rational addict[s],” in Gary Becker’s famous turn of phrase: they are well-informed, respond fully to the long-term costs they face, and accept them.¹⁷⁸ For them, the tax simply imposes pain or misshapes their preferences, a classic case of deadweight loss.

In terms of our earlier equations, the impact of mis-targeting is to return the possibility of consumer losses. If we add a new term P_r to reflect the portion of the population who do not suffer from externalities, then the welfare effect of externality-correcting sticks imposed uniformly on the population could be given as:

$$U_s = I + IL - L1 + L2 - P_r C + R$$

Nudge proponents claim that their behaviorally-informed regulatory instruments account for heterogeneity by varying costs in a way that correlates with the need for correction.¹⁷⁹ That is, those who treat the costs of a nudge as larger also may tend to be those who suffer from externalities. The irrational smoker perhaps smokes because she focuses excessively on her present satisfaction. That same trait will make the burden of, say, putting on her coat and stepping outside to smoke much more irksome than it would be for others who weren’t similarly present-biased. So the nudge corrects the externality for those who suffer it while imposing rather small costs on those who don’t.

Nudges may be preferable to other price instruments, then, if they can diminish the deadweight loss of poor targeting.¹⁸⁰ If the welfare effect of a nudge remains $U_n = I + IL - L1 + L2$, then even under unfavorable assumptions nudges will be preferable to sticks when $P_r C > R$ --

¹⁷⁶ See *supra* notes 72--74 and accompanying text.

¹⁷⁷ Strnad, *supra* note 25, at 1252, 1254--55.

¹⁷⁸ Gary S. Becker & Kevin M. Murphy, *A Theory of Rational Addiction*, 96 J. POL. ECON. 675, 676--78 (1988).

¹⁷⁹ Allcott et al., *supra* note 11, at 2, 23.

¹⁸⁰ Ayres, *supra* note 60, at 2091--92.

- in other words, if the consumer losses from the stick exceed any resulting revenue gains, we would rather have a nudge.

O'Donoghue and Rabin argue that taxes, too, can achieve the targeting benefit that they (in their joint work with Camerer and Issacharoff) attribute to nudges, but their claim relies on a questionable assumption. They posit that, since only low-willpower individuals will continue to consume tempting goods subject to a tax, rational consumers will not pay the tax.¹⁸¹ But as they acknowledge, individual tastes can also vary: some people might have full information or iron will but also really enjoy a good strawberry-frosted donut.¹⁸² For these consumers, a relatively high level of consumption is rational, so that taxes produce deadweight loss where nudges would not.¹⁸³ Nudges may also be better targeted in the sense that they may be better capable of changing the behavior of individuals who are usually inattentive to costs and benefits, and so would not be much influenced by a tax.¹⁸⁴ But this is not to say that advances in tax design couldn't potentially match nudges' targeting potential in the future.¹⁸⁵

Many carrots are also poorly targeted. For example, imagine that government will pay you to overcome your tendency to procrastinate, but in order to collect your reward you have to read some program rules written in bureaucrat, find household records that establish your eligibility, go through some complex calculations, and fill out and submit government forms. Quite probably serious procrastinators are the very last people who would benefit from that program.¹⁸⁶ Yet that happens to be the exact structure of individualized retirement accounts, or IRA's, an important tax incentive for retirement savings.¹⁸⁷ Chetty et al. find massive mis-targeting of similar retirement incentives in Denmark, with 85% of the beneficiaries, by their estimation, receiving subsidies that do not meaningfully change behavior.¹⁸⁸

Asymmetric costs and their targeting potential also distinguish true nudges from other forms of dollar-less prices. Prisons and shaming are both alternatives to a fine, but incarceration is a pretty universally unpleasant experience,¹⁸⁹ while some offenders might be fairly indifferent

¹⁸¹ O'Donoghue & Rabin, *supra* note 30, at 1831, 1835.

¹⁸² Ted O'Donoghue & Matthew Rabin, *Studying Optimal Paternalism, Illustrated by a Model of Sin Taxes*, 93 AM. ECON. REV. 186, 188 (2003); see The Simpsons, *Treehouse of Horror IV*, first aired Oct. 28, 1993 ("Mmmmm, forbidden donut.").

¹⁸³ Of course, if the tax is very small, the behavioral effect on rational consumers should be negligible, in which case internality gains should exceed any deadweight loss. O'Donoghue & Rabin, *supra* note 30, at 1835.

¹⁸⁴ *Cf. id.* (acknowledging that internality-correcting tax are inefficient unless "people with self-control problems are sensitive to tax changes").

¹⁸⁵ O'Donoghue & Rabin, *supra* note 182, at 190, offer some examples.

¹⁸⁶ Admittedly, this is not a problem entirely exclusive to carrots. For example, sticks that are imposed long after the unwanted behavior are poorly targeted at those who go wrong because of excessive time discounting. George Loewenstein & Ted O'Donoghue, "We Can Do This the Easy Way or the Hard Way": *Negative Emotions, Self-Regulation, and the Law*, 73 U. CHI. L. REV. 183, 189 (2006).

¹⁸⁷ JOINT COMMITTEE ON TAXATION, PRESENT LAW AND ANALYSIS RELATING TO INDIVIDUAL RETIREMENT ARRANGEMENTS 16--41 (June 26, 2008).

¹⁸⁸ Chetty et al., *supra* note 13, at 32, 37--38.

¹⁸⁹ Though the degree of punishment may vary across individuals, no commentator suggests that it incarceration is not punitive.

to wearing a signboard.¹⁹⁰ Nudges will therefore dominate other forms of dollar-less prices wherever they're feasible. For instance, governments could employ roving bands of professional wrestlers to body-slam any smokers they find. Bans on indoor smoking seem better targeted at those with self-control problems, though.

2. Targeting Externalities

Notice that individual heterogeneity does not arise to the same extent with negative externalities, which likely explains why nudge advocates have focused mostly on internalities.¹⁹¹ Carbon is carbon, no matter who emits it. That is not to say that matching regulation to the costs of externalities is always simple; to take the most common examples, different forms of pollution damage can vary depending on who lives nearby, how concentrated emissions are, local weather conditions, and a host of other factors.¹⁹² But many of these factors are observable, or at least theoretically measurable, in a way that individual variations in self-control and cognitive ability generally aren't yet.

Infra-marginality arguably presents a similar kind of targeting problem, though.¹⁹³ Infra-marginality is mostly a problem for carrots, and positive externalities in particular.¹⁹⁴ Under an effective enforcement regime, sticks will fall only on actors who defy the government's objectives. Carrots, in contrast, are generally awarded to everyone who goes along with the regulator's goals, so that there is no easy way to sort out those who would have done so anyway from those who needed some extra incentive. That's especially problematic for positive externalities because our intuition is that voluntary reductions in negative externalities are relatively rare; it's an unusual polluter who volunteers to the government the extent of its emissions without a good reason.¹⁹⁵

¹⁹⁰ Though shaming is in theory targetable, whether in practice it actually is properly targeted is a question I leave to those with the relevant expertise.

¹⁹¹ Thaler & Sunstein do discuss briefly what they call "libertarian benevolence," which appears to be the use of nudges to encourage positive externalities. Sunstein & Thaler, *Libertarian Paternalism*, *supra* note 15, at 1192--93. They also devote many examples in their book to various energy-conservation schemes, as does Ian Ayres. Ayres is explicit that he views his ideas as in part about self-regulation, AYRES, *supra* note 8, at 131--42; *see also* Ayres, *supra* note 60, at 2088 (proposing use of sticky defaults to account for heterogeneity in production of externalities), and it seems the gist of many of the Thaler & Sunstein suggestions is that we all want to save the planet but it's hard for us to focus ourselves on such a long-term goal. So there is a strong internality flavor even to these climate-oriented policies. *See* Andrew Green, *Self Control, Individual Choice, and Climate Change*, 26 VA. ENVTL. L.J. 77, 78--79 (2008). As I'll argue momentarily, one can also read the Thaler & Sunstein suggestions as basically a positive externality story, as well.

¹⁹² Helfand et al., *supra* note 19, at 262--65.

¹⁹³ The "marginal" actor is the person who is just on the knife's-edge of deciding what to do; with a bit of stick or carrot, they will change their behavior. Infra-marginal agents are so committed to their path that the incentive effects of the price instrument aren't important.

¹⁹⁴ Galle, *supra* note 22, at 820--21, 833--34.

¹⁹⁵ The pollution literature does report extensive "voluntary" compliance by firms (e.g., Toffel & Short 2010), but these compliance efforts are usually in the shadow of an extensive regulatory regime. Theorists suggest that the firms may self-enforce in order to win favor with regulators from whom they would otherwise face heavier future sanctions.

Both carrots and sticks can also potentially dissuade infra-marginal do-gooders by “crowding out” their internal motivation.¹⁹⁶ Researchers find that offering explicit monetary rewards diminishes voluntary contributions.¹⁹⁷ The psychological mechanism is uncertain.¹⁹⁸ Some psychologists suggest that monetary incentives are particularly apt to generate resistance because they reduce our sense of autonomy.¹⁹⁹ Possibly the dollar award attracts excessive focus, distracting volunteers from the more abstract reasons they held previously.²⁰⁰ Being paid may also diminish the “warm glow” signal that donors usually experience: some individuals may behave altruistically because they want to be recognized by others as altruistic, and when there is an explicit monetary incentive that signal is muddled.²⁰¹

Nudges can offer a partial solution.²⁰² Several studies find that nudge-like interventions have improved altruistic behavior.²⁰³ Because the nudge’s incentive effect is not easily visible to others, it may not confuse the altruistic signal to the same extent dollars do. And the implicit “price” of the nudge is more subtle, and thereby perhaps less likely to reduce self-perceived autonomy or to assume more salience than the donor’s other motives in her mind. Finally, since by definition the nudge does not change the behavior of the infra-marginal actor, there is no deadweight loss from complying with it.²⁰⁴

Lastly, I should acknowledge that traditional prices may have an advantage over nudges when the optimal tax schedule is complex. Recall that (setting aside some possible complications) the optimal Pigouvian price should be set equal to marginal social damage. For some externalities that damage could vary considerably depending on, say, the consumer’s prior

¹⁹⁶ Wendy J. Gordon, *Of Harms and Benefits: Torts, Restitution, and Intellectual Property*, 21 J. L. STUD. 449, 457 (1992); Andrew Green, *You Can’t Pay Them Enough: Subsidies, Environmental Law, and Social Norms*, 30 HARV. ENVTL. L. REV. 407, 429--35 (2006).

¹⁹⁷ For a helpful overview, see Feldman, *supra* note 155, at 23--29.

¹⁹⁸ *Id.* at 24.

¹⁹⁹ Edward L. Deci & Richard M. Ryan, *The Empirical Exploration of Intrinsic Motivational Processes*, 13 ADVANCES EXPERIMENTAL SOC. PSYCHOL. 39, 61 (1980).

²⁰⁰ See Bruno S. Frey & Alois Stutzer, *Environmental Morale and Motivation*, in THE HANDBOOK OF PSYCHOLOGY AND ECONOMIC BEHAVIOUR 406, 412--13 (Alan Lewis ed., 2008) (suggesting that crowding out may be due to individual’s shift in focus from internal to external motivations).

²⁰¹ See Ernst Fehr & Bettina Rockenbach, *Detrimental Effects of Sanctions on Human Altruism*, 422 NATURE 137, 140 (2003); William M. Landes & Richard A. Posner, *Salvors, Finders, Good Samaritans, and Other Rescuers: An Economic Study of Law and Altruism*, 7 J. Legal Stud. 83, 99 (1978); cf. E. Tory Higgins & Yaacove Trope, *Activity Engagement Theory: Implications of Multiply Identifiable Input for Intrinsic Motivation*, in 2 HANDBOOK OF MOTIVATION AND COGNITION: FOUNDATIONS OF SOCIAL BEHAVIOR 229, 240--43 (Richard M. Sorrentin & E. Tory Higgins eds., 1990) (noting that extrinsic incentives may reduce perception that actor was self-motivated).

²⁰² See Amir & Lobel, *supra* note 17, at 2131 (suggesting that behaviorally-informed regulation may be able to reduce crowding out effects).

²⁰³ E.g., Alberto Abadie & Sebastien Gay, *The Impact of Presumed Consent Legislation on Cadaveric Organ Donation: A Cross-Country Study*, 25 J. HEALTH ECON. 599, 606--13 (2006); James Andreoni & Justin Rao, *The Power of Asking: How Communication Affects Selfishness, Empathy, and Altruism*, 95 J. PUB. ECON. 513, 515--17 (2011).

²⁰⁴ Unlike a carrot, nudges affecting infra-marginal actors also are costless. But this is an aspect of their revenue differences, rather than targeting per se.

health history, their family situation, where they live, and so on.²⁰⁵ Alcohol consumption is a likely example, especially since small amounts of alcohol may actually improve some health outcomes.²⁰⁶ With enough information, an ex ante tax can approximate these effects, and with a reliable enough system of proof an ex post liability system can, as well.²⁰⁷

It isn't clear whether nudges can. If susceptibility to the nudge happens to be closely correlated with propensity to produce externalities, the impact of the nudge could vary with the marginal damage, but this may not always be possible. But most commentators believe that the informational demands of a non-linear tax are also usually unrealistic,²⁰⁸ so this may not be significant weakness of nudges.

IV. Examples

We now have the tools to evaluate New York City's beverage-size limits, and a number of other nudges, too. The results are a bit surprising. The superiority of taxes or other sticks, which prior commentators have almost universally assumed, in some instances is not so clear. Maybe less surprisingly, carrots often look even worse than they did when nudges weren't in the picture, as nudges in many cases can substitute for carrots without presenting the same risks.

A. Soda

Let's begin our examples with the recent controversy over New York's sugary beverage policy. Whether beverage-size limits are better than other price instrument options likely depends on whether we think the problem with soda involves a significant externality.²⁰⁹ If the primary focus of the regulation is to correct people's own choices, then targeting and revenues may both favor nudge-type approaches over a soda tax or similar stick-like instrument, such as cutting subsidies to beverage ingredients or increased tort liability for beverage producers.²¹⁰

The size limits are much better targeted at soda-drinkers' potential externalities than a tax would be. The default size is most binding on individuals with high discount rates and excessive focus on the present.²¹¹ Caffeine quaffers who excessively discount the future will more likely view the bother of obtaining a second cup as disproportionately large relative to the later benefits

²⁰⁵ Louis Kaplow & Steven Shavell, *On the Superiority of Corrective Taxes to Quantity Regulation*, 4 AM. LAW & ECON. REV. 1, 4-5 (2002).

²⁰⁶ Strnad, *supra* note 25, at 1244.

²⁰⁷ Jon D. Hanson & Kyle Logue, *The Cost of Cigarettes: The Economic for Ex Post Incentive-Based Regulation*, 107 YALE L.J. 1163, 1264--68 (1998).

²⁰⁸ O'Donoghue & Rabin, *supra* note 30, at 1830; Strnad, *supra* note 25, at 1271--72.

²⁰⁹ For evidence that soda consumption contributes to obesity, and therefore to obesity-related health problems, see Cara B. Ebbeling et al., *A Randomized Trial of Sugar-Sweetened Beverages and Adolescent Body Weight*, 367 NEW ENG. J. MED. 1407, 1407--16 (2012); Janine C. de Ruyter et al., *A Trial of Sugar-Free or Sugar-Sweetened Beverages and Body Weight in Children*, 367 NEW ENG. J. MED. 1397, 1397--1406 (2012).

²¹⁰ For discussion of the role of government subsidies in excess beverage consumption, see Adam Benforado et al., *Broken Scales: Obesity and Justice in America*, 53 EMORY L.J. 1645, 1791--95 (2004).

²¹¹ See James J. Choi et al., *Optimal Defaults*, 93 AM. ECON. REV. 180, 181 (2003) (modeling properties of defaults generally).

of quenching their thirst.²¹² Similarly, those who are the most focused on their immediate surroundings would be the most likely to be influenced by the size of the portion in front of them.²¹³ These two groups are also those who predictably will not accurately account for the future cost of their consumption when they make present drinking decisions.

In contrast, a soda tax would likely fall on all consumers, including those who are not at any risk of obesity and those who have rationally concluded that the risks are worth the costs. For all of these latter kinds of folks, assuming that there is little externality component to their consumption, the tax simply distorts behavior. On the other hand, this may be presuming that any soda tax would necessarily have to be linear---that is, that we would impose the same price per serving for all consumers. If a more flexible schedule were possible, such that those who are at greater risk of health consequences pay higher prices, then the tax might be better targeted than the nudge. It is very unlikely the ideal portion size is 16 ounces for all consumers.²¹⁴ But realistically it also seems very improbable that either the tax or the portion size could be set to vary with real marginal costs.

The size limit may also be better targeted in the sense that it reduces the extent to which internality sufferers substitute into other unhealthy behaviors. For example, taxes on soda could encourage consumers to switch to other unhealthy choices.²¹⁵ Will soda drinkers similarly switch to sugary juices in order to be able to buy them in larger sizes? Though of course time will tell, the soda nudge might not produce much of this kind of switching. To induce switching, the would-be consumer must recognize in advance that she will want additional consumption, and also recognize that she will then be unwilling to pay the price to overcome the default. As we've seen, both of these are uncertain: the consumption decision may be the product of the portion size the consumer experiences, and her ability to predict her perception of the price may be limited.

On the other hand, the soda tax certainly brings in more dollars than the size limit, but the welfare effects of that swap are less clear. As I argued earlier, it is possible that consumers would perceive an explicit tax to reduce their returns to labor, while not noticing or even appreciating the effects of a similar nudge. The beverage size limit seems a good example of where it is plausible that consumers would not connect the nudge to their labor/leisure decision,

²¹² Evidence that obesity may be the product of impatience includes Shinsuke Ikeda et al., *Hyperbolic Discounting, the Sign Effect, and the Body Mass Index*, 29 J. HEALTH ECON. 268 (2010); Charles J. Courtemanche et al., *Impatience, Incentives, and Obesity*, NBER Working Paper No. 17483, at 17--26 (Oct. 2011).

²¹³ Chandon, *supra* note 10, at 16 (connecting over-eating to temptation and misperceptions of the true size of food portions); Andrew B. Geier et al., *Unit Bias: A New Heuristic that Helps Explain the Effect of Portion Size on Food Intake*, 17 PSYCH. SCI. 521, 524 (2006) (suggesting that "immediate presence" of temptation helps to explain influence of portion size on consumption).

²¹⁴ Strnad, *supra* note 24, at 1321.

²¹⁵ Eric A. Finkelstein et al., *Impact of Targeted Beverage Taxes on Higher- and Lower-Income Households*, 170 ARCHIVES INTERNAL MED. 2028, 2033 (2010) (raising the substitution question); Jason M. Fletcher et al., *The Effects of Soft Drink Taxes on Child and Adolescent Consumption and Weight Outcomes*, 94 J. PUB. ECON. 967 (2010) (reporting evidence that taxes cause substitution to other unhealthy beverages).

since again there will be consumers who do not even notice that the smaller portion size changed their preferences. If so, then the greater revenues of the soda tax also come at some additional social cost, and it is ambiguous whether the opportunity they offer to cut other taxes (or invest in worthwhile new government programs) makes society better off on net.

The nudge option does seem to have better distributive outcomes. Studies find that the population at greatest risk from excessive sugary beverage consumption tends to be rather poorer on average than others.²¹⁶ So the soda tax has a good chance to be even more regressive than a standard sales tax. Some commentators have suggested mitigating that unfortunate outcome either through paying back the tax's proceeds to low-income households through cash rebates or by offering subsidies for healthy food options.²¹⁷ But note that both of these alternatives are either identical to or (if subsidies exceed taxes collected) inferior on revenue terms to the nudge. Once the distributional effects are corrected, the nudge and tax are identical, except that the nudge is better targeted.

Of course, it may not be the case that soda woes are limited primarily to externalities.²¹⁸ Jeff Strnad, in his exhaustive 2005 analysis, argued that "fat taxes" in general were best defended as a form of implicit insurance premium charged to consumers who would later put demands on the health-care system.²¹⁹ But Strnad did not argue there were no externalities, only that taxes could not be targeted accurately enough at externality sufferers.²²⁰ Nudges may improve targeting enough to overcome Strnad's objections.

If externalities are important to the beverage story income effects are also worth considering. Both the tax and the default could help the consumer to better allocate her available budget, creating an offsetting positive income effect. The tax, however, also reduces the consumer's household wealth, likely diminishing her demand for soda (assuming sugary drinks are normal rather than inferior goods).²²¹ Government could not efficiently duplicate this reduction simply by making the nudge more demanding. By assumption, the shadow price of the nudge is already set at the socially optimal level. Making the nudge more difficult to overcome--say, by lowering the maximum size to 12 ounces--would therefore cause many consumers to incur more costs than society would gain in benefits.

²¹⁶ NYC Dep't of Health & Mental Hygiene, Consumption of Sugar Sweetened Beverages in New York City, May 2011, at 1--2, available at <http://www.nyc.gov/html/doh/downloads/pdf/epi/databrief4.pdf>.

²¹⁷ Battle & Brownell, *supra* note 25, at 762; Pratt, *supra* note 25, at 125; see also Sugarman & Sandman, *supra* note 25, at 1489 (proposing rebates to help states cover the costs of obesity reduction).

²¹⁸ Korobkin, *supra* note 60, at 1681--82.

²¹⁹ Strnad, *supra* note 25, at 1234, 1267--68.

²²⁰ *Id.* at 1322.

²²¹ See Gideon Yaniv et al., *Junk-Food, Home Cooking, Physical Activity and Obesity: The Effect of the Fat Tax and the Thin Subsidy*, 93 J. PUB. ECON. 823, 823 (2009) (arguing that subsidies for healthy food could increase demand for unhealthy foods through income effect).

B. Other Internalities

Not all other internality-correcting nudges are as defensible as serving-size defaults. For instance, cigarette packaging rules have emerged recently as another important nudge-like form of regulation. In the United States, the FDA is in the process of litigating its effort to require the printing of graphic, disturbing images of sick smokers on the sides of packs.²²² Australia requires frightening images and additionally prohibits the display of any brand-related imagery at all.²²³ Both rules can be thought of as dollar-less prices; the FDA's pictures are like a psychic punch in the gut for everyone who reaches for their pack, while the Australia approach increases consumers' search costs and diminishes any brand-related signaling smokers might send to their peers.

Both sets of rules are relatively costly for their governments. In addition to forgoing revenues that could be collected from imposing a higher tax, each program likely reduces money brought in by existing cigarette levies.²²⁴ The U.S. effort also reduces revenues for states, most of whom also collect cigarette excise taxes.²²⁵ Labeling rules could potentially have somewhat better labor effects than taxes or other sticks, though. Especially in the case of the graphic imagery, it seems as though smokers might not be fully aware of the nudge's costs when they make budgeting decisions. Possibly the image instead acts as a short-term increase in the salience of information smokers already have, making that information as available to the smoker's mind as the temptation of the cigarettes in her hand. On this theory, the images correct momentary mis-estimates rather than changing the long-term experience of smoking that most likely informs the labor/leisure choice.

There is also an argument that the labeling rules could be better targeted than taxes, though that too likely depends on exactly how they turn out to function. At first glance it seems that the graphic images would hurt all smokers, including the infra-marginal or "rationally addicted" smoker. Suppose, though, that some smokers are more susceptible to emotionally-laden imagery. Children, for example, have been found to be more easily influenced by advertising that relies on images and emotions.²²⁶ Both the FDA's scary pictures and Australia's plain white wrappers could then be targeted most closely at younger smokers who have been manipulated by tobacco advertising and packaging into making irrational decisions.

Both nudges also help to mitigate the critique of tobacco taxes as unduly regressive, though this may somewhat weaken their targeting advantage. While it is true that cigarette taxes (or tax-like increases in price resulting from manufacturers' liability) fall disproportionately on

²²² *R.J. Reynolds Tobacco Co. v. Food & Drug Administration*, 696 F.3d 1205, 1208 (D.C. Cir. 2012).

²²³ Australian Government Department of Health and Ageing [sic], Plain Packaging of Tobacco Products, <http://www.health.gov.au/internet/main/publishing.nsf/content/tobacco-plain>.

²²⁴ World Health Organization, WHO Report on the Global Tobacco Epidemic 2011, Australia Country Profile, available at http://www.who.int/tobacco/surveillance/policy/country_profile/aus.pdf.

²²⁵ Urban/Brookings Tax Policy Center, Tax Facts, Tobacco Tax Revenues, available at <http://www.taxpolicycenter.org/taxfacts/displayafact.cfm?Docid=403>

²²⁶ Chaloupka & Warner, *supra* note 26, at 1583--84.

the poor, that can actually be a good thing in the case of very young smokers.²²⁷ Early teen smokers have relatively tiny budgets and little opportunity for borrowing against future income, making them extremely sensitive to small changes in dollar prices. Arguably, this is precisely the optimal pricing structure, since young teens also are most likely to be making bad decisions and, if not yet addicted, are most elastic in their response to costs fluctuations (and hence are least likely to be addicts who simply pay more in tax without reducing consumption).²²⁸

Overall, it looks as though early criticism of packaging rules is somewhat overstated. While it's possible higher cigarette taxes are still a better option, there are also some points to be made in favor of the regulations.

So far both our examples have compared nudges to sticks, but it is interesting also to consider an instance where nudges could replace carrots. Retirement savings offers a major example. In a recently-posted working paper, Chetty et al. appear to endorse proposals replacing tax incentives for retirement contributions, such as the 401(k) plan (and its lesser-known cousins, such as § 403(b)) with employer-administered default contributions to workers' retirement accounts.²²⁹ Though they don't frame it in precisely the terms I've set out here, in essence their claim is that defaults are better targeted and less costly for the government. Working from Danish data, they find that "inattentive" investors save more when default contributions are ratcheted up, but ignore (while still benefiting from) tax incentives. And inattentive investors make up 85% of the Danish working population. Thus they claim that default contributions both require little government investment and also reduce the likelihood of giving money to infra-marginal agents.²³⁰

My analysis matches up with this story pretty well, but suggests some possible qualifications. For one, the revenue benefits of defaults may be smaller than Chetty et al. assume. Eliminating § 401(k) could save on the order of \$125 billion annually, allowing the

²²⁷ Hanson & Logue also argue that advertising bans may be counter-productive when imposed side-by-side with an ex post liability regime. Hanson & Logue, *supra* note 207, at 1327--28. They suggest that tobacco firms would have incentives to target consumer with the lowest propensity to suffer harm (i.e., not kids), and that advertising bans would reduce the efficacy of that targeting. *Id.*

²²⁸ See Hanna Ross & Frank J. Chaloupka, *The Effect of Cigarette Prices on Youth Smoking*, 12 HEALTH ECON. 217, 217 (2003).

²²⁹ Chetty et al., *supra* note 13, at 43. For summary of past legislative efforts, see JOINT COMMITTEE ON TAXATION, *supra* note 187, at 48--49. For other academic supporters of opt-in defaults as a solution to the retirement savings problem, see PETER ORSZAG ET AL., AGING GRACEFULLY: IDEAS TO IMPROVE RETIREMENT SECURITY IN AMERICA Ch.4--5 (2006); Karen C. Burke & Grayson M.P. McCouch, *Social Security Reform: Lessons from Private Pensions*, 92 CORNELL L. REV. 297, 308--10 (2007); Camerer et al. *supra* note 15, at 1227--29; Edward Zelinsky, *The Defined Contribution Paradigm*, 114 YALE L.J. 451, 523--24 (2004).

²³⁰ Chetty et al., *supra* note 13, at 37--38. Chetty et al. also claim that tax incentives don't increase net savings even among attentive households, because in their sample tax incentives just encourage investors to move money from existing savings into tax-favored accounts. *Id.* at 42--43. This is an important result, but it doesn't necessarily imply that the incentives are fruitless. Eligible retirement savings vehicles may be much "stickier" than other savings---among other reasons, because there is a statutory penalty for withdrawal. If the government's goal is *long-term* savings, moving money into these stickier accounts may therefore still be a somewhat good investment.

government to lower overall tax rates and reduce the deadweight loss of federal taxation.²³¹ But the default may also generate deadweight loss, not only because it may not match the preferences of some “inattentive” investors, but also because it might affect their labor supply. If workers who ignore retirement are in fact motivated only by today’s take-home pay, they may perceive an extra 6% set-aside out of current earnings as the equivalent of a 6% tax. That might be a bigger effective hike than any cut that could accompany the \$125 billion windfall.²³²

Chetty et al. also appear to assume that switching away from the 401(k) carrot will better align income effects, but that isn’t necessarily the case. They echo a common criticism of carrots for retirement, which is that increases in household wealth tend to stimulate consumption, while the goal of the policy is to encourage savings and therefore to reduce current consumption.²³³ As we have seen, though, it is possible that a very well-targeted default could also be perceived as expanding the household’s budget. Workers could see their returns to labor as higher, since they won’t be wasting as much money on short-term temptations. So, in short, a more complete assessment of their proposal requires us to know more about how inattentive investors respond to default savings.

Perhaps a central theme to all of these internality examples is that the labor-supply effects of a nudge depend on the nature of the error individuals are making. When what is happening is a failure of will, rather than knowledge, labor supply seems most likely to increase. In this scenario, some households know that they are getting a valuable commitment device from the government, and recognize the improved budget allocation that device allows them.²³⁴ In contrast, when the error is a mistake of attention or understanding, families could well reduce their labor in response to the nudge, because they don’t see that the government has actually made them better off. Future empirical work devoted to better identifying how people are going wrong could therefore have significant policy implications.

C. Pollution

Regulators and inventive commentators have proposed and sometimes even road-tested a variety of nudge-like instruments for reducing carbon and other forms of pollution.²³⁵ Some of

²³¹ Or, of course, the government could spend the \$125 billion in some other way, if the alternative generates greater welfare gains than the tax cut.

²³² Chetty et al. also suggest that employers could be convinced to offer default retirement accounts with relatively small government incentives, perhaps just enough to cover the costs of administration. Chetty et al., *supra* note 13, at 43. That, too, is unclear. If employers currently capture some or all of the benefit of the government subsidy, persuading them to agree politically to the swap would likely require a promise to replace much of the current savings. Of course, Chetty et al. might argue that since workers seem not to care about retirement savings, we might think that employers cannot save much in the way of lower salaries, and therefore can’t capture much of the subsidy. But if that is true, then workers would likely perceive default savings as a tax and then the revenue benefits of their proposal are smaller.

²³³ GRUBER, *supra* note 31, at 650.

²³⁴ Cf. Gruber, *supra* note 26, at 203 (summarizing studies finding that expectation of future price changes affects current consumption of willpower goods).

²³⁵ Vandenbergh et al., *supra* note 24, at 763--79.

these interventions have been aimed at consumers, such as the various kinds of cues and defaults to reduce household energy consumption championed by Thaler & Sunstein and by Ian Ayres.²³⁶ Others operate primarily at the firm level, such as the “Toxic Release Inventory,” or TRI, program.²³⁷ Yet other major policies, such as the Obama administration’s recent efforts at increasing the fuel efficiency of motor vehicle fleets,²³⁸ don’t quite meet the “asymmetric costs” criteria for a nudge but do seem to resemble a dollar-less price.

Although it’s unclear that even in combination all the nudges could achieve the needed levels of carbon reduction,²³⁹ the energy-conserving nudges look to be at least a valuable component of any strategy. Consider first the household-level nudges, such as “smart” energy meters that offer instant feedback to households on their energy usage.²⁴⁰ It seems pretty straightforward that these kinds of efforts are preferable to paying families to adopt conservation strategies, subsidizing weather-proofing, and so on. Given the potentially vast number of infra-marginal claimants for such subsidies, the nudges almost certainly cost less, and either way will have a lesser unwanted income effect on household energy consumption.

Less intuitively, the constellation of nudges could outshine a carbon tax. At first glance, the nudges seem to sacrifice any possible “revenue recycling” benefits from the carbon proceeds. But nearly all carbon tax proposals include efforts to mitigate the severe regressivity of taxes on carbon, which function as a broad-based sales tax due to the energy involved in manufacturing and transporting nearly any consumer good.²⁴¹ In many proposals, most or all of the revenues from the carbon tax or its equivalents (such as the 2009 cap and trade bill I mentioned earlier) would be devoted not to corporate tax cuts but instead to cash rebates for low-income households.²⁴²

Nudges could therefore be similar both in revenue and distributive terms to a carbon tax.²⁴³ Alternately, if the carbon tax does not include a rebate, or rebates only a portion of poorer

²³⁶ THALER & SUNSTEIN, *supra* note 8, at 257--68; AYRES, *supra* note , at 131--42.

²³⁷ Bradley Karkkainen, *Information as Environmental Regulation: TRI and Performance Benchmarking, Precursor to a New Paradigm?*, 89 GEO. L.J. 257, 286--94 (2001).

²³⁸ The White House, Office of the Press Secretary, Obama Administration Finalizes Historic 54.5 MPG Fuel Efficiency Standards, Aug. 28, 2012, *available at* <http://www.whitehouse.gov/the-press-office/2012/08/28/obama-administration-finalizes-historic-545-mpg-fuel-efficiency-standard>.

²³⁹ For consideration of that question, see Thomas Dietz et al., *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) (estimating that behavioral changes can reduce U.S. emissions by 7 percent over the next decade).

²⁴⁰ Leslie Kaufman, *Utilities Turn Their Customers Green with Envy*, N.Y. TIMES, Jan. 30, 2009, at A1.

²⁴¹ *E.g.*, Gilbert E. Metcalf & David Weisbach, *The Design of a Carbon Tax*, 33 HARV. ENVTL. L. REV. 499, 514 (2009); David A. Super, *From the Greenhouse to the Poorhouse: Carbon Emissions Control and the Rules of Legislative Joinder*, 158 U. PA. L. REV. 1093, 1190--96 (2010).

²⁴² For discussion of several alternatives, see Terry Dinan & Diane Lim Rogers, *Distributional Effects of Carbon Allowance Trading: How Government Decisions Determine Winners and Losers*, 55 NAT’L TAX J. 199, 206 (2002).

²⁴³ Another important goal of carbon taxes is to not only reduce overall energy consumption but also to shift the sources of energy to less carbon-intensive uses. Nudges can also be designed to encourage switching. For instance, in addition to reporting total usage, smart meters could report the mix of sources being drawn from the grid, and allow the household to dynamically adjust which source it prefers.

households' average costs, the nudge could present a tradeoff between revenues and fairer distribution. The nudge does still arguably impose costs on some families---those who must exert effort to avoid or ignore it. For instance, with greater feedback I might feel bad that I'm using too much energy. But these deadweight losses are more likely to be equitably distributed across households, rather than being borne most heavily by the poorest. It certainly could be that the subjective mental costs of avoiding energy-conserving nudges are greater for individuals with less wealth, but it's not immediately obvious why that would be so. Early empirical evidence on the distribution of the costs of mental effort are unclear, with one or two papers actually finding that richer people seem to view effort as more costly.²⁴⁴

Relatedly, the nudges are probably better targeted in a couple of different respects. Even with rebates, households retain a marginal incentive to conserve energy under a carbon tax, since if my rebate is determined by everyone else's average costs I can come out ahead by being thriftier than they are. Again, if government cannot readily vary this marginal incentive with my effective wealth, then a marginal dollar in incentives will over-motivate the poor while under-motivating the very rich. Many conservation nudges in contrast can be designed to affect primarily those who need greater interventions. A thermostat set to automatically lower temperatures on winter evenings is more likely to change the behavior of households who are inattentive to energy use than those who are already paying attention. These are also families who may well derive some additional externality benefit from the nudge.²⁴⁵

A final factor to consider is crowd-out. Even if Glaeser is right that in an economic sense nudges are every bit as "coercive" as taxes, not everyone may see things the same way. As we saw earlier, express dollar-denominated incentives tend to replace other "intrinsic" motivation, but nudges might not. So carbon taxes could reduce altruistic energy conservation, while nudges might leave it unchanged or even improve it. Nudges might even help altruistic but low-willpower individuals achieve the greater conservation levels they desire.²⁴⁶

Dollar-less prices targeted at firms, such as the new "CAFE" gas efficiency standards, are perhaps similar. Recent regulations require auto manufacturers to achieve by 2016 an average fuel economy of 35.5 miles per gallon in the cars they sell in the United States, and 54.5 by 2025.²⁴⁷ The CAFE standard is a dollar-less price. Like a tax, it will increase manufacturers' costs, some of which they will be able to pass on to consumers. Again, either policy is likely more appealing than offering drivers "cash for clunkers" or tax incentives for hybrid vehicles. But CAFE brings in no revenue to offset any deadweight loss its higher costs will produce. If the alternative is a broad-based tax on consumption, such as a gasoline or carbon tax, however,

²⁴⁴ Jacob Goldin & Tatiana Homonoff, *Smoke Gets in Your Eyes: Cigarette Tax Salience and Regressivity* 25 (unpublished working paper, June 8, 2012), available at http://scholar.princeton.edu/sites/default/files/jgoldin/files/goldin_homonoff.pdf.

²⁴⁵ Carbon taxes could likewise help the family to better prioritize its spending, but at some overall cost to them.

²⁴⁶ Leonhard K. Lades, *Impulsive Consumption and Reflexive Thought: Nudging Ethical Consumer Behavior*, __ J. ECON. PSYCH. __, manuscript at 9--10 (forthcoming 2013).

²⁴⁷ White House, *supra* note 238, at 1.

revenues may be a wash, since any tax would likely either be paired with a rebate or incur unwanted distributive consequences.

Arguably, the CAFE standard shares some of the targeting advantage of other nudges. Some drivers may fail currently to buy fuel-efficient cars even though it would improve their own welfare---for example, because they are less inattentive to the future series of small savings they would realize than they are to the immediate sticker cost. For these buyers there would be an additional internality benefit from CAFE, making for lower total deadweight loss than in the case of a simple gasoline tax. On the other hand, some drivers may behave as though they don't appreciate future costs, when in actuality they see the fuel savings but simply lack the ready cash for a down-payment on a more efficient vehicle.²⁴⁸ CAFE could actually leave those would-be buyers worse off by shifting their purchase to a more-affordable used car with lower efficiency.

D. Positive Externalities

Positive externalities offer a particularly fertile area for developing new nudges. For the most part, carrots are the dominant U.S. instrument for encouraging many important positive externalities, ranging from copyright protections for artists to tax deductions for charitable contributions and research and development.²⁴⁹ As I suggested earlier, in many cases nudges can replace carrots in instances where sticks are problematic.

Charitable contributions are a possible example. Many of the tools others have designed for pension savings could also be employed for charitable giving. For example, employees could by default have a small portion of their earnings in excess of a certain threshold distributed among a short list of charities they had previously selected---say, 3% of income above \$40,000.²⁵⁰ Employees also could commit to donating a portion of future earnings, as Thaler & Sunstein suggest.²⁵¹ More radically, and taking a cue from Germany, the U.S. could collect donations for charities through the tax system without subsidizing them.²⁵² Realized gains on

²⁴⁸ For evidence that these kinds of liquidity constraints are an important obstacle for low-income car buyers, see Orazio P. Attanasio et al., *Credit Constraints in the Market for Consumer Durables: Evidence from Micro Data on Car Loans*, 49 INT'L ECON. REV. 401, 402, 433 (2008).

²⁴⁹ Galle, *supra* note 22, at 840.

²⁵⁰ The mean itemizing household currently donates about 2% of personal income to charity. JOINT COMMITTEE ON TAXATION, PRESENT LAW AND BACKGROUND RELATING TO THE FEDERAL TAX TREATMENT OF CHARITABLE CONTRIBUTIONS 45 (Feb. 11, 2013). If the employee never gets around to designating any beneficiary organizations, the firm could select them, or the money could be distributed to charities like the United Way that do the choosing for their donors.

A critic of the proposals might argue that they somewhat arbitrarily cap the amount of "subsidy" the government offers. In contrast, the deduction allows donors to determine the amount of matching dollars government will provide without limit, as long as annual contributions do not exceed 50% of AGI. That is accurate, but note that it isn't inevitable that the deduction will always have this advantage. Several serious legislative proposals over the past few years would cap the annual amount of subsidized contributions for each donor. See Colivaux et al. *supra* note 46, at 11--13, for an overview.

²⁵¹ THALER & SUNSTEIN, *supra* note 8, at 232.

²⁵² For an overview of the German system, see Stephanie Hoffer, *Caesar as God's Banker: Using Germany's Church Tax as an Example of Non-Geographically Bounded Taxation*, 9 WASH. UNIV. GLOBAL STUDIES L. REV.

investment properties could be “taxed” an extra few percentage points unless the taxpayer opts out, with the revenues flowing to their designated charities.

Charitable nudges along these lines are likely superior on deadweight loss terms to the current income-tax deduction for charitable contributions, while offering a somewhat less useful income effect than the deduction. Obviously the nudge would not reduce government revenues to the extent the deduction does.²⁵³ As with retirement savings, though, it is possible that donors could view the default as reducing their real returns to labor, resulting in deadweight loss that mimics the cost of the lost revenue. Donors who perceive the donation as a loss could also see themselves as poorer, reducing their demand for charity. And of course the donor pays a higher tax than she would with the deduction in place, which could further diminish her demand.

The nudges have other advantages as well. They are almost certainly better targeted than the deduction, much of the value of which is presently claimed by donors who likely would give a substantial amount regardless of the subsidy.²⁵⁴ Unlike the present design of the deduction, a nudge does not reduce the progressivity of the tax system.²⁵⁵ Another criticism of the deduction is that, because it offers larger rewards for higher-income givers, it tends to produce a charitable sector slanted towards the interests of the rich;²⁵⁶ I have also argued that unless charities can more firmly be separated from the political sphere the deduction also distorts our politics.²⁵⁷ Like a credit, the nudges I mentioned would somewhat mitigate these tendencies, though of course wealthier donors will still have more to give.

Similar nudges could also be used to supplement or replace the estate tax and its accompanying deduction for charitable bequests.²⁵⁸ Though the purposes behind the income-tax deduction for charitable contributions have been closely interrogated by commentators, the estate-tax deduction has mostly escaped scrutiny.²⁵⁹ Most of those who have examined it are generally cheerful about its effects: in addition to subsidizing charities, it serves to break up dynastic wealth, much like the estate tax generally.²⁶⁰ That is true, but the two instruments get

595, 601--06 (2010). Of course, aiding in collections is itself a bit of a subsidy, but a much smaller one than the charitable contribution deduction currently offers.

²⁵³ See JOINT COMMITTEE ON TAXATION, *supra* note 250, at 44 tbl.2 (estimating \$36.7 billion in 2012 federal tax savings for charitable contributors).

²⁵⁴ Molly F. Sherlock & Jane G. Gravelle, Cong. Research Serv., R 40919, An Overview of the Nonprofit and Charitable Sector 49 (2009), available at <http://pppnet.org/pdf/R40919.pdf>.

²⁵⁵ JOINT COMMITTEE ON TAXATION, *supra* note 250, at 36. Note, however, that the regressivity of the deduction could be offset by increasing tax rates for the income brackets of individuals who tend to donate more. Colinvaux et al., *supra* note 46, at 10.

²⁵⁶ Mark P. Gergen, *The Case for a Charitable Contributions Deduction*, 74 VA. L. REV. 1393, 1405--06 (1988).

²⁵⁷ Brian Galle, *Charities in Politics: A Reappraisal*, 54 WM. & MARY L. REV. 1561, 1600--03 (2013).

²⁵⁸ 26 U.S.C. § 2055(a).

²⁵⁹ Miranda Perry Fleischer, *Charitable Contributions in an Ideal Estate Tax*, 60 TAX L. REV. 263, 264--67 (2007).

²⁶⁰ James R. Repetti, *Democracy, Taxes, and Wealth*, 76 N.Y.U. L. REV. 825, 856 (2001); John G. Simon, *Charity and Dynasty Under the Federal Tax System*, 5 PROB. LAW. v, 33 (1978); see also Perry Fleischer, *supra* note 259, at 276--83 (agreeing with this point but cautioning that it does not explain all the legal features of the existing deduction).

there in very different ways---most obviously, one deposits money into the Treasury, while the other does not.²⁶¹ Whether the remnants of dynasty should be allocated by the public or the dynasts seems like it should be a question of some interest.

All that I want to say about the question of the institutional design of dynasty-breaking here is that nudges represent a third possibility. With nudges, the choice of how to allocate wealth are framed and influenced by the public's agents while the ultimate choices remain in the hands of donors. If the nudge replaces the estate-tax deduction, we must decide whether the incremental loss of private control, and the deadweight losses to those who do not surrender it, are worth the revenue gains. Alternately, the nudge (if effective enough) could replace the estate tax system altogether. Then the question would be whether the incremental *gains* in private control are worth the lost dollars.

Conclusion

I have attempted here to offer the first extended consideration of the relative policy merits of nudges and price instruments. As with any initial academic forays into untrodden ground, no doubt I have made some missteps or overlooked some important areas for exploration. For now, though, it looks as though present widespread skepticism of nudges may be misplaced. Nudges certainly bring in less money than sticks, and very likely cost less than carrots. But commentators have assumed, wrongly in my view, that these are the only differences. As a result, New York's soda law, and many other forms of asymmetric regulation, may merit closer consideration than others have so far been willing to offer.

[24,987] [15,614]

²⁶¹ Cf. Mark L. Ascher, *Curtailing Inherited Wealth*, 89 MICH. L. REV. 69, 135--36 (1990) (suggesting that estate-tax deduction might be justified because it diversifies providers of public goods); Ray Madoff, *What Leona Helmsley Can Teach Us About the Charitable Deduction*, 85 CHI.-KENT L. REV. 957, 965--66 (2010) (pointing out that charitable estate tax deduction allows the very wealthy to effectively control use of government funds).

Regulation of Externalities. In certain instances, production activities can impose negative externalities on society. Theoretically, the control of advertising is justified by the "negative externalities" created by false, misleading, unfair, and asocial ads. Its desired outcome is the creation of "public goods" in the form, for example, of the punishment of infractors, whose benefits are distributed among the populace at large. However, the main problem facing all private-interest groups such as self-regulatory bodies is that of the "free rider" who benefits from the reputation and services of an association but does not join or participate in it either by not paying dues or by violating its guidelines.

2. Relevance and the theory of externalities.
3. Externalities: definition, significant types, and optimal-pricing conditions.
4. Externalities: formal analysis.
5. Uncertainty and the choice of policy instruments: price or quantity controls?
6. Market imperfections and the number of participants.

In Part II, we move away from the pure theory of externalities to our central concern with the application of economic analysis to the design of a viable and effective environmental policy. The analysis also points out several (frequently undetected) booby traps that threaten the unwary in the use of the theory and have significant implications for policy. We have not tried in this book to provide a comprehensive review of the externalities literature.