

1-1-2011

Is Cap and Trade Fair to the Poor? Short-Sighted Households and the Timing of Consumption Taxes

Brian D. Galle

Boston College Law School, brian.galle@bc.edu

Follow this and additional works at: <http://lawdigitalcommons.bc.edu/lspf>

 Part of the [Environmental Law Commons](#), [Law and Economics Commons](#), and the [Tax Law Commons](#)

Recommended Citation

Brian D. Galle. "Is Cap and Trade Fair to the Poor? Short-Sighted Households and the Timing of Consumption Taxes." *George Washington Law Review* 79, (2011): 33-10.

This Article is brought to you for free and open access by Digital Commons @ Boston College Law School. It has been accepted for inclusion in Boston College Law School Faculty Papers by an authorized administrator of Digital Commons @ Boston College Law School. For more information, please contact nick.szydowski@bc.edu.

Is Cap-and-Trade Fair to the Poor? Short-Sighted Households and the Timing of Consumption Taxes

Brian Galle* and Manuel Utset†

March 25, 2010

ABSTRACT

Many forms of consumption tax, including recent proposals to impose a tax on the use of carbon, impose disproportionate burdens on the poor. Commentators who propose mitigating this impact with tax rebates for low-income families have overlooked the importance of the timing of consumption for these households, as well as the difficulties of “smoothing” income from one time period to another. We survey a wide array of evidence suggesting that poor households lack affordable mechanisms for both borrowing and saving, such that a lump-sum rebate, or even monthly rebates, would not leave the household as well off as they were in the absence of any tax. In addition, we show that the cognitive features of a rebate will be problematic for short-sighted households---those who heavily favor the present over the future. For example, they may impatiently spend rebates too quickly, leaving little money for later necessities, and potentially increasing overall carbon usage. And they likely will procrastinate both learning how to overcome these problems, as well as putting off investing in less carbon-intensive goods.

We do not, however, argue against carbon pricing. Instead, we offer new methods of structuring taxes and rebates to overcome these problems. For instance, we suggest that rebates be offered on a “self-directed” debit card, subject to a sticky default cap on weekly withdrawals. This implement “nudges” short-sighted households away from impatience, while offering affordable credit and modern banking to all. These same mechanisms can be used for other forms of transactional consumption taxes, such as state sales taxes or a possible national value-added tax.

* Assistant Professor, Florida State University College of Law; Visiting Associate Professor of Law, The George Washington University Law School.

† Charles W. Ehrhardt Professor, Florida State University College of Law. The authors are grateful for helpful comments from and conversations with Peter Byrne, Joseph Dodge, Lee Fennell, Dan Halberstam, Jon Nash, Gregg Polsky, Jim Repetti, Diane Ring, J.B. Ruhl, Chris Sanchirico, and Ethan Yale, as well as attendees of presentations at the Conference of the Society for Environmental Law & Economics and the University of Pennsylvania Law School Colloquium on Tax Policy.

Table of Contents

Introduction	2
I. Consumption Taxes and “Distributionally Neutral” Rebates	7
A. Distributive Justice in a Welfarist Framework	7
B. Existing Tax and Rebate Proposals	10
C. Importance of Income Smoothing	14
II. Liquidity Constraints, Hidden Taxes, and Rebates in Time-Consistent Households.....	15
A. Liquidity Constraints and Time Discounting	16
1. Evidence of Liquidity Constraints.....	17
2. Borrowing Against the Rebate	21
3. Impatience	26
B. Low Salience of Energy Costs.....	27
1. Welfare Costs of Hidden Taxes	27
2. Learning	33
C. Prebates Raise Similar Problems.....	34
D. Summary	35
III. Hyperbolic Households and the Limit of Lump-Sum Reimbursement Regimes.....	36
A. Intertemporal Decisions and the Evidence on Time-Inconsistency	37
B. Overconsumption and Procrastination.....	39
1. Overconsumption Scenario: Immediate Benefits and Delayed Costs.....	40
2. Procrastination Scenario: Immediate Costs and Delayed Benefits	41
3. Repeated Overconsumption and Procrastination	42
C. Overconsumption in Prebate Regime	43
1. Smoothing Problem: Liquidity Constrained Households.....	43
2. Overconsumption: Non-Liquidity Constrained Households.....	46
D. Procrastination and Consumption Smoothing.....	48
E. Procrastination in Making Transition Away from Carbon Dependence	50
F. Procrastination Acquiring Information	52
G. Relative Access to Commitment Devices	55
H. Immediate vs. Delayed Taxes	59
I. Summary	59
IV. Design of Fairer Carbon Tax Systems	60
A. Problems with Other Consumption Tax Offsets	60
B. Self-Directed Debit Cards	62
C. Accelerate the Costs of Carbon	65
V. Objections & Questions.....	66
A. Lifetime vs. Annual Equity	67
1. Problems Identifying High Marginal-Utility Households.....	67
2. Even Steven Theories.....	73
B. Paternalism	75
VI. Conclusion	79

INTRODUCTION

Who should pay to prevent catastrophic climate change?¹ Should it be the rich, who can more easily bear the costs?² Or the poor, whose poverty makes them more vulnerable to dramatic changes in the environment,³ and so arguably have more to gain? These are challenging questions, and contemporary advocates of major policies aimed at preventing climate change have attempted to avoid them through proposals that claim to be “distributionally neutral.”⁴ For example, some of those who suggest increasing the price of greenhouse-gas production to account for its damage to the global climate claim that, though their schemes would fall more heavily on the poor, this burden can be balanced out by providing a tax rebate to households with the lowest incomes.⁵ Pending legislation incorporates a similar rebate feature.⁶ In this Article, we argue that although these rebate schemes are nobly intentioned, as currently designed they do not actually achieve distributional neutrality. We go on to proffer more carefully tailored alternatives that might get closer to true equality.

¹ For an overview of the scientific consensus on the dangers of climate change, see INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, IPCC SPECIAL REPORT EMISSIONS SCENARIOS (2000); INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT (2007); INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CONTRIBUTION OF WORKING GROUP II TO THE FOURTH ASSESSMENT REPORT (2007) [hereinafter WGII].

² Rumi Shammin & Clark W. Bullard, *Impact of Cap-and-Trade Policies for Reducing Greenhouse Gas Emissions on U.S. Households*, 68 ECOL. ECON. 2432, 2436 (2009).

³ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, WGII, at 8.

⁴ Gilbert E. Metcalf & David Weisbach, *The Design of a Carbon Tax*, 33 HARV. ENV'T'L L. REV. 499, 516 (2009); Gilbert E. Metcalf, *A Proposal for a U.S. Carbon Tax Swap: An Equitable Tax Reform to Address Global Climate Change*, The Hamilton Project Discussion Paper 2007-12, at 16, 19 (Oct. 2007).

⁵ 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); Metcalf & Weisbach, *supra* note 4, at 513--14 & n.66; David Super, *From the Greenhouse to the Poorhouse: Carbon Emissions Control and the Rules of Legislative Joinder*, 158 U. PA. L. REV. ___, manuscript at 6 (forthcoming 2010); Metcalf, *supra* note 4, at 11--20.

⁶ H.R. 2454 (proposed 2009); CONGRESSIONAL BUDGET OFFICE, CONGRESSIONAL BUDGET OFFICE COST ESTIMATE OF H.R. 2454 AMERICAN CLEAN ENERGY AND SECURITY ACT OF 2009, at 20 (2009).

To see the central problem of the rebate scheme, consider: Would you rather be poor for eleven months, and rich for one, or middle-class the whole year round? From the way they behave, it looks like most people would prefer the latter: a “smooth” income is better than one with the same total value but more peaks and valleys.⁷ That’s because the pain of the lows is, typically, worse than the satisfaction of the pinnacles.⁸ Thus, we save up for rainy days, or insure against them, transferring money from ourselves when we are wealthy to ourselves when we are poor.⁹

The carbon tax/rebate schemes neglect this basic point.¹⁰ The tax raises prices for households throughout the year, reducing their standard of living. In the case of households of very low incomes, even a modest tax --- carbon tax estimates tend to run in the vicinity of \$1,200 per household annually --- could represent a substantial loss in wealth.¹¹ The drop from \$1,000 per month in household income to \$900 is a steep one: it means the difference between making rent or not, eating three meals a day or two. A repayment of \$1,000 at year’s end does not fully alleviate this lower standard of living; empty stomachs cannot be retroactively filled.

Of course, the proponents of these schemes probably did not just overlook a fundamental tenet of modern economics. Instead, they likely assume that households can convert the lumpy

⁷ ANDREU MAS-COLELL ET AL., MICROECONOMIC THEORY 187--88 (1995).

⁸ *Id.* at 185.

⁹ *Id.* at 187--88.

¹⁰ An exception is David Super, who briefly acknowledges that poor households may face higher energy costs during different parts of the year that borrowing cannot satisfy. He urges policy makers to target assistance to those times. Super, *supra* note 5, at 64--65.

Although we adopt the common lingo in terming these levies a “carbon tax,” most proposals would also include taxes on the production of greenhouse gasses other than carbon dioxide. Metcalf, *supra* note 4, at 12.

¹¹ Congressional Budget Office, Trade-Offs in Allocating Allowances for CO₂ Emissions Tbl.1 (2007) (estimating costs of a 15% reduction in carbon emissions for median households at \$960, or \$1184 in 2009 dollars); Dinan & Lim Rogers, *supra* note 5, at 212 Tbl.4 (estimating average household cost for 15% reduction at \$1,209, or \$1488 in 2009 dollars); Robert Greenstein et al., Center on Budget and Policy Priorities, *Designing Climate-Change Legislation that Shields Low-Income Households from Increased Poverty and Hardship*, <<http://www.cbpp.org/files/10-25-07climate.pdf>>, at 1 (May 9, 2008) (putting estimated cost for lowest quintile of homes at \$750 and increasing over time). For inflation calculations, see The Inflation Calculator, <http://www.westegg.com/inflation>.

tax/rebate combination into a smooth income stream simply by borrowing against it. If that were true, then we would have little objection to the claim that the tax/rebate combination is distributively neutral.

Unfortunately, as we review here, the evidence shows overwhelmingly that low-income households cannot easily borrow, even against a guaranteed future payment.¹² For one thing, poor households generally lack a credit history. Since lenders cannot easily tell conscientious borrowers from deadbeats who will skip town before their check arrives, they must charge exorbitant rates to break even. And because the borrowers have few alternatives, and may not even recognize the high cost of the complex fees they face, there is little price competition among lenders who serve poor communities.

Another problem with the rebate is that it strains the limits of many households' cognitive abilities.¹³ Borrowing to offset an expected tax increase requires a certain amount of awareness of one's own household finances, as well as a modest amount of sophistication and enterprise in order to understand them and translate that knowledge into the act of applying for a loan. Again, evidence suggests that these problems have prevented many families from borrowing even against guaranteed future income.

While it might seem that these problems can easily be banished simply by paying out the rebate in advance, that structure, too, creates serious havoc for some households. Here, too, we survey evidence drawn from sources as varied as studies of tax rebates to analyses of gym

¹² We are not the first to observe that credit markets and the timing of taxation can affect social welfare. See Lee Anne Fennell & Kirk J. Stark, *Taxation Over Time*, 59 TAX L. REV. 1, 34 (2005) (“[B]ehavioral factors and capital market imperfections limit the ability of taxpayers to fully smooth consumption.”). We build on Fennell and Stark’s work by adding, for the first time in the legal literature, a comprehensive survey of the evidence in support of their claim that there are failures in the market for credit for low-income households. We also explain how those failures affect the design of consumption taxes. Stark and Fennell limit their discussion to the income tax.

¹³ For discussion of the points in this paragraph, see *infra* Part II.B.

membership fees.¹⁴ What we see overwhelmingly is that households are impatient: they spend sudden windfalls, rather than saving them. Thus a prepaid rebate would, like one that comes at the end of the year, leave families with excess cash for one month and poorer for the other eleven. Moreover, impatience leads to procrastination: because the present is more valuable than the future, many taxpayers would not invest in efforts to understand a carbon tax or in technologies to reduce their future carbon consumption. Both these sets of problems, as we explain, are more acute for low-income families.

Prepayment not only affects the fairness of a carbon tax, but also may undermine its environmental goals. Carbon taxes and other similar policies, such as cap-and-trade regimes, are designed to force users and producers of carbon to take account of the social cost of their decisions.¹⁵ By increasing the price to reflect the harms carbon does to others, the taxes aim to reduce carbon production to a socially optimal level.¹⁶ As we model here, however, impatient households who receive a prepayment may well *increase* their consumption of carbon-intensive goods.¹⁷

It is worth emphasizing that our goal is not to argue against carbon pricing, but is instead to improve the design of any pricing system. Thus, after we have identified the likely timing problems of current rebate proposals, we suggest a set of alternatives that would mitigate these problems, as well as offering some other side-benefits to poorer communities.

For example, we suggest that rebates be dispersed through a self-directed debit card, or “SDD.” The SDD allows recipients to draw down their rebate throughout the year, without

¹⁴ For discussion of this paragraph, see *infra* Part III.

¹⁵ Paul Ekins & Terry Barker, *Carbon Taxes and Carbon Emissions Trading*, in *ISSUES IN ENVIRONMENTAL ECONOMICS* 75, 77--79 (Nick Hanley & Colin J. Roberts eds., 2002); Nicholas Bull et al., *Who Pays Broad-Based Energy Taxes? Computing Lifetime and Regional Incidence*, 15 *ENERGY J.* 145, 147 (1994).

¹⁶ That is, the carbon tax is a “pigouvian” tax, a levy priced according to the size of the negative externality the product creates for others. *Id.*

¹⁷ See *infra* Part III.C.

having to incur massive fees from the “fringe” lending industry. The amount of funds available each week, however, by default is limited in advance, subject to modification by the card-holder. Thus, a taxpayer who fears she will overspend once she gets access to her rebate can pre-commit herself to spreading the rebate out over the course of the year. That commitment could be undone, but only through a cumbersome process. We thereby preserve consumer choice, while helping to nudge taxpayers away from temptation.¹⁸ Issuing debit cards also has the useful benefit of expanding access to electronic transactions and other everyday banking services many of us take for granted, but which are unavailable to most of the poorest households.

Although we frame our discussion here around carbon pricing, our analysis could also be readily translated to any other form of consumption tax. Many leading proposals for national sales taxes or value-added taxes include some kind of rebate to soften their disproportionate impact on low-income households.¹⁹ These proposals, too, have ignored the timing and cognitive problems we outline here. And they, too, could benefit from our proposed improvements.

The Article proceeds in Six Parts. Part I first explains the basic welfarist economic analysis of distributive justice, and its implications for saving and borrowing behavior. It then sketches the distributive consequences of various consumption tax proposals, including carbon taxes and cap-and-trade regimes, and notes their dependence on the assumption that taxpayers smooth their incomes across the entire year. Part II considers the true distributive effects of a combined consumption tax/rebate regime, arguing that it is very unlikely many poor households could smooth their incomes without very high costs. It also shows that a prebate regime will have analogous shortcomings. Part III relaxes the assumption in Part II that households have

¹⁸ Our methodology here owes an obvious debt to RICHARD H. THALER & CASS R. SUNSTEIN, *NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS* 105--120 (rev'd and expanded ed. 2009).

¹⁹ For a survey, see *infra* Part I.B.

stable preferences over time, and shows that time-inconsistency will only exacerbate the general problems identified in Part II. . Part IV sets out our proposed reforms. Part V considers some general objections to our framework, in particular the possible claims that our approach is paternalist, and that our approach is irrelevant because the only important measure of distributive justice is over a lifetime, not annually. Part VI concludes.

I. CONSUMPTION TAXES AND “DISTRIBUTIONALLY NEUTRAL” REBATES

In this Part we introduce the basics of how economists usually approach questions of distributive justice. Under the standard approach, consumption taxes are widely acknowledged to impose an excessive burden on poor taxpayers. Thus, as we outline, most major consumption tax proposals include some mechanism for softening that blow, typically in the form of a rebate for taxpayers below a given income threshold. Readers already familiar with these proposals may safely skip to Part I.C.

A. Distributive Justice in a Welfarist Framework

There are, of course, many different ways to decide how to fairly distribute the burden of paying for government. In this Article we focus mostly on “welfarism,” the analytical tool of choice for many economists and other policy analysts.²⁰ We emphasize welfarism because it is the metric used by those who propose the consumption taxes we criticize, and our goal is to engage those proposals on their own terms.²¹

²⁰ JONATHAN GRUBER, PUBLIC FINANCE AND PUBLIC POLICY, at G-11 (2d ed. 2007).

²¹ In addition, virtually all ethical systems agree that welfare has at least some moral weight. Mark Kelman, *Hedonic Psychology and the Ambiguities of “Welfare,”* 33 PHIL. & PUB. AFF. 391, 391 (2005).

Welfarism is a variant of utilitarianism.²² As in Bentham's original utilitarian approach, it aims to measure the sum of every individual's utility, which is usually defined in turn as the degree to which each person is able to achieve their subjective preferences.²³ The sum total of every person's preferences is the "social welfare function," or SWF.²⁴ Welfarism departs somewhat from Bentham, though, in permitting each person's preference for the fair distribution of goods to itself count in the SWF.²⁵ For instance, if there were some who would be troubled by a society in which wealth is highly concentrated, those feelings of demoralization would lower overall welfare.²⁶ The welfarist would say that, given such an SWF, a society with more equitably distributed wealth would be preferable to the inequitable one.²⁷

In addition to incorporating other ethical systems, welfarism itself recommends redistribution from rich to poor in many circumstances. The basic premise is that each of us, on average, has a diminishing marginal utility of wealth.²⁸ That is, the richer we already are, the less each additional dollar gained or lost is worth in utility. If Charlie has one thousand dollars,

²² MATTHEW D. ADLER & ERIC A. POSNER, *NEW FOUNDATIONS OF COST-BENEFIT ANALYSIS* 25 (2006)

²³ LOUIS KAPLOW & STEVEN SHAVELL, *FAIRNESS VERSUS WELFARE* 16 (2002). There is some controversy on whether subjective preference-satisfaction is the best measure of an individual's well-being. See ADLER & POSNER, *supra* note 22, at 29--35 (sketching the controversy); Lawrence B. Solum, *To Our Children's Children's Children: The Problems of Intergenerational Ethics*, 35 *LOY. L.A. L. REV.* 163, 192--93 (2001) (same). Some scholars argue instead for simple happiness. John Bronsteen et al., *Well-Being Analysis*, *GEO. L.J.* __ (forthcoming 2010). Others maintain that, in light of the possibility that people will not choose what is best for themselves, the better metric would be the extent to which society achieves a more objective view of the good life. Amartya Sen, *Capability and Well-Being*, in *THE QUALITY OF LIFE* 30 (Martha C. Nussbaum & Amartya Sen eds., 1993). Although both these views have points in their favor, as neither of these views is yet mainstream among policy analysts, see ADLER & POSNER, *supra* note 22, at 40, in this paper we will generally take welfare to mean the satisfaction of subjective preferences.

²⁴ ADLER & POSNER, *supra* note 22, at 23.

²⁵ ADLER & POSNER, *supra* note 22, at 25. On the indifference of utilitarians to distribution, see Solum, *supra* note 25, at 191. Some welfarists also distinguish themselves from Bentham on the grounds that Bentham believed utility should be measured according to happiness rather than satisfaction of preferences. ADLER & POSNER, *supra* note 22, at 29--31.

²⁶ See David W. Pearce, *Framework for Assessing the Distribution of Environmental Quality*, in *THE DISTRIBUTIONAL EFFECTS OF ENVIRONMENTAL POLICY* 23, 62--63 (Nick Johnstone & Yse Serret eds., 2006) (describing how SWF takes account of preferences for fairness).

²⁷ ADLER & POSNER, *supra* note 22, at 25; Dale W. Jorgenson et al., *Carbon Taxes and Economic Welfare*, 1992 *BROOKINGS PAPERS ON ECONOMIC ACTIVITY: MICROECONOMICS* 393, 396.

²⁸ GRUBER, *supra* note 20, at 29--30.

and loses five hundred, he is in serious trouble, and may face hunger or eviction. If he has one million dollars, and loses five hundred, he is mildly bummed. Thus welfarists agree that some degree of transfer from the richest to the poorest is often likely to increase social welfare.²⁹

The idea of the diminishing marginal utility of wealth also has important implications for saving and borrowing. If Charlie is rational, he will attempt to smooth his expenditures, so as to move the pain of losing money from his poorest times to his richest times.³⁰ For example, if Charlie knows he will retire one day, and earn only one-tenth his current income, he should put money in the bank, so that the utility cost of the dollars he must spend for upkeep in retirement will be much smaller.³¹ In saving, Charlie gives up consumption today, but that doesn't hurt as much, because today he is rich. If we sum up all of Charlie's utility across his life, his net utility will be higher when he saves, because the cost of putting money away is smaller than the gain of being able to spend it later.

Borrowing is similar, but with time's arrow reversed.³² Borrowing increases our wealth now but decreases it later. If we expect to be richer when payment comes due, this should increase our welfare. The problem is that many of us may be liquidity constrained: we cannot borrow the full, utility-maximizing amount.³³ For example, we may have private information about our own future earning potential, which it would be difficult for a lender to obtain or verify.³⁴ This is the rationale behind, for example, government subsidies for student loans.³⁵

²⁹ ADLER & POSNER, *supra* note 22, at 23. We qualify the language in the text because most welfarists argue that redistribution also creates transaction costs, such as the possibility that taxes on high-earners might discourage work. See, e.g., Louis Kaplow & Steven Shavell, *Why the Legal System is Less Efficient than the Income Tax in Redistributing Income*, 23 J. LEGAL STUD. 667, 680--81 (1994).

³⁰ Martin Browning & Annamaria Lusardi, *Household Saving: Micro Theories and Micro Facts*, 34 J. ECON. LIT. 1797, 1799 (1996); Lee Anne Fennell, *Taxing Willpower* 8 (unpublished manuscript, May 8, 2009).

³¹ Browning & Lusardi, *supra* note 30, at 1800.

³² GRUBER, *supra* note 20, at 636--37.

³³ Fennell & Stark, *supra* note **Error! Bookmark not defined.**, at 12.

³⁴ Fennell & Stark, *supra* note **Error! Bookmark not defined.**, at 12; Daniel Shaviro, *Beyond the Pro-Consumption Tax Consensus*, 60 STAN. L. REV. 745, 770 (2007).

Finally, it is important for our later discussion to emphasize that there can be complex interactions between the welfarist arguments for redistribution, savings, and borrowing. In particular, note that many people who look relatively poor by some measures today may in fact have the ability to borrow against ample future earnings (consider medical students).³⁶ Others may look wealthy because they have borrowed heavily, but in the long run will in fact be poor. So the question of whether redistribution today will increase society's current welfare may depend on our ability to determine individuals' ability to save or borrow.

B. Existing Tax and Rebate Proposals

Consumption taxes may have undesirable distributive consequences when evaluated under a welfarist framework. A consumption tax is just what it sounds like: a tax on the purchase or use of goods and services.³⁷ Sales taxes are a typical example.³⁸

Consumption taxes are more burdensome for poorer taxpayers in two distinct ways. First, the poor consume a larger portion of their income.³⁹ Since they spend more and save less, if we measure the burden of consumption tax by the percentage of a person's income it uses up,

³⁵ GRUBER, *supra* note 20, at 288.

³⁶ See Henrik Klinge Jacobsen et al., *Distributional Implications of Environmental Taxes in Denmark*, 24 FISCAL STUDIES 477, 478 (2003) (“[M]any households with low current incomes are students or pensioners with higher lifetime income.”).

³⁷ Barbara H. Fried, *Fairness and the Consumption Tax*, 44 STAN. L. REV. 961, 961 (1992).

³⁸ WALTER HELLERSTEIN ET AL., STATE AND LOCAL TAXATION: CASES AND MATERIALS 605--14 (9th ed. 2009). A point worth noting for any “tax geeks” among our readers is that we use the term “consumption tax” to refer to what is more technically known as a “transactional consumption tax.” George K. Yin, *Accommodating the “Low Income” in a Cash-Flow or Consumed Income Tax World*, 2 FLA. TAX REV. 445, 450 (1995). The transactional tax should be distinguished from a “cash-flow consumption tax,” which is simply a consumption tax collected out of income: that is, it is an income tax with a deduction for savings. *Id.* at 451--52. The timing mismatches we alluded to in the Introduction are perhaps avoidable under a cash-flow consumption tax. For one thing, a cash-flow consumption tax could achieve progressivity simply by changing its rate structure. Joseph Bankman & David A. Weisbach, *The Superiority of an Ideal Consumption Tax Over and Ideal Income Tax*, 58 STAN. L. REV. 1413, 1428--30 (2006).

³⁹ Dinan & Lim Rogers, *supra* note 5, at 209; Daniel R. Feenberg et al., *Distributional Effects of Adopting a National Retail Sales Tax*, 11 TAX POL'Y & ECON. 49, 86 (1997).

consumption taxes will occupy much more of the budgets of the indigent than the relatively better-off.⁴⁰

Even if rich and poor saved comparable amounts, consumption taxes would still be harder on the poor because of the diminishing marginal utility of wealth.⁴¹ A tax that demands an equal percentage of the budgets of two different people will impose a greater utility loss on the one who is poorer.⁴² For example, suppose Raheem earns \$1 million per year and Parvati \$10,000. Both spend all their income on consumption, which is taxed at 10%. Raheem will pay \$100,000 in tax, leaving him with a quite comfortable \$900,000 for consumption. Parvati will be left with \$9,000, and may have to trim back her grocery budget. More technically, Parvati's 10% tax comes out of very high-priority goods, and hence goods that provide a very large amount of utility, while Raheem's comes out of goods from which the average consumer would derive very small utility.⁴³

Most existing consumption taxes recognize this disparity and attempt to correct for it. For example, the sales tax laws of most U.S. states exempt rent and food prepared in the home from tax, in order to mitigate the burden of the sales tax on those whose expenditures are mostly food and shelter.⁴⁴ In Europe modern Value-Added Taxes, a form of transactional consumption tax imposed on both consumer goods and their inputs, follow a similar approach;⁴⁵ previously,

⁴⁰ Dinan & Lim Rogers, *supra* note 5, at 210; Greenstein et al., *supra* note 11, at 1; Yin, *supra* note 38, at 459. Poor households also spend a higher portion of their incomes on carbon-intensive products. Shammin & Bullard, *supra* note 2, at 2436.

⁴¹ JOSEPH M. DODGE, *THE LOGIC OF TAX* 88 (1989)

⁴² John C. Harsanyi, *Cardinal Utility in Welfare Economics and in the Theory of Risk Taking*, 61 J. POL. ECON. 434, 434 (1953).

⁴³ GRUBER, *supra* note 20, at 29--30.

⁴⁴ Donald Bruce and William F. Fox, *E-Commerce in the Context of Declining State Sales Tax Bases*, 53 NAT'L TAX J. 1373, 1375--76 (2000); Robert F. Van Brederode, *A Normative Evaluation of Consumption Tax Design: The Treatment of the Sales of Goods Under VAT in the European Union and Sales Tax in the United States*, 62 TAX LAW. 1055, 1060 n.16 (2009).

⁴⁵ See Council Directive 2006/112, art. 93, ann. III, 2006 O.J. (L. 347) 1 (EC) (authorizing EU member states to exempt food and food ingredients from VAT).

some also exempted taxpayers below a certain income threshold from any VAT liability.⁴⁶

Canada currently issues VAT rebates to low-income families.⁴⁷

Proponents of new major consumption taxes offer more sophisticated versions of these mitigation efforts. Michael Graetz argues in favor of a U.S. VAT, and proposes to render it distributionally neutral by reducing Social Security payroll tax withholding for low-income workers.⁴⁸ George Yin has also described other methods for assuring that a cash-flow consumption tax could putatively avoid regressivity problems, such as through a payroll-tax rebate and refundable income tax credit, although Yin is skeptical that these proposals are worth pursuing.⁴⁹ And proponents of the so-called “fair tax” urge the U.S. to adopt a national sales tax, and claim that they can balance out any resulting unfairness either through an annual payroll tax rebate or through a “prebate” to poor households.⁵⁰

⁴⁶ William J. Turnier, *Designing an Efficient Value Added Tax*, 39 TAX. L. REV. 435, 438--40 (1983). Hall and Rabushka's “flat tax” takes a VAT-like approach in exempting some income from any tax; for a family of four, they suggest the first \$25,500 in earnings would be untaxed. ROBERT E. HALL & ALVIN RABUSHKA, *THE FLAT TAX* vii, 59 (2d ed. 1995).

⁴⁷ Robert E. Hall, *Toward Fundamental Tax Reform*, in GUIDELINES FOR TAX REFORM: THE SIMPLE, PROGRESSIVE VALUE-ADDED CONSUMPTION TAX 73--74 (Alan J. Auerbach & Kevin A. Hassett eds., 2005).

⁴⁸ Id. at 290--91; see also Joseph Bankman & Thomas Griffith, *Social Welfare and the Rate Structure: A New Look at Progressive Taxation*, 75 CAL. L. REV. 1905, 1908 & n.5 (1987) (explaining use of “demogrants” to achieve desirable level of progressivity in tax system with regressive rates).

The payroll tax is a flat 7.5% assize on the first \$95,000 of salary received by the employee, plus an additional 7.5% tax on each dollar of salary paid by the employer. T.C. §§ 3101, 3111. For a helpful overview of the social security tax system, see Jonathan Barry Forman, *Making Social Security Work*, 65 OHIO ST. L.J. 145, 149--55 (2004).

⁴⁹ Yin, *supra* note , at 466--90.

⁵⁰ Paul Bachman et al., *Taxing Sales Under the Fair Tax: What Rate Works?*, TAX NOTES 663, 668 (Nov. 13, 2006) (prebate); David R. Burton & Dan R. Mastromarco, *Emancipating American From the Income Tax: How the National Sales Tax Would Work* nn.41--42, Cato Policy Analysis No. 272, available at <http://www.cato.org/pubs/pas/pa-272.html> (rebate).

Many carbon tax or cap-and-trade proposals contain similar features.⁵¹ In the most basic model, each individual taxpayer would simply receive a lump-sum tax rebate consisting of some fraction of the total revenue brought in by the carbon tax.⁵² Metcalf and Weisbach suggest a somewhat more complex scheme, in which each worker will receive a rebate on her social security tax.⁵³ In practice the employer-side tax is paid mostly by the worker, since the employer reduces salary in order to account for the cost of the tax.⁵⁴ Metcalf and Weisbach propose rebating the full 15% to workers, but capping the rebate at about \$560.⁵⁵ Alternatively, Metcalf has suggested in his own work that low-wage earners might get a credit against their federal income tax.⁵⁶

According to Metcalf and Weisbach, their rebate plan helps to assure that carbon taxes would be distributionally neutral.⁵⁷ Because the rebate is capped, it will have much larger proportional value to low-income households.⁵⁸ This disproportionate benefit aims to offset the disproportionate burden of their cap and trade regime.⁵⁹

⁵¹ A cap-and-trade mechanism can be designed to be economically equivalent to a carbon tax. Ekins & Barker, *supra* note 15, at 79--80. A carbon tax imposed on energy producers usually consists of a set price per unit of carbon emitted by the producer. Under cap and trade, energy producers must acquire a permit in order to produce each unit of carbon. Since there are a limited number of permits available, if permits are tradeable, the market will determine a price for each unit of carbon. Dinan & Lim Rogers, *supra* note 5, at 203. The government can set the number of available permits so that at equilibrium the market price per unit will be the same as it would be under a direct carbon tax. Super, *supra* note 5, at 8. That said, there are design differences between the two models, *see* Metcalf, *supra* note 4, at 22--27 (arguing that a carbon tax is superior to cap and trade), but these differences are not pertinent to our discussion.

⁵² *See* Metcalf, *supra* note 4, at 18 (modeling but not endorsing this approach). Despite the rebate, consumers would still have incentives to reduce their use of carbon-intensive products. Since everyone receives the same rebate, but taxes depend on carbon usage, households that do a better job reducing their carbon footprint will end the year with more money. Shammin & Bullard, *supra* note 2, at 2437.

⁵³ Metcalf & Weisbach, *supra* note 4, at 513--14 & n.66 (citing Metcalf, *supra* note 4, at 14).

⁵⁴ John A. Brittain, *The Incidence of Social Security Payroll Taxes*, 61 AM. ECON. REV. 110, 111 (1971); Jonathan Gruber, *The Incidence of Payroll Taxes: Evidence from Chile*, 15 J. LABOR ECON. S72, S78-79, S99 (1997).

⁵⁵ Metcalf, *supra* note 4, at 14.

⁵⁶ Gilbert Metcalf, *A Distributional Analysis of Green Tax Reforms*, 52 NAT'L TAX J. 655, 663 (1999).

⁵⁷ Metcalf & Weisbach, *supra* note 4, at 516; Metcalf, *supra* note 4, at 16.

⁵⁸ Metcalf, *supra* note 4, at 16.

⁵⁹ Metcalf, *supra* note 4, at 16; *see also* Dinan & Lim Rogers, *supra* note 5, at 213 Tbl.6 (estimating distributional effects of various rebate models); Dallas Burtraw et al., *The Incidence of U.S. Climate Policy*, Resources for the

Many forms of consumption tax, then, recognize the dangers of regressivity, and make some efforts to eliminate them. In many cases, the safeguard mechanism is some form of annual rebate. As we will now argue, however, the timing of rebates may matter as much as their amount.

C. Importance of Income Smoothing

An important, albeit implicit, caveat to claims of many distributionally neutral consumption taxes is that they assume households are capable of perfectly smoothing their incomes over time. That is, they presume that money received in one lump can be spread out more evenly through borrowing or saving. Again, where there is a diminishing marginal utility of wealth, both borrowing and saving are critical to maximizing each person's utility.

To take an admittedly extreme example, suppose that rebate checks must be consumed in full within a month of receipt. Now take a household with \$1,000 in monthly income, \$100 in monthly consumption tax costs, and a \$1,200 rebate check. For eleven months of the year, the household will have a standard of living of a family with net income of \$900, meaning that they will have a small home, eat only essentials, and skimp on other expenses. In the rebate month, they must consume \$2,100 worth of goods, meaning that they will have to purchase many things to which they assign relatively low utility -- true luxuries.⁶⁰ In the absence of the spending requirement, the family could instead live at a \$1,000 per month standard of living year-round. The extra \$100 could be devoted to high-utility recurring expenses, such as food and rent.

Future Discussion Paper No. 09-17-Rev, at 2, 19 (June 2009) (projecting that several versions of a carbon tax rebate could be distributionally neutral, but finding that payroll tax rebate might not).

⁶⁰ Of course, it is possible that the family could pre-pay their rent, or purchase some durable goods, and in that way improve their standard of living for subsequent months. Purchase of durable goods, in effect, is a form of savings. But let us rule out durable-goods purchases to be true to the spirit of our hypothetical.

Thus, the time-limited rebate, although apparently distributionally neutral, in fact reduces the welfare of recipient households. Households that cannot smooth their rebate over the year will lose utility relative to those that can, with the size of the loss depending on the degree to which the marginal utility of wealth diminishes for that household --- how much more well-being the family gets from safer housing and nutrition, say, than from going to the movies.

While obviously no one is proposing to enact a time-limited rebate, there are many conditions in the real world that result in imperfect household income smoothing. For a family of modest means, being poor for 364 days and rich for one is often not the same as being middle-class for the whole year. We explore some of the sources of imperfect smoothing over the next two Parts.

II. LIQUIDITY CONSTRAINTS, HIDDEN TAXES, AND REBATES IN TIME-CONSISTENT HOUSEHOLDS

In this Part we begin our analysis of the effects of rebate timing on household welfare. A single annual rebate can be modeled as occurring either before or after the year's consumption, corresponding to a beginning-of-year or end-of-year rebate date. Alternately, the reader can conceive of the two models both as representing Dec. 31 rebates, but the end-of-year model captures what happens in the first year of the tax (if the tax is effective Jan. 1 of the same year), while the beginning-of-year model represents what would occur in subsequent years for taxpayers who treat the first year of the tax as a pure loss. We call the beginning of the year payment a "prebate."

The central problem with the rebate, we argue, is that households may not be able to draw on the wealth it represents until the date they actually receive it. For example, households may be unable to borrow as much as they would prefer, or may fail to realize their need or ability to

borrow until after they have been hit by unexpectedly high consumption costs. In these situations, the year-end increase in wealth may fail to offset the lost welfare the household experiences during the year. These same problems arise when the lump sum is converted to a rebate: taxpayers still face costly or unavailable mechanisms for moving money from one time to another, and must be cognizant of their need to do so.

Throughout this Part, we assume that households' preferences are stable across time. That seems like a simple assumption, but in fact it is contrary to much recent evidence.⁶¹ In Part III we revisit our analysis with the assumption of time-consistency relaxed.

A. Liquidity Constraints and Time Discounting

Recent studies of spending by poor households suggest very strongly that a year-end rebate will not adequately compensate those households. While these studies can be interpreted in several ways, each of these different interpretations likely imply that on net low-income families will lose welfare under a "distributionally neutral" rebate scheme. First, the evidence shows that poorer households are liquidity constrained --- they cannot borrow effectively.⁶² Even where individuals were able to borrow, they often paid remarkably high interest rates, implying that the opportunity to smooth income had very high welfare benefits.⁶³ Second, and alternatively, willingness to pay high borrowing costs might be evidence not of the gains from smoothing but simply of impatience --- a desire to consume sooner rather than later.⁶⁴ But, if this is a valid preference that policy analysts ought to include in their calculation of welfare, the inability to satisfy this impatience would be a strike against a year-end rebate.

⁶¹ See *infra* text accompanying notes 160--174.

⁶² See *infra* Part II.A.1.

⁶³ See *infra* Part II.A.2.

⁶⁴ David B. Gross & Nicholas S. Souleles, *Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence from Credit Card Data*, 117 Q.J. ECON. 149, 179--80 (2002).

1. Evidence of Liquidity Constraints

Although it seems an intuitive point that the very poor cannot easily borrow, in fact it is theoretically ambiguous how severely any borrowing constraint would bind. For one, as we mentioned in Part I.A., some individuals who are poor now may not be in the future, and might potentially borrow against “human capital” --- their ability to bring in additional revenues in the future. Whether this prospect is realistic depends on how effectively lenders can discern human capital and motivate borrowers to make full use of it to repay.⁶⁵ Additionally, households may have sources of fiscal and other support that do not show up on their balance sheets, such as parents and children outside the home, friends, neighbors, or simply the kindness of strangers.⁶⁶ Thus, it is useful to have evidence on whether these kinds of alternatives are important in the real world.

While the empirics do not rule out these factors for some, they do show that many households are severely liquidity constrained, to the point where they could not easily borrow the hundreds of dollars represented by a consumption tax rebate.⁶⁷ A key set of data is a series of studies showing consumer responses to a predictable, one-time future spike in income, usually in the form of a tax rebate.⁶⁸ For a consumer who could borrow, and expected no other fluctuations

⁶⁵ See GRUBER, *supra* note 20, at 288 (describing obstacles to borrowing against future earnings potential).

⁶⁶ Tullio Japelli et al., *Testing for Liquidity Constraints in Euler Equations with Complementary Data Sources*, REV. ECON. & STATS. 251, 252 (1998); Angela Littwin, *Beyond Usury: A Study of Credit-Card Use and Preference Among Low-Income Consumers*, 86 TEX. L. REV. 451, 460 (2008); James X. Sullivan, *Borrowing During Unemployment: Unsecured Debt as a Safety Net*, 43 J. HUM. RES. 383, [12] n.21 (2008).

⁶⁷ David S. Johnson et al., *The Response of Consumer Spending to Rebates During an Expansion: Evidence from the 2003 Child Tax Credit 2* (unpublished manuscript, Apr. 2009). Until relatively recently, studies of liquidity constraints were largely inconclusive, owing to problems in the available data and difficulties in sorting cause from effect. See Browning & Lusardi, *supra* note 30, at 1833--34 (critiquing earlier studies on these grounds); Angela C. Lyons, *How Credit Access Has Changed Over Time for U.S. Households*, 37 J. CONSUMER AFF. 231, 232--33 (2003) (same); Nicholas S. Souleles, *The Response of Household Consumption to Income Tax Refunds*, 89 AM. ECON. REV. 947, 947--48 (1999) (same).

⁶⁸ Sumit Agarwal et al., *The Reaction of Consumer Spending and Debt to Tax Rebates --- Evidence from Consumer Credit Data*, 115 J. POL. ECON. 986, 987--88 (2007); David S. Johnson et al., *Household Expenditures and the Income Tax Rebates of 2001*, 96 AM. ECON. REV. 1589, 1590 (2006); Matthew D. Shapiro & Joel Slemrod,

in income, the rational behavior would be to smooth that spike across time --- to borrow in order to spend some of it before the rebate, and save to spend some after.⁶⁹ Strikingly, many consumers did not much increase spending before the spike, and then spent a significant chunk of their rebate in the few months afterwards.⁷⁰ In most studies, that pattern was most pronounced for households with low incomes and low wealth.⁷¹ The pattern held true for those who confirmed that they in fact anticipated the income spike,⁷² although unsurprisingly those who did not expect the income were most likely not to spend it in advance.⁷³

Similar recent investigations found a strong relationship between the timing of income tax refunds or minimum wage hikes and the ability to take out auto loans.⁷⁴ The authors suggest that the key barrier to credit for some households is a down-payment, often quite modest, that lenders

Response to Tax Rebates, 93 AM. ECON. REV. 381, 381 (2003); Souleles, *supra* note 67, at 947; Christian Broda & Jonathan Parker, *The Impact of the 2008 Tax Rebates on Consumer Spending: Preliminary Evidence 1--2* (unpublished manuscript, July 29, 2008); Shawn Cole et al., *Where Does it Go? Spending by the Financially Constrained*, Harvard University Joint Center for Housing Studies Paper No. UCC08-3, at 1 (Apr. 14, 2008); Julia Lynn Coronado et al., *The Household Spending Response to the 2003 Tax Cut: Evidence from Survey Data 1* (unpublished manuscript July 25, 2005); Claudia Sahm et al., *Household Response to the 2008 Tax Rebates: Survey Evidence and Aggregate Implications 1* (unpublished manuscript, Aug. 27, 2009).

⁶⁹ Johnson et al., *supra* note 68, at 1595. In some situations this prediction is not as robust. Browning & Lusardi, *supra* note 30, at 1801.

⁷⁰ Johnson et al., *supra* note 68, at 1597--99; Broda & Parker, *supra* note 68, at 3; Johnson et al., *supra* note 67, at 9--10, 14; Sahm et al., *supra* note 68, at 6, 15.

⁷¹ Johnson et al., *supra* note 68, at 1603--04; Souleles, *supra* note 67, at 953, 956; Broda & Parker, *supra* note 68, at 3; Coronado et al., *supra* note 68, at 12; Johnson et al., *supra* note 67, at 14. *But see* Shapiro & Slemrod, *supra* note 68, at 385 (finding that poorer households were less likely to spend rebate than others). Sahm et al. find a more complex pattern in which poorer households spent faster but over time spent less of their rebate than the richest. Sahm et al., *supra* note 68, at 7, 10--11. The contrary results may be explainable as an aspect of debt burdens. Shapiro and Slemrod find that paying off debt far exceeded either spending or saving for all categories of respondents. Shapiro & Slemrod, *supra* note 68, at 385 tbl.2. Paying off debt may be more important for low-income households. Since these households have difficulty saving, maintaining an open line of credit is vital to them in surviving future crises. ANGUS DEATON, UNDERSTANDING CONSUMPTION 197 (1992). Thus, paying off debt is a form of saving for future liquidity needs. *Cf.* Johnson et al., *supra* note 67, at 14 n.19 (arguing that some observed data can also be explained by fact that poor households need to accumulate "buffer stock" of savings in the event of future crises). This story implies that debt repayment is itself evidence that households expect themselves to be liquidity constrained in the future. *Cf.* Gross & Souleles, *supra* note 64, at 153 (arguing that borrowers' refusal to use all of their credit limit is evidence of liquidity constraint where it is motivated by fear that credit will be needed more urgently in future).

⁷² Coronado et al., *supra* note 68, at 1.

⁷³ *Id.*

⁷⁴ William Adams et al., *Liquidity Constraints and Imperfect Information in Subprime Lending*, 99 AM. ECON. REV. 49, 56--58 (2009).

demand as security for the loan.⁷⁵ The tax refund is a large enough lump to overcome the down-payment problem, greatly facilitating borrowing for major purchases.⁷⁶

In another study of auto loans, a separate set of authors found different evidence suggestive of liquidity constraints.⁷⁷ In that case, lower-income buyers paid premiums for extending their loans over a longer period of time.⁷⁸ The inference is that what drives borrowing behavior for those families is the ability to make monthly loan-service payments.⁷⁹ That implies that households cannot borrow infinitely against future income, but instead are constrained by their ability to make current payments.⁸⁰

Finally, yet other research documents the use and availability of credit cards for income smoothing. In general, evidence here again shows many households that cannot easily borrow all they would prefer.⁸¹ For instance, when credit limits increase, so does the carried balance for a significant number of cardholders.⁸² But we view this results as offering only limited support

⁷⁵ Adams et al., *supra* note **Error! Bookmark not defined.**, at 57, 63; *see also* Daniel Aaronson et al., *The Consumption Response to Minimum Wage Hikes 2--3*, 23--26 (unpublished manuscript, Sept. 18, 2008), available at <http://www.chicagofed.org/economists/EricFrench.cfm/> (finding that increases in minimum wage rate allow households to buy goods requiring down payments).

⁷⁶ Adams et al., *supra* note **Error! Bookmark not defined.**, at 56--57. An average tax refund represents about 6.5 weeks of net income for a low-income family. Cole et al., *supra* note 68, at 1. Additional evidence on the importance of rebates to overcoming the down-payment problem includes Souleles, *supra* note 67, at 954, and David W. Wilcox, *Social Security Benefits, Consumption Expenditures, and the Life Cycle Hypothesis*, 97 J. POL. ECON. 288, 288--304 (1989) (finding that actual receipt of higher social security benefits increases auto purchases, but announcement of benefits increase does not).

⁷⁷ 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--04 (2008).

⁷⁸ *Id.* at 404.

⁷⁹ *Id.* at 406, 427.

⁸⁰ *Id.* at 433. For additional evidence that monthly payment requirements limit borrowing, see Gross & Souleles, *supra* note 64, at 168.

⁸¹ Agarwal et al., *supra* note 68, at 1005--10 (describing effects of rebate on low-limit credit card holders, and arguing they represent "binding liquidity constraints"); Cole et al., *supra* note 68, at 10--11 (suggesting that high fees paid by taxpayers to accelerate their refunds by a few weeks indicate that borrowers lack "lower-cost credit alternatives"); Donald Cox & Tullio Japelli, *The Effect of Borrowing Constraints on Consumer Liabilities*, 25 J. MONEY, CREDIT & BANKING 197, 198 (1993) (employing survey to identify borrowers who were denied credit); Gross & Souleles, *supra* note 64, at 151--52 (using data set of credit card use, finding borrowing increases together with limit increases); Lyons, *supra* note **Error! Bookmark not defined.**, at 248--49; Sullivan, *supra* note 66, at [20--24] (using survey data to link spending patterns with periods of unemployment).

⁸² Gross & Souleles, *supra* note 64, at 164; Lyons, *supra* note **Error! Bookmark not defined.**, at 249.

for the notion that households are credit constrained in general, rather than simply showing that they are constrained from using credit cards. The studies do not generally observe other forms of household debt,⁸³ so credit balances, or inability to obtain a card or a higher limit, might still leave a household with other credit alternatives, albeit perhaps alternatives that are less convenient or more expensive.

Overall, most economists interpret these results as evincing significant liquidity constraints among poorer households.⁸⁴ If households do not smooth their income, it is most likely because they cannot --- although there may also be a complicated story here about impatience and self-restraint, which we will set out shortly.

One point worth emphasizing about existing research is that it fails to examine the very poorest households. Studies of tax rebates by definition can collect data only on those who are entitled to a rebate; for example in one experiment, the rebate was only available to working households, or to households with “qualifying” income of at least \$3,000.⁸⁵ Thus retirees with little social security income⁸⁶ and individuals with disabilities, to take possible groups, may be too poor to even appear in the research. And car loans and credit cards are usually totally

⁸³ E.g., Gross & Souleles, *supra* note 64, at 159.

⁸⁴ George-Marios Angeletos et al., *The Hyperbolic Consumption Model: Calibration, Simulation, and Empirical Evaluation*, 15 J. ECON. PERSPECTIVES 47, 62--64 (2001); Marianne Bertrand & Adair Morse, *What Do High-Interest Borrowers Do With Their Tax Rebate?*, Chicago Booth Initiative on Global Markets Working Paper No. 29, at 1 (Jan. 2009); Jeffrey R. Campbell & Zvi Hercowitz, *Liquidity Constraints of the Middle Class*, Federal Reserve Bank of Chicago Working Paper No. WP-09-20, at 16 (Dec. 2008), available at http://www.sabanciuniv.edu/HaberlerDuyurular/Documents/DD20081030044837/zvi_LiquidityConstraintsDec08.pdf. For yet other evidence of liquidity constraints in addition to what we have summarized here, see David Card et al., *Cash-on-Hand and Competing Models of Intertemporal Behavior: New Evidence from the Labor Market*, Q. J. ECON. 1511, 1553 (2007).

The data also suggest that black households and those headed by unmarried women are especially constrained. Lyons, *supra* note **Error! Bookmark not defined.**, at 241.

⁸⁵ Sahn et al., *supra* note 68, at 1; see also Agarwal et al., *supra* note 68, at 987 n.1 (noting that about 23 million households did not file an income tax return and so were not covered by their study); Johnson et al., *supra* note 67, at 4 n.7 (acknowledging that credit they study flows mostly to families making in excess of \$20 thousand).

⁸⁶ In order to qualify for social security benefits, an individual must have met certain salary and years-worked targets, or been married to another individual who did so. See *Social Security Retirement Benefits*, SSA PUBLICATION NO. 05-10035 (Jan. 2010), available at <http://www.ssa.gov/pubs/1035.pdf> (discussing social security benefit eligibility requirements).

unavailable to the very poor.⁸⁷ Theory suggests these kinds of households would be even more liquidity constrained,⁸⁸ but we don't have any data to confirm that.

2. Borrowing Against the Rebate

It might be argued that, although poorer families are often liquidity-constrained as a general matter, this problem should disappear when there is a year-end distribution. That is, the claim would be that even the least credit-worthy household should be able to borrow against their expected rebate. This has not proven true empirically, however. Further, theory suggests that intermediaries will capture at least some of the value of borrowing for highly-constrained households, and the available data bear this out.

The same studies that suggest liquidity constraints generally also demonstrate that consumers cannot easily borrow even against a certain rebate. Again, most of the studies we mention examine exactly the situation in which the taxpayer was certain to receive her rebate.⁸⁹ But those studies found incomplete income smoothing, particularly among poorer households.⁹⁰ Intuitively, we might expect that some failure to borrow might result from the household's failure to recognize that the rebate is coming. One study offers some support for that, finding that income-tax rebates were a genuine surprise to more than a quarter of households, and about a third of households in the case of a payroll tax rebate.⁹¹

Even well-informed families often failed to smooth their rebates, however, suggesting that liquidity constraints remained an obstacle despite the certain influx of income.⁹² There are a number of possible causes for this problem. Some individuals might remain poor credit risks

⁸⁷ Littwin, *supra* note 66, at 463.

⁸⁸ Shapiro & Slemrod, *supra* note 68, at 385.

⁸⁹ Johnson et al., *supra* note 68, at 1592; Sahm et al., *supra* note 68, at 2.

⁹⁰ Johnson et al., *supra* note 68, at 1603; Sahm et al., *supra* note 68, at 6--7.

⁹¹ Coronado et al., *supra* note 68, at 11.

⁹² Coronado et al., *supra* note 68, at 13--14.

despite a guarantee of income: for example, those that could file for bankruptcy, or that might quickly spend their rebate proceeds and render themselves effectively judgment-proof. Others might commit the same funds to multiple creditors, or prove to have more urgent expenses when their check arrives.⁹³ Persons who work only part-time or temporary jobs might also be thought to be risks to relocate, incurring more costs in collection than the value of any interest payments.⁹⁴ Lenders face high fixed costs of verifying all this information, costs that may be prohibitively high for small loans.⁹⁵ Thus, since so much of the likelihood of these kinds of risks will remain known only to the borrower, market failure due to information asymmetry is likely.⁹⁶

In some situations, theory would predict that the lending market would not fail, but that much of the value of borrowing would be captured by lenders. The standard information asymmetry story assumes that only “low quality” customers --- in borrowing, the riskiest --- would accept the unfavorable rates offered by the uninformed counter-party.⁹⁷ But that analysis is strictly accurate only at the margin. Where there are enough infra-marginal high-quality

⁹³ Cf. Keith Ernst, John Farris & Uriah King, Ctr. for Responsible Lending, *Quantifying the Economic Cost of Predatory Payday Lending* 3 (2004), available at <http://www.responsiblelending.org/pdfs/CRLpaydaylendingstudy121803.pdf> (finding that payday borrowers often fail to repay when paycheck arrives because they must instead pay “basic living expenses, such as electricity, rent, and groceries”).

⁹⁴ Julia J. Bartkowiak, *Trends Toward Part-Time Employment: Ethical Issues*, 12 J. BUS. ETHICS 811, 812 (1993); cf. Michael S. Barr, *Banking the Poor*, 21 YALE J. ON REG. 121, 146 (2004) (noting that transient workers and undocumented immigrants have difficulty opening bank accounts).

⁹⁵ Ronald J. Mann & Jim Hawkins, *Just Until Payday*, 54 UCLA L. REV. 855, 864--65 (2007); see Barr, *supra* note 94, at 155 (explaining that high fees for fringe lenders are associated in part with costs of origination, follow-up, and loan losses).

⁹⁶ William H. Meckling, *Financial Markets, Default, and Bankruptcy: The Role of the State*, LAW & CONTEMP. PROBS., Autumn 1977, at 13, 24--27; Sumit Agarwal et al., *Adverse Selection in the Credit Card Market: Evidence from a Natural Experiment* 3, 14--15 (unpublished manuscript), available at <http://ushakrisna.com/CreditCardAdvSelection.pdf>. That is, borrowing by low-asset individuals often produces a “market for lemons.” Without knowing the riskiness of a borrower, rational lenders will not offer rates that any but the riskiest borrowers would accept. Since these are the only customers the lender attracts, she ends up losing money on many of her loans, leading her to charge yet higher rates, leading to yet riskier borrowers, and so on.

⁹⁷ Joseph E. Stiglitz & Andrew Weiss, *Credit Rationing in Markets with Imperfect Information*, 71 AM. ECON. REV. 393, 403 (1981); Agarwal et al., *supra* note 96, at 3.

customers,⁹⁸ lenders should be able to find a market without driving up their own costs above price.⁹⁹ The new equilibrium point will fall at an interest rate that looks unfair --- a price no comparably risky marginal borrower would stomach. Ordinarily, this possibility would not be of much use to the lender, as the costs of driving away customers closer to the margin would make it impractical to price at this high level.

If, however, the lender can charge separate prices to different portions of the market, it can profit on risky loans without driving away other customers.¹⁰⁰ Modern finance now apparently allows lenders to separate borrowers into pools, if not to identify the riskiness of any particular credit applicant.¹⁰¹ For example, the rise of credit reporting agencies has divided consumers between those with established credit histories and those without.¹⁰² Lenders can identify the riskiness of those with credit histories, while those without---generally, those who are young, poor, or both---remain unknowable and presumptively risky.¹⁰³ This bifurcation, together with a looser legal price-control regime, permits lenders to set two tiers of prices, so that they can charge high rates from high-demand high-risk borrowers without driving away the pool of safe

⁹⁸ Infra-marginal purchasers are those who are willing to pay more than the equilibrium price for a good, because they value it more than the customer who values it least (the marginal customer). MUSGRAVE & MUSGRAVE, *supra* note , at 284.

⁹⁹ That is, although there remain “lemons” in the market, if infra-marginal demand is high enough, the high-demand high-quality borrowers may be profitable enough to overcome losses from low-quality borrowers. See Richard R.W. Brooks, *Credit Past Due*, 106 COLUM. L. REV. 994, 998 (2006) (stating that lending to “fringe” customers is made possible by cross-subsidy from safe but unknown customers to risky borrowers).

¹⁰⁰ See, e.g., Adams et al., *supra* note 74, at 66--68 (demonstrating that lenders can break even in the presence of asymmetric information by offering contracts that force borrowers to reveal their own riskiness, such as through different tiers of down-payments).

¹⁰¹ Mann & Hawkins, *supra* note 95, at 911.

¹⁰² See JOHN P. CASKEY, FRINGE BANKING: CHECK-CASHING OUTLETS, PAWNSHOPS, AND THE POOR 84--110 (1994) (tracing rise in business of lending to the poor); Brooks, *supra* note **Error! Bookmark not defined.**, at 997--1002.

¹⁰³ Susan Block-Lieb & Edward J. Janger, *The Myth of the Rational Borrower: Rationality, Behavioralism, and the Misguided “Reform” of Bankruptcy Law*, 84 TEX. L. REV. 1481, 1508--14 (2006); Brooks, *supra* note **Error! Bookmark not defined.**, at 997, 1012; see Adams et al., *supra* note 74, at 82 (“modern credit scoring can go a significant distance toward mitigating adverse selection problems”).

bets.¹⁰⁴ Market concentration among lenders, and cognitive or informational challenges to price-shopping among borrowers, would also help to keep borrowing costs high.¹⁰⁵

If borrowers are fully rational, the diminishing marginal utility of wealth might make even these very high-interest loans welfare-increasing, albeit only narrowly. Because the value of income smoothing is so high at the extreme low end of the income distribution --- where smoothing means survival or not, homelessness or not --- it makes sense that there would be many potential borrowers willing to pay very high rates of interest.¹⁰⁶ For very high demanders, that price may still increase utility.¹⁰⁷ However, the utility those borrowers receive will be much smaller than what they would have had they been able to borrow at a “market” rate --- the price of funds available to those for whom it is easier for the lender to verify credit-worthiness. In

¹⁰⁴ See Block-Lieb & Janger, *supra* note 103, at 1488, 1516--17 (observing that innovations in fringe lending practices allow lenders to charge prices that “would have been viewed as usurious” in an earlier era); Mann & Hawkins, *supra* note 95, at 889 (explaining that key development allowing bifurcation of loan market was legal change allowing very high rates).

¹⁰⁵ See Oren Bar-Gill & Elizabeth Warren, *Making Credit Safer*, 157 U. PA. L. REV. 1, 9 (2008) (arguing that consumers’ “imperfect rationality” reduces price competition among lenders); Brooks, *supra* note **Error! Bookmark not defined.**, at 1010 (noting that conventional lenders avoid fringe market, reducing competition for small lenders); Block-Lieb & Janger, *supra* note 103, at 1525--58 (arguing that cognitive failures allow lenders to exploit low-income borrowers). *But see* Oren Bar-Gill, *The Law, Economics, and Psychology of Subprime Mortgage Contracts*, 94 CORNELL L. REV. 1073, 1083 (2009) (arguing that increased competition might actually increase efforts to mislead borrowers).

¹⁰⁶ *Cf.* Littwin, *supra* note **Error! Bookmark not defined.**, at 457--58 (explaining importance of credit in allowing low-income families to cope with and even survive crises, and noting that “[t]iming is especially crucial for low-income families”); Bertrand & Morse, *supra* note 84, at 2, 10 (finding that certain payday borrowers use funds to “avoid ... having the gas connection turned off or to catch up with late rent payments” and “buying groceries”). We are also sympathetic to claims that many borrowers are not acting rationally at all, but instead are making serious mistakes that reduce their own subjective well-being. *E.g.*, Block-Lieb & Janger, *supra* note 103, at 1489--90. Markets may contain a mix of rational and irrational actors. Bar-Gill, *supra* note **Error! Bookmark not defined.**, at 1123--24. Indeed, we believe that mistaken borrowing can be a serious problem for tax rebates, as we elaborate *infra* Part III.G. For now our only point is that, even if all borrowers are fully rational, there is still a strong basis for government intervention.

¹⁰⁷ See Mann & Hawkins, *supra* note 95, at 885 (suggesting that some borrowers who pay high fees are acting rationally, and use funds to “purchase food or medicine”).

effect, the lender expropriates what would have been the borrower's consumer surplus had there not been market failure.¹⁰⁸

Thus, allowing lenders to price for these infra-marginal borrowers means that borrowers give up huge utility in order to enrich the shareholders of lenders by a comparatively nominal amount. As we will describe in Part IV.B., *infra*, government interventions that made borrowing easier for these kinds of poor households would therefore increase social welfare by large amounts at relatively little cost in absolute dollars.

Other research confirms this story: there is in fact a market for loans to very poor borrowers, but only at exorbitant interest rates.¹⁰⁹ Many tax-return preparers will offer customers entitled to a tax refund expedited access to the funds in exchange for several small fees, each in the range of \$30 to \$135.¹¹⁰ Since the client only receives their money a few weeks early, the effective annual rate of interest paid on these loans averages between 150 and 300%, although prices have come down slightly in the past few years.¹¹¹ Similarly, so-called "payday lenders" will advance money to borrowers on the condition that the borrower allows the lender to automatically debit his account on the date of his next paycheck.¹¹² Here, too, nominal fees are modest, but over the course of a year translate to effective interest rates of 300% or higher.¹¹³ Other forms of credit, such as pawnshop loans, can carry effective rates as high as 1000%.¹¹⁴ In

¹⁰⁸ Cf. Christopher L. Peterson, *Usury Law, Payday Loans, and Statutory Slight of Hand: Salience Distortions in American Credit Pricing Limits*, 92 MINN. L. REV. 1110, 1126--27 (2008) ("[P]ayday lending has proven wildly profitable.").

¹⁰⁹ Bertrand & Morse, *supra* note 84, at 1.

¹¹⁰ National Consumer Law Center, Inc., Chi Chi Wu & Jean Ann Fox, *Coming Down: Fewer Refund Anticipation Loans, Lower Prices from Some Providers, But Quickie Tax Refunds Loans Still Burden the Poor*, at 8--11 (March 2008); Barr, *supra* note 94, at 166--68.

¹¹¹ National Consumer Law Center, Inc., *supra* note 110, at 4, 10--12; Barr, *supra* note 94, at 168--70.

¹¹² Barr, *supra* note 94, at 149, 153. For an overview of the industry, see CASKEY, *supra* note 102, at 36--68.

¹¹³ Barr, *supra* note 94, at 154--55.

¹¹⁴ Mann & Hawkins, *supra* note 95, at 891.

one study, the receipt of a tax rebate reduced taxpayers' use of these other forms of borrowing, strongly implying that no other, cheaper sources of credit were available for the household.¹¹⁵

3. Impatience

We must acknowledge at this point that the evidence on liquidity constraints can also be interpreted to imply that year-end rebates would increase welfare for some households. Failure to smooth an expected revenue spike might be the product not of externally-imposed limits on borrowing, but instead of deliberate choices to save.¹¹⁶ At first glance, the savings story is hard to reconcile with data that households spent much of their rebate paying down debt,¹¹⁷ and that many were willing to pay very high effective rates of interest to accelerate the receipt of the rebate.¹¹⁸ The savings story also is puzzling for families that spent some of their rebate on what look like luxuries, such as vacations and apparel;¹¹⁹ it would be strange to defer consumption of essentials in order to save for luxuries. These odd behaviors, though, may be more sensible for certain impatient households: families who struggle to save, and know it. Those families might use the delayed tax rebate as a way of forcing themselves to overcome impatience.¹²⁰ We return to these issues in Part III.

¹¹⁵ Bertrand & Morse, *supra* note 84, at 1.

¹¹⁶ *Cf.* Johnson et al., *supra* note 67, at 14 n.19 (noting that their data can also be interpreted as evidence of households deliberating choosing to accumulate a “buffer stock” against uncertain future outcomes); Fennell & Stark, *supra* note **Error! Bookmark not defined.**, at 19--20 (explaining that what look like “failures” to smooth may be the product of deliberate but unusual preferences).

¹¹⁷ See sources cited *supra* note **Error! Bookmark not defined.**

¹¹⁸ Cole et al., *supra* note 68, at 9--11.

¹¹⁹ Bertrand & Morse, *supra* note 84, at 7--8; Broda & Parker, *supra* note 68, at 3--4.

¹²⁰ Angeletos et al., *supra* note 84, at 49; see Michael S. Barr & Jane K. Dokko, *Paying to Save: Tax Withholding Among Low- and Moderate-Income Taxpayers* 2--4 (unpublished manuscript, Aug. 2009) (considering this argument).

B. Low Salience of Energy Costs

Another factor that may contribute to imperfect smoothing is households' possible failure to recognize the increased costs of a consumption tax. Because consumption taxes are likely to be relatively "low salience," or "hidden," families might be surprised by budgets that prove tighter than expected, leaving less money available for top priorities.¹²¹ In addition to compounding the budget woes of those who are liquidity constrained, salience also affects borrowing: for example, a taxpayer who does not know she will get a refund at the end of the year will not think to borrow against it.

1. Welfare Costs of Hidden Taxes

In the classic household-budgeting model, families know how much each of their options costs when they decide how to divvy up their limited funds.¹²² The model therefore assumes that within each time period families allocate their money first to the highest-priority items, and then to the next-highest, and so on, until the budget is exhausted.¹²³ That technique maximizes the family's welfare: every item purchased produces more utility than any item that was not.¹²⁴

There is recent evidence, however, that consumers sometimes do not know the true prices they are paying. Many marketing studies find that hiding part of the cost of a good in the fine print, or breaking the price up into a number of smaller components, leads consumers to buy

¹²¹ For a review of the empirical evidence on whether transactional consumption taxes are more difficult for shoppers to detect, see Brian Galle, *Hidden Taxes*, 87 WASH. U. L. REV. 59, 72--77 (2009).

¹²² See Christine Jolls et al., *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471, 1476 (1998) (explaining rational planning model of economic behavior).

¹²³ See B. Douglas Bernheim & Antonio Rangel, *Beyond Revealed Preference: Choice Theoretic Foundations for Behavioral Welfare Economics* 23--24 (Nat'l Bureau of Econ. Research, Working Paper No. 13737, 2008), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1086986.

¹²⁴ *Id.*

more of the product.¹²⁵ Since there is little reason to think that printing part of the price in six-point font is a valuable aspect of a good, the implication is that consumers believe, erroneously, that the price for the good is lower than its true total. Similarly, some credit-card users pay too much for credit relative to their peers, with those who are overpaying failing to notice some of the complex pricing rules governing the credit contract.¹²⁶ Most directly on point for us, a few studies find similar outcomes when part of the price of a good or service is a hard-to-notice tax: for instance, in one study, people bought less of a good when the sales tax was computed for them and displayed on the shelf.¹²⁷

Hidden taxes and other low-salience costs may have a negative impact on household welfare. Chetty et al. argue that hidden taxes potentially interfere with a family's budget-allocation process.¹²⁸ Suppose the Ericsson family believes that heating their house this month will cost \$100, but after tax they ultimately pay \$110. That \$10 shortfall must come from somewhere else in the monthly budget. If the Ericssons do not notice the \$10 gap until the end of the month, they may find themselves without enough money to pay rent or buy the last week's groceries. If so, they likely would have been better off putting on sweaters and paying a smaller utility bill.

One uncertainty here is that households may be aware of their own ignorance. For example, Chetty et al. hypothesize that hidden taxes may be the product of rational ignorance, in which taxpayers know that a tax exists but consider the mental effort of computing it too

¹²⁵ For surveys of the evidence, see Vicki G. Morwitz et al., *The Price Does Not Include Additional Taxes, Fees, and Surcharges: A Review of Research on Partitioned Pricing* 6--10 (unpublished manuscript, Feb. 26, 2009); Aradhna Krishna et al., *A Meta-Analysis of the Impact of Price Presentation on Perceived Savings*, 78 J. RETAILING 101, 101--18 (2002).

¹²⁶ Lawrence M. Ausubel, *The Failure of Competition in the Credit Card Market*, 81 AM. ECON. REV. 50, 75--76 (1991); Stefano DellaVigna & Ulrike Malmendier, *Contract Design and Self-Control: Theory and Evidence*, 119 Q.J. ECON. 353, 377--79 (2004).

¹²⁷ Raj Chetty et al., *Salience and Taxation: Theory and Evidence*, 99 AM. ECON. REV. 1145, 1145--46 (2009).

¹²⁸ *Id.* at [41--46].

burdensome to be worth their time.¹²⁹ These kinds of taxpayers might have a sort of fudge factor when they allocate their household budget: they estimate that some costs will be higher, or the budget tighter, than projected.¹³⁰ By leaving some of the budget unallocated, they could avoid being caught short by hidden taxes. We call these families “calculators.” Whether anyone actually behaves this way is an empirical, and unanswered, question.

Another, less formal, way of capturing the intuition behind the Chetty et al. theory is to view the household budgeting method as targeting a rough standard of living, rather than a precise balance sheet. Families might know from their prior shopping and living experiences the sorts of things that they can generally afford --- we call these families “informed muddlers.”¹³¹ If these experiences include a consumption tax, then the family may have a fairly accurate picture of their own purchasing power, even if they are unaware that tax contributes to the cost of their purchases. In effect, the family has planned for hidden taxes, even if they are unaware of them.

Both of these descriptions of planning for hidden taxes assume, however, that taxpayers can predict with some degree of accuracy the total economic burden of hidden costs on their budgets. In fact, though, a variety of factors are likely to frustrate good predictions. Most obviously, newly-enacted taxes will throw off predictions.¹³² Informed muddlers will not take account of new enactments when they shop, because their experiences have been formed in a world where their existing income purchased more goods. Calculators will not accurately estimate new hidden taxes because, by definition, hidden taxes cannot be determined in advance:

¹²⁹ Chetty et al., *supra* note 127, at [41--42].

¹³⁰ *Id.* at [42--44].

¹³¹ *Cf.* Browning & Lusardi, *supra* note 30, at 1846 (claiming that people may develop “rules of thumb” that allow them to approximate the correct decision even where they experience cognitive failures).

¹³² *Cf.* Littwin, *supra* note **Error! Bookmark not defined.**, at 477--78 (describing how poor women learn techniques for managing tight finances, and noting these techniques are imperiled by rapid changes in household finance).

they are either not worth the effort of calculating, or the family is incapable of calculating them.¹³³ Only time, and repeated experience paying hidden tax and retrospectively examining the family's books, will provide the calculator household with enough information to account for new hidden taxes. And, crucially, neither household will even be aware of the need to muddle or calculate unless they are aware of the facts of the new tax's enactment and its economic incidence on them.¹³⁴ The same is true of changes in consumption from untaxed to taxed goods --- the family that buys its first car and begins to encounter gasoline taxes, for example.

It might be argued that the enactment of a major new consumption tax, such as a climate change statute, will be a significant enough cultural event that the fact of its existence will be highly salient for most families.¹³⁵ Having read several surveys of popular political awareness, we are dubious.¹³⁶ But, even if the public is aware that a bill has passed, there are several more cognitive steps that each family must take to connect that fact with their own planning, as we just outlined: they must also recognize that the legislation means higher costs for them, and they must know how much. The mere fact of enactment offers little on either front.¹³⁷

¹³³ That is, taxes are hidden either because individuals rationally conclude that the effort of calculating them exceeds the benefit, or because people are totally unaware of the tax, or cannot perform the calculations. All of these barriers are equally present, if not more so, for the family that attempts to calculate hidden taxes in advance. Galle, *supra* note, at 85--89.

¹³⁴ "Incidence" is the economist's term for the person bearing the actual economic burden of paying a tax. GRUBER, *supra* note, at . For instance, the legal duty to collect a sales tax falls on the seller, but in practice much of the cost of the tax is passed on to purchasers. Thus, our argument is that, in order to plan for a new consumption tax, consumers must not only know that the new tax was passed but also realize that it will hit their own wallets.

¹³⁵ We are grateful to Gilbert Metcalf for making this point in response to our questions.

¹³⁶ See Viktor J. Vanberg and James M. Buchanan, *Constitutional Choice, Rational Ignorance, and the Limits of Reason*, in THE CONSTITUTION OF GOOD SOCIETIES 39, 43 (Karl Edward Stolton & Stephen Elkin eds., 1996) (finding that voters are rationally ignorant of public policy); Cesare Martinelli, *Rational Ignorance and Voting Behavior*, 35 INT'L J. OF GAME THEORY 315, 316 (2007) (reporting other studies of voter ignorance). "Rational ignorance" refers to the fact that the cost of acquiring information is high while the voter perceives the effect of her vote (given the low probability that her vote will be decisive) to be low. As a result, many voters chose to remain ignorant and do not seek out information regarding the new rules or statutes.

¹³⁷ Cf. Greenstein et al., *supra* note 11, at 7 (describing difficulties of informing low-income households about new government programs that are supposed to benefit them). Empirical evidence that consumers are often surprised by tax rebates also probably bears on this question; see *supra* t.a.n. 71--73.

Planning for budget shortfalls is also likely to be challenging in scenarios in which the size of the expected tax is very difficult to predict. Studies suggest that many people cannot predict accurately their own willpower, and instead overestimate their own future restraint.¹³⁸ Carbon taxes (and their cap-and-trade equivalents) fall more heavily on households that use large amounts of carbon-intensive products. Willpower --- the ability to put on a sweater, bike instead of driving, turn off the television --- will be a significant determinant of the amount of tax the household pays. More generally, for any consumption tax, the resolution to save instead of spend allows a household to defer paying tax, giving them the benefit of the time value of the taxes they save. Consequently, if families are bad at predicting whether they will be able to exert willpower, they will also be unable to estimate their tax.

Finally on this point, both calculators and muddlers may struggle to make accurate tax-avoiding investment decisions. One of the objectives of a carbon tax is to encourage households to invest in energy-efficient appliances and lifestyles.¹³⁹ In order to decide, however, whether to spend an extra \$500 for new air conditioner, a family must have a fairly detailed sense of the expected future cost savings. In particular, the family must know that the mysterious shortfall in their monthly budget is attributable to energy costs, must calculate how much of the shortfall the investment would eliminate, and then discount that future savings to its present value. Our claim about hidden taxes is that these kinds of calculations are either beyond the capacity of some households, or are perceived not to be worth the mental effort of engaging in them. There may also be a significant procrastination component to a taxpayer's unwillingness to think about the cost-effectiveness of her investments, as we explore in more detail in Part III.F.

¹³⁸ Ted O'Donoghue & Matthew Rabin, *Self-Awareness and Self-Control*, in TIME AND DECISION 217 (George Loewenstein et al. eds., 2003); George Loewenstein et al., *Projection Bias in Predicting Future Utility*, 118 Q.J. Econ. 1209 (2003).

¹³⁹ Stephen H. Schneider and Lawrence H. Goulder, *Achieving Low-Cost Emissions Targets*, 389 NATURE 13, 13 (1997).

The hidden tax problem is more acute for the poorest families. Theory and empirics to date are unclear on whether taxes are more hidden from rich or poor households.¹⁴⁰ But unexpected costs are a greater danger to highly illiquid households; liquid households surprised by their energy bill can always put the groceries on a credit card. Wealthier households also have a larger margin for error; when the family is already purchasing luxuries, an extra \$100 per month is easier to absorb out of lower-priority items.¹⁴¹

In sum, if consumption taxes are at least somewhat hidden from consumers, they may prevent some households from smoothing their incomes over the course of the year. That is very likely to result in greater welfare losses for households that cannot smooth than for those that can.

Additionally, as others have recognized, hidden pigouvian taxes lead to additional social loss.¹⁴² The point of the pigouvian tax is to change behavior by impounding the negative consumption externality of a good into its price.¹⁴³ But if consumers do not notice the tax they do not reduce their usage of the good; in the case of a carbon tax, they do not reduce carbon emissions. An estimated budget, such as Chetty et al. suggest, would not solve this problem; families would reduce spending, but not necessarily their consumption of carbon-intensive goods.

¹⁴⁰ Galle, *supra* note 121, at 100-104.

¹⁴¹ Bar-Gill & Warren, *supra* note 105, at 64.

¹⁴² Amy Finkelstein, *E-ZTax: Tax Salience and Tax Rates*, 124 Q.J. ECON. 969, 981--82 (2009).

¹⁴³ *See supra* note 16.

2. Learning

It might be argued in response to these points that hidden taxes are at worst a short-term problem, because households will quickly learn that their costs are higher than expected.¹⁴⁴ Alternatively, liquidity-constrained households might learn to avoid the worst kinds of credit, diminishing the extent to which the surplus from income smoothing would be diverted to lenders. While both of these are theoretically possible, based on available evidence it is more likely that learning will be slow and partial, leaving many families vulnerable for extended periods.

Oren Bar-Gill and Elizabeth Warren have explained why learning can be ineffective in the credit market.¹⁴⁵ Consumers who do not understand credit may also be unaware of their need to educate themselves, be unable to comprehend new information, might believe (wrongly) that the costs of effort of learning outweigh the benefits, or might expect that they can free-ride on the information-gathering efforts of others.¹⁴⁶ Education by interested third-parties, such as consumer advocacy groups, may be difficult, in part because of these same factors, but also because of the highly differentiated nature of credit.¹⁴⁷ Whether a loan is a good deal or not depends on how the household behaves, its tolerance for risk, and the exact features of the loan.¹⁴⁸ It is very hard for outsiders to gather this kind of information about millions of families.¹⁴⁹ Similarly, competitors would also struggle to educate potential customers sufficiently, and might prefer not to in any event because they would rather also prey on the

¹⁴⁴ See Todd J. Zywicki, *The Economics of Credit Cards*, 3 CHAP. L. REV. 79, 140--42 (2000) (making this argument about credit card users).

¹⁴⁵ Bar-Gill & Warren, *supra* note 105, at 11--25; Bar-Gill, *supra* note **Error! Bookmark not defined.**, at 1128--29.

¹⁴⁶ Bar-Gill & Warren, *supra* note 105, at 12--14.

¹⁴⁷ *Id.* at 14--17. Additionally, peer-to-peer learning may be slowed by the self-interest of informed peers. John Y. Campbell, *Household Finance*, 61 J. FIN. 1553, 1555, 1586--88 (2006).

¹⁴⁸ Bar-Gill & Warren, *supra* note 105, at 16, 24--25.

¹⁴⁹ *Id.* at 16. Similarly, where individual factors are important families cannot easily learn just by observing others. Browning & Lusardi, *supra* note 30, at 1846.

misinformed or fear that their rivals would capture any gains from education.¹⁵⁰ Bar-Gill and Warren also round up empirical evidence to support their theory: learning in the credit market is slow, and people who do learn often forget their lessons over time.¹⁵¹

As one of us has also detailed elsewhere, many of these same factors apply to learning about hidden taxes.¹⁵² That earlier work additionally argues that taxpayers often fail to make use of hints and clues about their own misjudgments, not only because household finance is complex and therefore these signals are “noisy,” but also due to our tendency to perceive evidence as confirming rather than disproving what we already believe.¹⁵³ The fact that taxes are and remain hidden also seems to explain several features of our national tax system,¹⁵⁴ if learning about hidden taxes were easy, it would be difficult to understand why these features have persisted over time.

C. Prebates Raise Similar Problems

Switching from rebates to prebates does not eliminate the difficulties we have just described. Accelerating payment does somewhat change the nature of the problem, though. For one thing, a prebate may still require costly income smoothing: instead of borrowing, the family now must save its money and use it to offset higher energy costs throughout the year. More generally, a lump-sum regime, whether in the form of a rebate or prebate, will fail to put poor and wealthy households on the same footing, if the costs of smoothing consumption are greater

¹⁵⁰ Bar-Gill & Warren, *supra* note 105, at 17--20.

¹⁵¹ Bar-Gill & Warren, *supra* note 105, at 26--56. For similar surveys of persistent household ignorance in personal finance decisions, see Campbell, *supra* note **Error! Bookmark not defined.**, at 157--85, 1588--89; Alexander L. Brown et al., *Learning and Visceral Temptation in Dynamic Saving Experiments*, Q. J. ECON. 197, 200 (2009).

¹⁵² Galle, *supra* note 121, at 89--93.

¹⁵³ *Id.* at 90.

¹⁵⁴ Joel Slemrod, *Old George Orwell Got it Backward: Some Thoughts on Behavioral Tax Economics*, CESifo Working Paper No. 2777, at 5--6 (Sept. 2009).

for the poor. This will hold whenever the poor have to pay more to borrow or save or are unable to do so.

In order to smooth consumption in a prebate regime, poor households will have to have saving technologies available that make it easy for them to save. If these are not available or have higher transaction costs than those available to wealthier households, then the poor will once again be at a relative disadvantage. Although evidence here is less extensive than in borrowing, the data still suggest that many poor households have no access to conventional banking.¹⁵⁵ Instead, they use risky or expensive substitutes, such as purchases of expensive durable goods subject to theft, damage, or devaluation.¹⁵⁶

For similar reasons, the hidden nature of consumption tax regimes will also affect households who receive a prebate. In order to make optimal consumption/saving decisions, a household has to be able to incorporate information about the hidden tax regime, and do so in a timely fashion.¹⁵⁷ For instance, households may not realize that prebates are designed to offset increased energy costs. They may then fail to save enough to cover those costs later, again resulting in budget “surprises” that reduce welfare.

D. Summary

On the whole, it appears so far that many forms of transfers aimed at making consumption taxes more progressive are seriously flawed as presently designed. To achieve distributional neutrality of welfare, and not simply of annual income, rebates and prebates must account not only for how much but also when households spend. But, as we have shown, smoothing consumption is neither cheap nor guaranteed. Compared to their wealthier counterparts, poor

¹⁵⁵ Barr, *supra* note 94, at 130--33; Sondra G. Beverly & Michael Sherraden, *Institutional Determinants of Savings: Implications for Low-Income Households and Public Policy*, 28 J. SOC. ECON. 4 (1999).

¹⁵⁶ Barr, *supra* note 94, at 123--24.

¹⁵⁷ See Chetty et al., *supra* note 127, at [41--46] (explaining household budgeting process under uncertainty about tax rates).

households pay more to borrow and get less when they save, a disadvantage exacerbated in turn by the hidden nature of a transactional consumption tax.

III. HYPERBOLIC HOUSEHOLDS AND THE LIMIT OF LUMP-SUM REIMBURSEMENT REGIMES

So far, in establishing that the timing and frequency of the “neutrality payout” matters, we have assumed that households are impatient: they discount costs and benefits that are in the future. Importantly, we also have assumed that a household’s discounting remains constant over time. Constant discounting guarantees that—barring new information—a household’s long-term and short-term preferences will always coincide, a result that rules out self-control problems, such as overconsumption and procrastination.¹⁵⁸

In this Part we relax this time-consistency assumption. Evidence from numerous experiments and field studies by economists, not to mention simple intuition and common sense, suggests that many people come to regret their impatience or procrastination, so that their *ex ante* preferences are inconsistent with their sentiments after the damage is done.¹⁵⁹ We show that the shortcomings of lump-sum payout regimes identified in Part II become more pronounced once one allows for time-inconsistent households (“TI households”). Time-inconsistency gets in the way of smoothing, leading households to save too little in a prebate regime, or to procrastinate borrowing against an expected rebate. Moreover, the incentive to procrastinate will extend to two other important investment decisions: when to purchase more energy-efficient durable goods, such as appliances, automobiles, and home insulation; and when to acquire information about the impact of the tax and need to smooth consumption. More generally, we also show that

¹⁵⁸ See George Loewenstein & Drazen Prelec, *Anomalies in Intertemporal Choice: Evidence and an Interpretation*, 107 Q.J. ECON. 573, 573--78 (1992) (describing differences between prediction of standard discounting model and observed instances of overconsumption and procrastination).

¹⁵⁹ See *infra* text accompanying notes 160--176 .

even if poor and rich households have identical self-control problems, the poor will fare worse on average due to their tighter budget constraints and the diminishing marginal utility of wealth. Parts III.A. and III.B. provide a general overview of the quasi-hyperbolic model applied in the remainder of Part III; those familiar with the model can safely proceed to Section C.

A. Intertemporal Decisions and the Evidence on Time-Inconsistency

An intertemporal decision is one in which the costs and rewards that flow from the decision are not all incurred or received in the same time period.¹⁶⁰ The relative timing of costs and rewards matters because, as a general matter, people are impatient in that they prefer to receive benefits as early as possible and delay incurring costs until future periods.¹⁶¹ A rational actor will choose her behavior to maximize the sum of her current and future well-being.¹⁶² This can be modeled using an *intertemporal utility function* that sums up the instantaneous utility (the payoffs) in each relevant time period as discounted to account for an actor's time preference.¹⁶³ Early work in formalizing intertemporal choice used an exponential discount function, which, while easier to use, has an important (but, in hindsight, undesirable) side effect: it implies that actors have a constant level of impatience.¹⁶⁴ In short, an exponential discounter will never give added weight to immediate costs and rewards and thus will always act in a time-consistent manner.¹⁶⁵ But there is a large body of empirical evidence showing that people routinely exhibit time-inconsistent preferences, because of a short-term preference for immediate gratification that

¹⁶⁰ George Loewenstein & Richard H. Thaler, *Anomalies: Intertemporal Choice*, 3 J. ECON. PERSP. 181, 181 (1989).

¹⁶¹ Loewenstein & Prelec, *supra* note 158, at 573

¹⁶² *Id.*

¹⁶³ *Id.*

¹⁶⁴ See Shane Frederick et al., *Time Discounting and Time Preference: A Critical Review*, in ADVANCES IN BEHAVIORAL ECONOMICS 162, 166–67 (Colin F. Camerer et al. eds., 2007) (stating that the exponential function is the only one that ensures that actors will exhibit constant levels of impatience).

¹⁶⁵ *Id.* at 170 (“Constant discounting implies that a person’s intertemporal preferences are *time-consistent*, which means that later preferences ‘confirm’ earlier preferences.”).

leads them to override their long-term preferences.¹⁶⁶ It is this asymmetry between long-term and short-term impatience that leads people to procrastinate and overconsume.¹⁶⁷

The principal challenge to the time-consistency assumption of neoclassical theory originated in a series of experiments finding that people value immediate gratification and therefore exhibit declining, instead of constant, discount rates. In short, people discount immediate payoffs more steeply than they discount those same payoffs from a long-term perspective.¹⁶⁸ A common type of experiment to test whether people have time-inconsistent preferences asks subjects to choose between a smaller, earlier reward and a higher, delayed one, where in some instances the smaller reward can be received immediately and in others both the smaller and larger rewards are delayed until future periods.¹⁶⁹

In an early study, the economist Richard Thaler told subjects to imagine that they had won a lottery and could choose to either receive the money immediately or leave it in the bank earning interest.¹⁷⁰ He then asked them how much interest they would require to make them

¹⁶⁶ For reviews, see Frederick et al., *supra* note 164, at 172--79; Loewenstein & Thaler, *supra* note 160, at 183--90.

¹⁶⁷ Importantly, economists embraced exponential discounting because it made their models more tractable mathematically, not because they believed that real-world actors use exponential functions. See BECKER, *supra* note ___, at 11 ("The assumption of consistent preferences is clearly not a literal description of much actual behavior . . . but it is an extremely useful simplification of behavior."); Frederick et al., *supra* note 164, at 167 (noting that earlier economists adopted the model for its ease of use, not its accuracy). Unlike the large body of evidence supporting the time-inconsistency assumption, there is no systematic evidence finding that people have constant discount rates. See Warren K. Bickel & Matthew W. Johnson, *Delay Discounting: A Fundamental Behavioral Process of Drug Dependence*, in *TIME AND DECISION: ECONOMIC AND PSYCHOLOGICAL PERSPECTIVES ON INTERTEMPORAL CHOICE* 419, 422 (George Loewenstein et al. eds., 2003) (stating that "[e]xponential discounting . . . has not been empirically supported by behavioral research" conducted in humans and animals); see also *infra* Part III.C (describing evidence that real-world actors have declining discount rates).

¹⁶⁸ See GEORGE AINSLIE, *PICOECONOMICS* 63--80 (1992) (describing evidence of declining discount rates and using hyperbolas to model them); Christopher Harris & David Laibson, *Hyperbolic Discounting & Consumption*, in *ADVANCES IN ECONOMICS AND ECONOMETRICS* 258, 258 (Mathis Dewatripont et al eds., 2003) (stating that generalized hyperbolic discount functions decline at a faster rate in the short-run than in the long-run, matching a key feature of experimental data); Loewenstein & Prelec, *supra* note 158, at 579--81 (1992) (setting forth hyperbolic discount function).

¹⁶⁹ See RICHARD H. THALER, *Some Empirical Evidence on Dynamic Inconsistency*, in *QUASI RATIONAL ECONOMICS* 127, 128--29 (1991).

¹⁷⁰ *Id.*

indifferent between receiving \$15 immediately or in three, twelve, and thirty-six months.¹⁷¹ The required median returns were \$30, \$60, and \$100, respectively, which translates into continuously compounded discount rates of 277%, 139%, and 63%, for the three, twelve, and thirty-six month delays.¹⁷² As can be seen, the implicit discount rate declined as the delay in receiving the money increased.¹⁷³

B. Overconsumption and Procrastination

It is helpful to compare the way that time-consistent (“TC”) and time-inconsistent (“TI”) households make intertemporal decisions. We will assume that a household will choose a consumption path that takes into account its long-term impatience, as captured by a discount factor, δ . Moreover, the decisions of TI households will also be affected by their preference for immediate gratification, as captured by a short-term discount factor, β , set to less than 1, and applicable only when the household is making a short-term decision: one in which it either has to incur an immediate cost or grab an immediate reward.

From the long-term perspective of period 0, when all costs and benefits are delayed, both types discount future payoffs using a standard exponential function. That is, from the perspective of period 0, a TC household will choose the future course of action that will maximize the sum of its instantaneous utility in periods 1 through n : $\delta u_1 + \delta^2 u_2 + \delta^3 u_3 + \dots \delta^n u_n$. A TI household will reach the same exact conclusion, since in period 0, it discounts periods 1 through n by $\beta \delta u_1 + \beta \delta^2 u_2 + \beta \delta^3 u_3 + \dots \beta \delta^n u_n$, which reduces to the standard exponential function.

However, in period 1, the TC household will act to maximize: $u_1 + \delta u_2 + \delta^2 u_3 + \dots \delta^{n-1} u_n$, while its TI counterpart will maximize $u_1 + \beta \delta u_2 + \beta \delta^2 u_3 + \dots \beta \delta^{n-1} u_n$. Since $\beta \delta < \delta$, in period 1,

¹⁷¹ *Id.* at 130.

¹⁷² *Id.*

¹⁷³ *Id.* at 129.

the TI household will give greater weight to the instantaneous utility, u_I , than its TC counterpart and its own previous self. That is, given its preference for immediate gratification, it will value present utility more now than it did from the long-term perspective of period 0. As we will now see, if that immediate utility is a benefit, a TI household will have a greater incentive to overconsume. If the immediate utility is a cost, the TI household has a greater incentive to procrastinate.

1. Overconsumption Scenario: Immediate Benefits and Delayed Costs

Smoking, eating tasty but unhealthy foods, indulging in one’s youth instead of saving for retirement—all require a tradeoff between an immediate benefit and delayed consequences. We will refer to a consumption scenario as one in which a household can grab an immediate benefit, but doing so triggers a cost that it will bear in the future. We will also say that a household *overconsumes* whenever it has a long-term preference to abstain, but makes one or more short-term decisions to override that preference, solely due to the added weight it gives to immediate gratification. It follows that TC households will never overconsume in this manner.

More formally, suppose that consuming in period 1 provides an immediate benefit, v_1 , but triggers a delayed cost in the following period, c_2 . From the perspective of period 0, TC and TI households will both decide not to consume in period 1 whenever $v_1 + \delta c_2 < 0$. Since TC households give no added weight to immediate gratification they will keep to their plan, but their

TI counterparts will override their original decision whenever, $v_1 + \beta \delta c_2 \geq 0$ (assuming that it

Comment: these greek letters seem to create large white spaces in my version of the document. Do you have that problem in yours?

consumes if it is indifferent). Moreover, it follows that all other things being equal a household's incentive to overconsume will increase the higher the immediate benefits and the greater its preference for immediate gratification.

2. Procrastination Scenario: Immediate Costs and Delayed Benefits

An investment scenario is one in which an actor has to incur a cost in the present to create a future benefit: exercising, writing a paper, getting a divorce, entering into a contract, or acquiring information to reduce transactional risks. A household *procrastinates* when it has a long-term preference to complete A in period t , but makes one or more short-term decisions to delay doing so, solely due to the added weight it gives to the immediate costs it must incur to complete A.

Suppose that completing A in period 1 requires an immediate investment of c_1 , yielding a reward in period 2, v_2 . From the perspective of period 0, TC and TI households will both decide

to complete A in period 1, whenever, $c_1 + \delta v_2 \geq 0$. TI Households, however, will choose to

procrastinate whenever, $c_1 + \beta \delta v_2 < 0$. As with overconsumption, households are more likely to procrastinate the higher the immediate costs of completing A and the greater their short-term impatience.

3. Repeated Overconsumption and Procrastination

At any one point, a household will be guided by its overall goal of maximizing the sum of its current and future welfare. In order to do this, it will have to predict how it expects to act in the future. It follows that TI households must try to predict the short-term discount factor that they expect to use in future periods, when making short-term consumption and investment decisions.

More formally, at time t , a household will try to predict the β that it will use at $t + 1$. If we let $\hat{\beta}$ be its prediction, then a correct prediction is one in which $\hat{\beta} = \beta$. Such a sophisticated household will make a correct assessment of its future propensity to overconsume and procrastinate and adopt commitment devices to assure that it keeps to its long-term preferences.¹⁷⁴ On the other hand a naïve household is one that period after period incorrectly believes that in the future it will exhibit perfect self-control; that is it believes that it will act in a time-consistent manner and thus has a $\hat{\beta} = 1$, notwithstanding the fact that it has a $\beta < 1$. It follows that naïve households will repeatedly overconsume and procrastinate, believing each time that they are doing so for the last time. It is unlikely that actual households are completely naïve or sophisticated.¹⁷⁵ More likely, they know that they have a preference for immediate gratification—a $\beta < 1$ —but are overly optimistic of their future willpower.¹⁷⁶ A partially naïve

¹⁷⁴ Commitment devices are mechanisms that restrict an actor's ability to yield to the pull of immediate gratification. More generally, a commitment device is a type of externally imposed self-regulation mechanism adopted to overcome self-control problems when relying on internal sources of self-regulation is not sufficient. See ROY F. BAUMEISTER ET AL., LOSING CONTROL: HOW AND WHY PEOPLE FAIL AT SELF-REGULATION 6–7 (1994) (describing the ability among human beings “to exert control over one’s own inner states, processes, and responses” and defining self-regulation as “any effort by a human being to alter its own responses” so as to override the push to act in ways that diverge from what they really want).

¹⁷⁵ See Ted O’Donoghue & Matthew Rabin, *Choice and Procrastination*, 116 Q.J. ECON. 121, 122--160 (2001) (developing a model of partially naïve households).

¹⁷⁶ See *id.* at 149 (suggesting that earlier findings support model of optimism about future willpower).

household is one that has $\beta < \beta^* < 1$. Importantly, even a relatively small misprediction can lead partially naïve households to repeatedly overconsume or procrastinate—i.e., to act in the same as if it were fully naïve.

We will now lay out the implications of these findings for a consumption tax/rebate regime.

C. Overconsumption in Prebate Regime

On its face, a lump sum payment at the beginning of the year seems like a plausible mechanism to achieve tax neutrality. Since the poor household receives the prebate before incurring the tax liability, it will not have to borrow, as in the case of a rebate. Nonetheless, in order to smooth consumption—to use the prebate to pay the carbon taxes, as they become due—it will have to save. We now show that, all other things being equal, TI households will consume the prebate faster than TC households, and thus faster than they want to from a long-term perspective. It follows that TI households that are liquidity constrained will overconsume carbon products at the beginning of the year and be forced to cut back once they have gone through the prebate funds. Moreover, under a prebate regime, TI households that are not liquidity constrained will overconsume at the beginning of the year and continue down their long-term consumption path the rest of the year. In short, a prebate can have the perverse effect of leading some households to overconsume carbon products, something that goes against the basic goal of reducing consumption.

1. Smoothing Problem: Liquidity Constrained Households

In order to focus on the overconsumption problem, it is helpful to limit our attention to a prebate regime in which households receive the funds on December 31, and make a long-term

plan setting forth how much electricity to consume during the coming year, keeping all other liabilities fixed. We begin with households that are liquidity constrained: if they run out of funds before the year is through, they will have no other choice but to cut back their electric consumption. To simplify matters we will assume that they receive a prebate of \$2,400 and decide to consume the same amount of electric power each month, leading to a monthly tax liability of \$200. In other words, they conclude that in order to maximize their intertemporal utility over the whole year, they need to smooth their electricity consumption in this manner. While they anticipate that this consumption plan will require sacrifices—using fans instead of air conditioning and blankets instead of electric heaters—they believe that it is the one that will minimize these shortfalls in utility.

Consider a TC versus a TI household. To isolate the effect of short-term discounting, assume that they both have a long-term discount factor, $\delta = 1$ (this does not affect the general results in any way), and the TI household has a short-term discount factor, $\beta = 0.5$. Each time they use electricity they receive an immediate benefit—using air conditioning instead of a fan—but each month that they spend more than \$200 in taxes (the “excess carbon”) they trigger a delayed cost, borne in the following months, when they are forced to consume less electricity than they had wanted. Let $v_l = \$500$ be the immediate benefits of consuming more electricity than the allotted monthly amount, and $c_l = \$900$ the delayed cost of exceeding the allotment—i.e., due to the electricity shortfall, after it has exhausted the prebate. From the long-term perspective of December 31, both households will plan to keep to the allotment, given that $\$500 + (-\$900) < 0$. But while the TC household keeps to its optimal consumption plan, come January, its TI counterpart does not, since it now compares an immediate benefit of \$500 with a delayed, discounted cost of $0.5 \times \$900 = \450 . While this is a relatively simple example, it does

provide the underlying intuition: all other things being equal, a TI household will go through the prebate funds sooner than what it believes is optimal. Additionally, policymakers who fail to take this into account, and instead adopt the standard time-consistency assumption, will fail to realize the way that the prebate can distort the consumption decision of real households.

As we saw above, a fully sophisticated household will anticipate its future propensity to overconsume, and adopt commitment devices if available and affordable.¹⁷⁷ On the other hand, since naïve households always conclude that in the future they will act in a time-consistent manner, they will overconsume each month, believing that they are doing so for the last time, and will go without electricity once they have exhausted the prebate funds. Finally, suppose that a partially naïve household has a $\hat{\beta} = 0.556$, which is a relatively small misprediction, given that its true $\beta = 0.5$. That household will nonetheless overconsume each month, since it believes incorrectly that it will later decide that it will keep to its consumption plan—i.e., $(0.556 \times \$900) = \$500.40 > \$500$.

There is evidence that households behave in this manner with respect to other lump-sum payments—e.g. food stamps and social security benefits. For example, Bertrand and Morse find that taxpayers whose other behavior suggests a susceptibility to “temptation” are most likely to spend their tax rebate on indulgences rather than paying bills.¹⁷⁸ Shapiro found that caloric intake in households receiving food stamps declines as the month goes on, and after considering various possible explanations opts for one similar to our prebate explanation—sufficiently naïve TI households will overconsume earlier in the month and have to curtail their food consumption

¹⁷⁷ See *supra* text accompanying notes 173--174.

¹⁷⁸ Bertrand & Morse, *supra* note 84, at 7--9.

as the month progresses.¹⁷⁹ There is also evidence that purchases tend to increase on paydays, particularly for leisure goods that provide an immediate benefit, including food, alcohol, and drugs.¹⁸⁰ And, most on point for us, Ayres et al. find that energy consumption rises on Fridays (after controlling for weather and other likely causal factors),¹⁸¹ which we suggest could be explained by a payday effect.

2. Overconsumption: Non-Liquidity Constrained Households

Suppose now that the TI household is not liquidity constrained: if in any month it does not have enough cash to consume the monthly allotment of electricity, it can meet that shortfall by borrowing. Borrowing however is expensive; assume that given finance costs a household will want to borrow to meet the allotment shortfall, but no more. In other words, the immediate utility of consuming the whole allotment of electricity is sufficiently high to meet the delayed finance costs. More specifically, assume that to pay for the full monthly allotment a household will have to borrow funds and incur a delayed finance charge of \$2,000, and that the utility of consuming that full allotment translates to \$1,200. From a long term perspective a TI household with a $\beta = 0.5$ will want to avoid the finance charges, but given its short-term preferences it will ultimately find it worthwhile to borrow the funds. Under this scenario, the TI household will start the year with a long-term preference never to exceed the monthly allotment of electricity. Nonetheless, if one continues to work with the numbers from the example above, this household

¹⁷⁹ See Jesse M. Shapiro, *Is There a Daily Discount Rate? Evidence from the Food Stamp Nutrition Cycle*, 89 J. PUBLIC ECON. 303 (2005). Also discuss

¹⁸⁰ See Carlos Dobkin and Steven Puller, *The Effect of Government Transfers on Monthly Cycles in Drug Abuse, Hospitalization and Mortality*, 91 J. PUBLIC ECON. 2137 (2007); Melvin Stephens Jr., “3rd of the Month”: Do Social Security Recipients Smooth Consumption between Checks?, 93 AMER. ECON. REV. 406 (2003); David Huffman and Matias Barenstein, *Riches to Rags Every Month? The Fall in Consumption Expenditures Between Paydays* (Working Paper, Dec. 2004). NOTE: while these all find a pattern that can be explained, at least in part, due to time-inconsistency, the authors provide a number of possible explanations.

¹⁸¹ Ian Ayres et al., *Evidence from Two Large Field Experiments that Peer Comparison Feedback Can Reduce Residential Energy Usage* 11 & fig.8 (unpublished manuscript), available at <http://ssrn.com/abstract=1434950>. For yet more evidence that impatience impairs savings, see Brown et al., *supra* note 151, at 199.

will overconsume during the early part of the year, and when it has exhausted the prebate will borrow to meet the shortfall. It will do so even though borrowing funds creates a welfare loss that it had wanted to avoid.¹⁸²

Unconstrained and impatient households not only lose their own welfare, but may also frustrate the goals of the carbon tax. A prebate regime will create a welfare loss for the liquidity constrained household, and thus will reduce aggregate social welfare. Nonetheless, poverty here acts as a powerful commitment device, albeit one that comes into play too late to help the household: poverty assures that regardless of how the household allocates its electricity consumption it will never consume more than the total amount that it had committed to consume. On the other hand, the household that is not liquidity constrained will overconsume for the same number of months as its liquidity constrained counterpart, but will continue to consume electricity after it has exhausted the prebate. This household also faces a welfare loss, in the form of finance charges, that need to be accounted in the social welfare function, but since it continues to consume electricity for the rest of the year, will end up consuming more than the wealth constrained household. It follows that if two households have the same short-term discount factor, the richer household will consume more since it is in a better position to bear the costs from its overconsumption.

So far we have assumed that the household can accurately predict the amount of electricity that it will want to consume in each month. In reality, the household will face unforeseen shocks—a summer far warmer, or winter far colder than usual—and will have to adjust their consumption plan accordingly.¹⁸³ Given their liquidity constraints, they will want to guard

¹⁸² See Sumit Agarwal et al., *Payday Loans and Credit Cards: New Liquidity and Credit Scoring Puzzles?*, 99 AM. ECON. REV. 412, 415 (2009) (offering evidence that credit cards may lead to overconsumption out of impatience).

¹⁸³ We will suppose that it makes it long-term cost benefit analysis on a day in which the weather is perfect, and calls for no artificial re-conditioning. The reason for this assumption is that a number of studies have found that

against unexpected contingencies by saving during months with unforeseen lower consumption needs. However, TI households that give into temptation and overconsume will save less than optimal during those months, which will put them in a more precarious position when outside shocks lead them to prefer using a greater amount of energy than they had anticipated.

D. Procrastination and Consumption Smoothing

While the impulse to overconsume has relatively straightforward implications for a prebate, procrastination behaviors interact with a tax/rebate regime in several complex ways. First, as we explain in this section, procrastination may impact the extent to which households smooth their consumption over time. In Parts III.E. and III.F., we note two other effects of procrastination: lower investments in carbon-reducing technologies, and lower investments in learning about the tax's incentives to reduce carbon consumption.

Time-inconsistency compounds the obstacles to consumption smoothing we surveyed in Part II. TI households may fail to smooth consumption because they repeatedly procrastinate borrowing or saving funds. These two types of financial transactions require households to expend time and effort, along with myriad other transaction costs—comparing intermediaries, identifying transactional hazards, and disclosing information that they prefer keep quiet, such as their immigration status. While all of these costs are incurred immediately, the benefits from smoothing are not all received immediately.¹⁸⁴ As we have seen it is this combination of immediate costs and delayed rewards that creates the specter of procrastination. Although at first glance it may appear that a household that borrows funds gets an immediate benefit, this is the

people tend to mispredict their future preference because they project they give undue weight to their current state when making such predictions. For example, someone who has just had a large breakfast may order a light lunch because it projects its current sated state in trying to ascertain how hungry she will feel by lunch. See(discussing projection bias).

¹⁸⁴ See O'Donoghue & Rabin, *supra* note 175, at 148--49 (explaining why partially naïve time-inconsistent households might not invest optimally for their future).

case only when it leads to immediate consumption. A payday loan used to acquire groceries or some leisure activity is different than one used to pay bills—the benefit from paying them is to avoid the future disutility associated with collection agencies or having one’s utilities shut off.

Procrastination is particularly damaging for low-income families. There is evidence that poor households have less access to financial institutions and the full panoply of credit and savings products that are readily available to higher income households.¹⁸⁵ While commentators have generally acknowledged that such a state of affairs will make it more difficult for poor households to get out of the poverty trap,¹⁸⁶ once one allows for TI households, it is easy to see that the problem goes deeper: even relatively small hurdles can lead to repeated procrastination. If a poor household and a rich one have identical short-term discount factors, but the poor one faces higher transaction costs when entering financial transaction, it follows that it will have a greater incentive to procrastinate. In other words, both households may procrastinate, but the higher immediate costs faced by the poor household will lead it to procrastinate longer and in a greater number of transactions.¹⁸⁷ These higher transaction costs will lead poor households to smooth less than they believed optimal, from a long-term perspective, and less than otherwise equivalent households who face lower transaction costs.

Thus, TI households may have lower welfare under either a rebate or a prebate. Both mechanisms assume families will smooth consumption, but the impulse to procrastinate may prevent them from doing so.

Present-bias also can raise the cost of income smoothing. When choosing between financial institutions, TI households are more likely to enter into transactions offering lower up-

¹⁸⁵ Campbell, *supra* note **Error! Bookmark not defined.**, at 1563--64; Littwin, *supra* note **Error! Bookmark not defined.**, at 463.

¹⁸⁶ *E.g.*, Barr, *supra* note 94, at 123.

¹⁸⁷ *Cf.* Campbell, *supra* note **Error! Bookmark not defined.**, at 1563, 1568--69 (noting that fixed costs of learning about financial markets tends to reduce participation by less-wealthy households).

front costs, even if they have higher long-run costs.¹⁸⁸ There is evidence that consumers react to teaser rates from credit card companies in just this manner, choosing cards which provide greater benefits up front, even though once the introductory period is over the cards have higher interest rates.¹⁸⁹ One can extend the general intuition to explain why poor households resort to payday lenders who charge exorbitant rates. There are two important characteristics of payday loan providers: their location and advertisement makes them very convenient; and the transaction costs associated with getting a loan are very low compared to other sources of funds.¹⁹⁰ This may explain why poor households may rely on them instead of credit cards: applying for and receiving a credit card takes time and effort and must be timed so that it occurs at a point in time in which the household has sufficient income security to be approved.

E. Procrastination in Making Transition Away from Carbon Dependence

One of the goals of the carbon tax is to cause households to invest in making the transition away from carbon dependency.¹⁹¹ We now argue that time-inconsistent households will face an incentive to procrastinate investing in carbon abatement technology—energy efficient appliances, hybrid automobiles, better home insulation.¹⁹² As with any other investment, this will require an immediate expense in order to create a valuable future income stream. Again, TI households are likely to procrastinate in the face of even small present costs. This delay will have important implications for both the efficacy and incidence of carbon taxes.

¹⁸⁸ Bar-Gill, *supra* note 105, at 1119.

¹⁸⁹ See [Haiyan Shui & Lawrence Ausubel, Time Inconsistency in Credit Card Markets....]

¹⁹⁰ Mark Flannery & Katherine Samolyk, *Payday Lending: Do the Costs Justify the Price?* 10 (FDIC Ctr. for Fin. Research, Working Paper No. 2005-09, 2005), available at http://www.fdic.gov/bank/analytical/cfr/2005/wp2005/CFRWP_2005-09_Flannery_Samolyk.pdf.

¹⁹¹ See Metcalf & Weisbach, *supra* note 4, at 515--17 (arguing for dedicating some of the revenue from a carbon tax for this purpose).

¹⁹² Since businesses will need to make the same type of transition investments, they too will have an incentive to procrastinate, but this more general problem is beyond the scope of this Article.

Indeed, a number of recent studies have found that time-inconsistent preferences can lead individuals to procrastinate making analogous exit decisions even when the immediate costs are much lower than those required to make the transition out of a high-carbon lifestyle.¹⁹³ If these same dynamics are at play in a carbon tax, procrastination will both reduce the amount of carbon reduction from the tax and also shift the incidence of carbon taxes towards TI households over time. Carbon emissions remain higher with procrastination because families repeatedly fail to invest in carbon reduction, since the benefit of avoiding taxes is always largely in the future. And as other households respond more rationally to the tax, the relative amount of carbon produced by TI households --- and the concomitant share of tax they pay --- will increase.

Although these two effects are true at all income levels, they once more are especially pronounced at the lowest incomes. Assume, as we have throughout, that the poor and rich have the same level of short-term impatience and level of awareness about their self-control problems. Nonetheless, carbon tax will leave a poor household worse off because the household faces higher immediate costs of making the transition to a lower-carbon-consumption lifestyle.¹⁹⁴ Households that are liquidity constrained will need to save before they can invest in these more efficient durable goods, but this will require them to divert funds away from higher utility products such as food or shelter or those that provide an sufficiently high immediate utility—

¹⁹³ See Stefano DellaVigna & M. Daniele Paserman, *Job Search and Impatience*, 23 J. LABOR ECON. 527, 565, 569 (2005) (finding that impatient unemployed workers expended less effort to find new job); Teela Sanders, *Becoming an Ex-Sex Worker: Making Transitions Out of a Deviant Career*, 2 FEMINIST CRIMINOLOGY 74, 75–76 (2007) (describing studies finding that women delay leaving the sex trade because of the immediate economic costs of exiting, such as drug use and lack of an available alternative work); Francesco Drago, *Career Consequences of Hyperbolic Time Preferences* 1–3 (IZA Discussion Paper No. 2113, 2005), available at <http://ssrn.com/abstract=706281> (finding that impatient employees expended less effort to get promoted); Hanming Fang & Dan Silverman, *Time-Inconsistency and Welfare Program Participation: Evidence from the NLSY 1*, Feb. 2006 (unpublished manuscript, on file with The Houston Law Review) (finding impatient women exerted less effort to transition from welfare to work).

¹⁹⁴ Cf. Super, *supra* note 5, at 39 (noting that costs of energy efficiency may be a bar for low-income families even with some government assistance).

leisure goods. Because of this, poor households are more likely to procrastinate making the transition away from carbon consumption than wealthier households.

This general inequality is exacerbated by the fact that the transition to more energy efficient durable goods has been going on for a while and rich households are more likely to replace appliances and automobiles.¹⁹⁵ In fact, many poor households live in rental units and have to make do with the appliances provided by the landlord.¹⁹⁶ Given that as a general rule renters are responsible for paying utilities, they are unlikely to replace existing appliances with energy efficient ones.¹⁹⁷ Even if one were to adopt the strong assumption that the market for rental property in poor neighborhoods is very competitive (an unlikely fact), the same arguments underwriting the hidden taxes discussion in Part II would apply here. In order to discern the relative efficiency of appliances, insulation, and windows, renters will have to first move in. As a result they are unlikely to incorporate their carbon tax implication at the time that they settle on an apartment. In conclusion, one would expect that at the very start of a carbon tax regime, poor household will already be at a relative disadvantage—they are more likely to own “clunker” appliances and automobiles.

F. Procrastination Acquiring Information

To make a decision to smooth consumption, a household will need more than a tacit awareness that a carbon tax is in place and a rebate forthcoming: it needs the right type of information, at the right time. We now show that time-inconsistent households will have an

¹⁹⁵ Cf. Shammin & Bullard, *supra* note 2, at 2436 (finding that poorer households make use of more carbon-intensive products).

¹⁹⁶ Richard Counihan and David Nemetzow, *Energy Conservation and the Rental Housing Market*, 2 SOLAR L. REP. 1103, 1104--05 (1981).

¹⁹⁷ *Id.*

incentive to procrastinate acquiring information that could reduce the hidden taxes problem or put them in a better position to make long-term financial decisions.

Transacting parties—including taxpayers who are in a long-term transaction with the taxing authority—acquire information in order to become aware of transactional hazards and to take actions to reduce those hazards, such as through entering into contracts or discounting for the risk.¹⁹⁸ A household will need to determine how much information to acquire about the costs and benefits of investing in carbon abatement, about future shocks that may make it sensible to save some of the prebate, about providers of credit who will help it smooth consumption, and about more general information regarding the carbon tax itself.¹⁹⁹ Once a household determines that the benefits of acquiring a piece of information exceed the costs, it must still decide when to follow through.²⁰⁰ As in any procrastinating context, a household will have an incentive to procrastinate acquiring information whenever the gains from delaying for one period exceed the (discounted) lost benefits from that one-period delay (in the form, for example, of a decline in the value of that information). Procrastination in acquiring information can lead households to under-appreciate the need to react to the carbon tax, to fail to seek out alternate sources of funds, and to neglect the value of investing in carbon abatement.²⁰¹

¹⁹⁸ See Ronald J. Gilson, *Value Creation By Business Lawyers: Legal Skills and Asset Pricing*, 94 YALE L.J. 239, 268--71 (1984) (analyzing incentives of transaction parties to acquire and reveal information).

¹⁹⁹ See Stephan Meier & Charles Sprenger, *Discounting Financial Literacy: Time Preferences and Participation in Financial Education Programs*, IZA Discussion Paper No. 3507, at 2--3 (May 2008) (explaining that households must decide how much effort to invest in acquiring information about financial matters).

²⁰⁰ While sometimes it is beneficial to acquire information immediately, at other times it is valuable to wait, given that uncertainty regarding the value of that information may be reduced over time. As Kenneth Arrow argues, investments in information often represent irreversible investments that depreciate over time in the same fashion as capital investments in tangible assets. KENNETH J. ARROW, *THE LIMITS OF ORGANIZATIONS* 39--41 (1974). An implication of the irreversibility of investments in information is that waiting to acquire information, until some of the uncertainty regarding the information has been resolved, may be valuable in the same fashion that waiting to make irreversible investments in hard assets may provide the decision-maker with an option value. On the creation of option values in waiting to make irreversible investments, see DIXIT & PINDYCK, *supra* note __, at 6--9.

²⁰¹ See Meier & Sprenger, *supra* note 199, at 3--4 (reporting evidence that households procrastinate acquiring costly information).

Importantly, households may procrastinate not only in acquiring information about the external world, but also about themselves, such as information about their own skill and talents or even their propensity to procrastinate.²⁰² In addition to the actual costs of acquiring this information, one must account for various collateral, often immediate, costs associated with acquiring negative self-evaluative information—for example, the information may challenge an individual’s positive self-image or undermine her self-confidence.²⁰³ Households may thus procrastinate receiving *free* information about themselves, if possessing that information creates immediate collateral disutility.²⁰⁴

It follows therefore that one important type of procrastination is what could be called “meta-procrastination.” For the large part, commentators have implicitly assumed that actors will undertake repeated cost-benefit analyses to ascertain whether it is sensible to procrastinate.²⁰⁵ However, people often experience an immediate disutility from thinking about the fact that they are procrastinating—whenever the thought appears in their minds, they quickly

²⁰² In addition to the *external* informational asymmetries discussed in the law-and-economics literature on contracting (for example, asymmetrical knowledge about the other party’s characteristics), transacting parties also face what one can call “*internal* informational asymmetries”: an individual’s informational deficits about *herself*. These can include imperfect information about her talents, her past actions and their motivations, and her propensity to succumb to self-control problems. The economists Roland Bénabou and Jean Tirole argue that the actors “who usually populate economic models have little doubt about ‘who they are’: they know their own abilities and basic preferences.” See Ronald Bénabou & Jean Tirole, *Self-Knowledge and Self-Regulation: An Economic Approach*, in *THE PSYCHOLOGY OF ECONOMIC DECISIONS* 137, 138 (2003). In a series of papers, they focus on economic actors with imperfect self-knowledge, imperfect willpower and imperfect recall, what they call the “three ‘grains of sand’ (or humanity) in the well oiled mechanics of the ultra-rational economic agent.” *Id.* at 137.

²⁰³ A positive self-image is something that individuals value, and self-confidence and optimism play an important role in preserving and bolstering that self-image. See Roy F. Baumeister, *The Self*, in *1 THE HANDBOOK OF SOCIAL PSYCHOLOGY* 680, 688–92 (Daniel T. Gilbert et al. eds., 4th ed. 1998) (providing overview regarding body of literature on how individuals construct and maintain their sense of self, and how they protect it against negative information that may challenge their self-esteem). In fact, one way of understanding an individual’s self-image is as an additional argument to that individual’s utility function. See Bénabou & Tirole, *supra* note 142, at 142.

²⁰⁴ Economic actors may engage in such “strategic ignorance” aimed at preserving their current levels of self-confidence. *Id.* at 144. As Baumeister states: “Given the powerful motivation to think well of oneself, it is necessary to ask how people manage to maintain such self-flattering views in the face of mixed and even contrary evidence.” Baumeister, *supra* note 143, at 690.

²⁰⁵ *E.g.*, O’Donoghue & Rabin, *supra* note 175, at 122–24 (modeling individuals who periodically calculate expected future costs of procrastination in each successive period).

dispose of it without incorporating it into their general deliberation.²⁰⁶ Meta-procrastination can thus increase the propensity of people to procrastinate, given that it reduces the salience of the delayed costs associated with yielding to immediate gratification.

G. Relative Access to Commitment Devices

We have just seen that even if poor and wealthy households have the same level of short-term impatience, poor households will face greater welfare losses from their time-inconsistency whenever they face higher transaction costs to enter into valuable transactions. The same argument applies to overconsumption: households with greater opportunities to consume goods that provide an immediate reward are more likely to overindulge. Individuals with easier access to addictive products, for instance, are more likely to become and remain addicted, even if they have a long-term preference to break the addiction.²⁰⁷ But there is an additional reason why poor households may suffer greater welfare losses: they are less likely to have easy access to low-cost commitment devices, which are mechanisms for overcoming time-inconsistent behavior.

Some of the strongest evidence of time-inconsistency, and real world actors' awareness of it, comes from the fact that people routinely resort to using commitment devices.²⁰⁸ Such devices are costly to implement, and even if they were available at zero cost, people are reluctant to restrict their future ability to act freely²⁰⁹ unless they believe that pre-commitment is otherwise

²⁰⁶ Cf. Patrick Bolton & Antoine Faure-Grimaud, *Thinking Ahead: The Decision Problem 1--3* (NBER Working Paper No. W11867, 2005) (claiming that deciding how to act in the future is experienced as a present cost).

²⁰⁷ George Ainslie, *A Research-Based Theory of Addictive Motivation*, 19 L. & PHIL. 77, 79--91 (2000).

²⁰⁸ See O'Donoghue & Rabin, *supra* note 138, at 105 (noting that economists use commitment devices as evidence—"smoking guns"—of time-inconsistent preferences).

²⁰⁹ One cost of commitment is that people generally value their autonomy and find disutility in having their wills constrained unnecessarily. See CHARLES FRIED, *CONTRACT AS PROMISE: A THEORY OF CONTRACTUAL OBLIGATION* 13--14 (1981) (discussing the cost of commitment and autonomy in the realm of interpersonal contracts).

worthwhile.²¹⁰ As a result, in a world of time-consistent actors, commitment devices would not exist.²¹¹ Nonetheless, people with long-term preferences to eat healthily, exercise, and lose weight join health clubs and go to special weight-loss spas, both of which require costly up-front commitments. Students and professors use deadlines (preferably externally imposed)²¹² to combat the temptation to procrastinate completing papers.

Many of the most effective devices for committing to savings are largely unavailable to poor households.²¹³ For example, retirement accounts and certificates of deposit come with built-in penalties for early withdrawal.²¹⁴ TI customers appear to appreciate this feature.²¹⁵ Again, because poor families have only limited access to modern banking and finance, IRA's and CD's are often out of their reach.²¹⁶ To the extent that wealthy households have easier access to a greater number of lower cost financial products that have commitment qualities, they

²¹⁰ Once we introduce the potential of uncertainty regarding future payoffs, an intertemporal decisionmaker may find it valuable to have an option to reverse her original decision. On the creation of option values by waiting to make irreversible investments until a decisionmaker has acquired greater information, see AVINASH K. DIXIT & ROBERT S. PINDYCK, *INVESTMENT UNDER CERTAINTY* 6–9 (1994). See also Daniel T. Gilbert & Jane E.J. Ebert, *Decisions and Revisions: The Affective Forecasting of Changeable Outcomes*, 82 J. PERSONALITY & SOC. PSYCHOL. 503, 510–11 (2002) (finding that, although the individuals who were given the choice to change their minds about which photography prints to keep liked their choices less than those individuals who had no ability to change, individuals still preferred having the option to change).

²¹¹ See Dan Ariely & Klaus Wertenbroch, *Procrastination, Deadlines, and Performance: Self-Control by Precommitment*, 13 PSYCHOL. SCI. 219, 223 (“A rational decision maker with time-consistent preferences would not impose constraints on his or her choices.”).

²¹² See, e.g., T.C. Schelling, *Economics, or the Art of Self-Management*, 68 AM. ECON. REV. 290, 290 (1978) (discussing externally imposed self-control devices such as creating an inaccessible savings account and overstating dependents for tax purposes in order to reduce tax liability in April); see also Ariely & Wertenbroch, *supra* note 211, at 220–23 (analyzing the role of self-imposed deadlines in addressing temptation to procrastinate); Wertenbroch, *supra* note, at 318 (describing the strategic self-imposition of constraints in the context of purchasing cigarettes). Drug and alcohol rehabilitation programs require minimum stays and full payment (up-front) for the required treatment period, a part of which is kept if the patient checks out early. For example, the Cirque Lodge, a well-known facility of this type, has a thirty-day minimum stay and requires patients to pay for that thirty-day period at the time that they check in. See The Cirque Lodge, Admission Guidelines, <http://www.cirquelodge.com/Admission/AdmissionGuidelines.php> (last visited Aug. 7, 2007) (requiring that “[a] deposit for 30 days is due upon admission”).

²¹³ Littwin, *supra* note **Error! Bookmark not defined.**, at 470–71.

²¹⁴ For an overview, see Richard A. Kaplan, *Retirement Funding and the Curious Evolution of Individual Retirement Accounts*, 7 ELDER L.J. 283, 292–302 (1999).

²¹⁵ See Nava Ashraf et al., *Tying Odysseus to the Mast: Evidence from a Commitment Savings Product in the Philippines 2* (Apr. 11, 2004) (unpublished manuscript, on file with The Houston Law Review).

²¹⁶ See sources cited *supra* note 155.

will again have a competitive advantage over poorer households, even though they both have the same level of short-term impatience.

Illiquid investments can also provide commitment. The economist David Laibson has argued that people with long-term preferences to set enough money aside for retirement make highly illiquid investments in their youth—purchasing homes—to prevent themselves from overconsuming early in life, much like an IRA.²¹⁷ But this strategy often requires down-payments to acquire the illiquid durable good.²¹⁸ As we have noted, evidence suggests that down payment requirements are significant obstacles for poor households.²¹⁹ So again there are disparities across income levels in families' ability to self-commit.

It might be argued that a carbon tax rebate is itself a useful commitment device for recipients.²²⁰ In this view, the year-end rebate increases welfare for some impatient households. The family would prefer to save, but lacks the willpower to do so.²²¹ Delaying payment until year's end would, on this assumption, be a soft-paternalist intervention leading to higher social welfare.

There are several flaws with this welfare-increasing logic. First, it likely describes only some households. Others may be genuinely liquidity constrained, and would suffer large welfare losses from delayed payment. The policy challenge then becomes either balancing the gains of delay against the losses, or designing a regime that allows the government to sort the two kinds of households, and offer delayed payments only to those for whom delay would increase welfare.

²¹⁷ See David Laibson, *Life-Cycle Consumption and Hyperbolic Discount Functions*, 42 EUR. ECON. REV. 861, 868 (1998) (discussing commitment devices to deal with procrastination in saving for retirement, including channeling funds to illiquid assets such as defined benefit pensions, 401(k)'s, social security contributions, and home equity).

²¹⁸ Adams et al., *supra* note **Error! Bookmark not defined.**, at 57.

²¹⁹ See *supra* text accompanying notes 74--76.

²²⁰ See Barr & Dokko, *supra* note 120, at 2--3 (considering this argument, and reporting that many taxpayers claim that they intentionally over-withhold for this reason); Richard H. Thaler, *Anomalies: Saving, Fungibility, and Mental Accounts*, 4 J. ECON. PERSP. 193 (1990) (suggesting this behavior as an aspect of mental accounting).

²²¹ Barr & Dokko, *supra* note 120, at 5, 14.

We take up this challenge in Part IV. The second flaw is that postponing rebates to year's end may actually not be a long enough delay for many households: their need is to save for the much longer term, such as retirement needs.²²² We are thinking here of the families that quickly spend their rebates on luxuries. In these households, delay has simply moved spending from one low-utility usage to another. Here, too, we think there are possibilities for government intervention, and those, too, we set out in Part IV.

A final flaw is that self-imposed illiquidity is a highly inefficient response to impatience. Impatient households can prevent over-consumption by denying themselves access to funds.²²³ But they also thereby deny themselves benefits of income smoothing.²²⁴ The better mechanism would be one that gave the family access to just enough money to smooth their income without tempting them to spend too much. This is a tall order, but government policies can perhaps approximate it.

Lastly, one important characteristic of commitment devices that has been largely overlooked by the literature is that they require an immediate expenditure at the time of adopting them, and will produce a benefit in the future, when the actor keeps to its long-term preferences. As a result, households that are sufficiently sophisticated may have a long-term preference to adopt commitment devices, but if they require a sufficiently large up-front investment, they will have an incentive to procrastinate. Of course, they may adopt commitment devices to assure that they adopt commitment devices, but the same problem arises. As we will see in Part IV, this “meta-procrastination” problem is one reason why governments can increase social welfare by

²²² See Barr, *supra* note 94, at 123 (describing failure of low-income families to save for long-term goals).

²²³ Angeletos et al., *supra* note 84, at 48.

²²⁴ See Angeletos et al., *supra* note 84, at 59 (finding that hyperbolic households hold less liquid wealth, and accordingly “smooth consumption less successfully over the life cycle”); *cf.* Barr & Dokko, *supra* note 120, at 20 (finding that intentional over-withholding is inefficient unless household places extremely high value on present consumption over deferred consumption); *id.* at 22 (noting that commitment to defer refund can cause household to use high-cost debt for unexpected short-term needs).

providing off-the-rack commitment devices that parties can opt-into at a lower cost than if they had to create them from scratch.

H. Immediate vs. Delayed Taxes

It is not just the timing of a rebate that matters; the timing of the tax itself can also affect its level of effectiveness. Compare two types of tax schemes. In the first, the consumer will experience the tax immediately—e.g., a gasoline tax. In the second scenario, the consumer gets the benefit of consumption before it incurs the disutility of the tax, as with electricity which is billed at the end of the month. Assuming normal long-term discounting, a delay of one day, a week, or even a month between getting the benefit of consumption and incurring the added cost of the tax should not matter much. As a result, models that assume time-consistent households will predict that the tax will in essence work the same in both instances. On the other hand, our model predicts that the immediate tax will lead to a greater reduction in consumption than a delayed tax that is otherwise equivalent. In fact, assuming a short-term discount factor of 0.5, a TI household will perceive a immediate tax of \$1 as providing a disutility of \$2.

I. Summary

Short-sighted households will respond far differently to a combination of taxes and rebates than standard economic theory predicts. As we have shown here, even if short-sightedness is evenly distributed across incomes, the consequences of present bias will be especially disadvantageous to poor households facing a tax/rebate or tax/prebate system. Impatient spending can leave households with little money for end of the year necessities, and increase carbon usage overall. Commitment devices for overcoming this problem are expensive, and those afflicted by present bias may procrastinate investing in the, or even learning about their

need for them. And procrastination will likely slow poor households' investment in reducing their carbon usage, leading to a vicious cycle in which the burden of a carbon tax shifts more and more towards those families. Taken together, all these features point to an urgent need for policymakers to take cognitive factors into account in designing a rebate scheme. We take up that challenge in the next Part.

IV. DESIGN OF FAIRER CARBON TAX SYSTEMS

Thus far, we have shown that annual repayments to poor households do not achieve distributional neutrality of welfare. We do not propose, though, to maintain fairness even if it means the polar icecaps melt. Instead, drawing on existing research into behavioral economics, we suggest in this Part alternative formulations of transactional consumption taxes that we expect to perform better at recompensing poor households. First, though, we must say a few words about the inadequacy of some other versions of the consumption-tax offset we haven't yet covered.

A. Problems with Other Consumption Tax Offsets

To this point we have mainly critiqued the annual-rebate approach suggested by Metcalf and Weisbach, as well as by some defenders of the so-called "Fair Tax." As we noted earlier, other transactional consumption taxes use different methods to deal with the regressivity problem. These solutions, too, are unsatisfying.

First, the standard approach, common to both U.S. sales taxes and other nations' VAT, of exempting certain categories of expenditures is inefficient, and particularly unsuited to a carbon tax. As is well known, taxing some forms of consumption but not others encourages shoppers to switch to the untaxed options, reducing their welfare without generating any tax revenue for the

government.²²⁵ In addition, taxing some products more than others leads to difficult line-drawing problems, resulting in needless uncertainty and transaction costs.²²⁶ For instance, there is case-law on whether ice cream pops are “food” (exempt) or “candy” (not exempt).²²⁷ There is also a current EU dispute over whether arcade-type machines that show pornographic films are “automated recreation devices” (heavily taxed) or “cubical cinemas” (lightly taxed).²²⁸ And of course in the special case of a pigouvian tax such as the carbon tax exempting consumption of the item that policy makers wish to discourage use of would be counter-productive.²²⁹

Some jurisdictions have also tried to simply exempt persons below a certain income threshold from having to pay consumption taxes. This is, again, not a viable option for a carbon tax. For consumption taxes more generally, the problem is that the scheme creates “cliffs”: sharp discontinuities in tax treatment at certain income levels. That creates significant distortions in either actual or reported labor effort near the threshold.²³⁰ Another kind of fraud is also a problem: the use of straw purchasers to buy goods tax-free for those who ought to pay the consumption tax.

Lastly, other authors, evidently somewhat cognizant of the problem of some timing mismatches, have proposed rebates more frequently than once per year. Graetz suggests reducing payroll taxes in each paycheck; some versions of the “Fair Tax” would grant monthly prebates.²³¹ As we have shown, the problem of income smoothing does not arise solely across

²²⁵ Metcalf & Weisbach, *supra* note 4, at 513--14.

²²⁶ See Kirk Stark, *The Uneasy Case for Extending the Sales Tax to Services*, 30 FLA. ST. UNIV. L. REV. 435, 446--48 (2003) (explaining distortive effect of sales taxes on some goods but not others).

²²⁷ To choose but one of many such cases, see *O’Boyle’s Ice Cream Island, Inc. v. Pennsylvania*, 553 A.2d 1033, 1034--35 (Pa. Comm. Ct. 1989) (Answer: candy).

²²⁸ Charles Forelle, *A Peep at EU Tax Law. Read On. Really.*, posted to WSJ Blogs, Real Time Brussels, March 12, 2010.

²²⁹ Metcalf & Weisbach, *supra* note 4, at 514.

²³⁰ See Fennell, *supra* note 30, at 56 (noting this problem arises for any sharp income threshold).

²³¹ See *supra* text accompanying notes 47--50.

gaps of eleven months, but also from paycheck to paycheck.²³² In addition, these kinds of up-front payments continue raise similar dangers to those that we identified for prebates more generally: impulsive spending and other difficulties in saving for anticipated future costs. In Graetz's case, there is the further problem that he offers no obvious solution for those who do not work or work in the "informal economy" and so already pay no payroll taxes.

In short, other solutions are still needed.

B. Self-Directed Debit Cards

In the absence of effective other solutions, consumption tax designers must walk a narrow path between two opposing sets of problems. On the one hand, making rebate funds available too early can tempt time-inconsistent households into spending too soon, leaving them with insufficient funds to cover their later tax and essentials, and potentially raising carbon emissions overall. On the other, locking funds away until the end of the year may leave those households who would prefer not to have saved worse off, and will make all of them more vulnerable to short-term fiscal crises. What is needed, then, is an instrument that will make the rebate available throughout the year, but not *too* available, and especially not so available as to tempt the impatient.

We suggest that self-directed debit cards, or "SDD's," can fill this need. Angela Littwin has previously suggested the creation of what she calls "self-directed credit cards": cards that would the enable to choose in advance to limit the amount of credit that would be available to them.²³³ Littwin's solution is similar to a proposal by David Laibson, who suggested "a bank account that requires advance notification for withdrawals" as a way to limit impulsive

²³² See *supra* text accompanying notes 92--115.

²³³ Littwin, *supra* note 66, at 485--88.

spending.²³⁴ The SDD fits squarely in between these two ideas. The card would grant the holder access to any account into which the government would deposit the holder's tax rebate.

However, the card would by default permit only a limited amount of money to be withdrawn each week --- 1/52 of the total, say. Holders could change this default to increase or decrease the amount of money available, but only with some minor but cumbersome effort---filling out and mailing in a form, or making a phone call to a slightly understaffed calling center. This opt-out would grant access to additional funds a short time later, such as 24 hours.

This combination of defaults offers the benefits of income smoothing to all taxpayers, while reducing the likelihood of impulsive spending by those who are present-biased. Taxpayers who place only a small discount on future costs and benefits will easily bypass the minor impediments to obtaining extra credit. But these taxpayers are not those who are likely to overspend. Over-spenders, as we have modeled, are those with a $\beta < 1$; that is, they value immediate costs and gains considerably more than equivalent gains and losses in the future. That is the psychological dynamic that causes them to spend their rebate, even though they may know they will need the money later to pay their tax or other important bills. This same dynamic also causes procrastination: even a small, immediate cost looms much larger than substantial future gains. As Laibson explains, the annoyance of having to opt out of the credit limit *now* appears much more significant than the benefit of getting extra money *tomorrow*.²³⁵ The delay in any gratification also will limit tendencies towards impulsive spending. But, in cases of genuine need, the money is still there for the household to use.

We also want to emphasize the usefulness of allowing card-holders to decrease the amount of money available on the card for any given period. This has several advantages.

²³⁴ David J. Laibson, *Hyperbolic Discount Functions, Undersaving, and Savings Policy*, NBER Working Paper No. 5635 (June 1996), at 21--22.

²³⁵ *Id.*

Sophisticates, those who know that they have a $\beta < 1$, may wish to set their limit even lower than the default to prevent any impulsive purchases. As we noted, many taxpayers attempt to use tax rebates as a form of forced savings, but that technique sacrifices liquidity that may be vital in the event of emergencies. Many such families also immediately spend the rebate when it becomes available.²³⁶ The SDD can overcome both these problems: money is available when needed, but psychologically difficult to access. And we would also suggest a feature allowing card-holders to commit in advance (albeit with a cumbersome opt-out) to transfer any year-end balance to a linked savings account, as in Thaler and Sunstein's "save more tomorrow" plan,²³⁷ so that they will not be as tempted to spend the funds.

An alternative version of this plan would simply allow the government itself, or qualified intermediaries, to loan rebate proceeds to recipients. The loan program could include many soft limits similar to those that would exist with the debit-card, such as a default cap, waivable with some effort by the recipient, on the amount of loan funds available in any one week or month. We prefer the debit card, however, because it would also have the significant advantage of giving access to modern banking to the large segment of poor households who currently lack it.²³⁸

Each of these alternatives offers a number of significant benefits. For one, they provide affordable income smoothing together with accessible commitment devices for households that usually cannot easily pay for either, increasing welfare with little government expenditure.²³⁹ Expanding access to credit could save government dollars in other programs, such as food

²³⁶ See sources cited *supra* note 70.

²³⁷ Thaler & Sunstein, *supra* note 18, at 105--119.

²³⁸ On the advantages of expanding banking access, see Barr, *supra* note 94, at 176.

²³⁹ *Cf.* Fennell & Stark, *supra* note 12, at 47 (noting that a tax system that facilitated income smoothing could increase welfare cost-effectively).

stamps and free health care, as families will be more able to pay their own way.²⁴⁰ Though a debit card program might carry some administrative costs, it could also be piggy-backed on existing government e-payments, such as the “EBT” program used to deliver food stamps.²⁴¹

Indeed, these plans seem so sensible to us that we see no reason to limit them to consumption tax rebates. In particular, offering income smoothing through a government-issued self-limited debit seems an excellent vehicle for delivering the Earned-Income Tax Credit, a form of social insurance designed for poor working families and administered through the federal income tax.²⁴² Currently, many households use refund anticipation loans to get early access to their EITC payment, with the result that much of the value of the EITC is skimmed off by RAL providers.²⁴³ Admittedly, government provision of the loan services would diminish the providers’ profits, effectively transferring wealth from the RAL-provider’s shareholders to poor households. Assuming, however, that the shareholders are on average much wealthier than the rebate recipients, that transfer should increase substantially overall social welfare.²⁴⁴

C. Accelerate the Costs of Carbon

As we have described, in the special case of a pigouvian consumption tax, such as a cap-and-trade regime, present-biased consumers may over-consume the undesirable good, especially if given a rebate in addition to their existing funds. Here, again, it is possible to nudge consumers away from socially undesirable behavior. In particular, since the problem stems from

²⁴⁰ See Sullivan, *supra* note 66, at 37.

²⁴¹ We owe this piggyback idea to the CBPP, which has also argued for providing any carbon tax rebate electronically, albeit without mentioning any of the cognitive features we have highlighted. Greenstein et al., *supra* note 11, at 10--1.

²⁴² T.C. § 32.

²⁴³ See National Consumer Law Center, Inc., *supra* note 110, at 12.

²⁴⁴ Alternatively, society could reduce the total transfer to rebate recipients to leave them at the same level as they formerly received, net of RAL fees. This might be superior in welfare terms to shifting all the money to recipients in the event that society has some third use for the money that generates more welfare than either other option. This could include a more efficient means of improving the well-being of the rebate recipients.

consumers overvaluing the present, policy-makers should attempt to shift the costs of carbon consumption forward. This can be done while maintaining distributional neutrality.

If government adopts the self-directed debit card, one approach to accelerating the apparent costs of carbon might be to “penalize” carbon-intensive purchases. The carbon-tax component of any purchase might count double or triple against the card’s weekly allocation. That will make it harder to make large, impulsive carbon-intensive purchases, and even small purchases will threaten to force the holder to engage in an unpleasant opt-out procedure.

Whether or not debit-cards are in use, the government could also require the “purchase” of a license to use carbon-intensive products, such as gasoline. The money for the license would be rebated, plus interest, at the end of the month or year. However, since present-biased consumers have a discount rate much higher than the market rate, this exchange will feel like a loss, making high-intensity carbon consumption much less attractive.

V. OBJECTIONS & QUESTIONS

To this point we have argued that putatively distributionally-neutral consumption taxes in fact may reduce welfare for short-sighted households, and suggested some “nudge”-like solutions. In this Part we consider in depth two important objections. Both objections go to the foundations of our project. First, it might be argued that distributive fairness should be measured, not annually, but instead across the entire span of each individual’s lifetime. In the long gaze of a lifetime view, brief timing mismatches between income and expenditures might be no more than a blink of a welfarist’s eye. Secondly, it could also be claimed that individuals who choose to forego borrowing against a rebate or consume quickly their prebate are simply maximizing their own preferences, and therefore that it would be paternalistic to change those

outcomes. We believe both these objections are misplaced, but recognize that for others they will retain strong appeal.

A. Lifetime vs. Annual Equity

Metcalf and other environmental economists argue that the best measure of the burden of an emissions tax would be based on its total effects over a lifetime.²⁴⁵ Thus, for example, a few studies claim that seen from a long-term perspective carbon taxes are not as regressive as others claim.²⁴⁶ The lifetime perspective is said to mitigate inequality for several reasons. Most simply, if individuals can save and borrow perfectly, the economic burden of any one year could be spread out over their life, so that any nonrecurring expense affects welfare only if it reduces total lifetime income.²⁴⁷ We have already shown, however, considerable evidence that individuals cannot effectively smooth the impact of a tax and rebate system over even short periods, let alone their lifetimes. As a result, whatever its general merits, this version of the lifetime equity theory offers no reason to set aside the distributional consequences of a consumption tax.²⁴⁸ The other versions are more challenging, as we now explain.

1. Problems Identifying High Marginal-Utility Households

A second argument in favor of lifetime equity suggests that even if saving and borrowing is imperfect, there frequently remains a mismatch between income and true wealth, so that a

²⁴⁵ Bull et al., *supra* note 15, at 145; Kevin A. Hassett, Aparna Mathur, & Gilbert E. Metcalf, *The Consumer Burden of a Carbon Tax on Gasoline*, AEI Working Paper #147, at 3 (May 26, 2009); Jorgenson et al., *supra* note 27, at 395; see also Don Fullerton & Diane Lim Rogers, *Lifetime Versus Annual Perspectives on Tax Incidence*, 44 NAT'L TAX J. 277, 277--78 (1991) (making this argument about taxes generally).

²⁴⁶ Bull et al., *supra* note 15, at 146, 161; Burtraw et al., *supra* note 59, at 22; Hassett et al., *supra* note 245, at 9; Jacobsen et al., *supra* note 36, at 486.

²⁴⁷ Hassett et al., *supra* note 245, at 3.

²⁴⁸ See Shaviro, *supra* note 34, at 771 (explaining that where some taxpayers cannot borrow fully, lifetime income mis-measures welfare, since a dollar may have different utility to the taxpayer at different times); Dinan & Lim Rogers, *supra* note 5, at 217 (suggesting that since capital markets are not perfect, annual incidence is also important). Some lifetime equity proponents acknowledge this point. Bull et al., *supra* note 15, at 149.

person with low income this year might still derive relatively little marginal utility from government transfers.²⁴⁹ This would raise the possibility that current income, and even current measurable wealth, do not always clearly predict an individual's marginal utility from money. The goal of a distributionally-neutral tax is to make certain that the welfare effects of a tax scheme are shared equally across the population.²⁵⁰ In order to make such a scheme work, the government must make assumptions about how much utility a household will lose from an expenditure of a given amount. Conventionally, we assume that households with the least wealth will suffer the most from a set amount of tax.²⁵¹ But if some households have unmeasurable wealth, those assumptions are untrue.²⁵² Proposals aimed at helping the poor might be too generous to these families.

To take a concrete example, consider two three--person households with annual earnings of \$20,000, the Busdrivers and Students. The Busdriver family has a head of household in the middle of her career and at the peak of her earning potential. The Student family is headed by a young woman enrolled in law school (her annual income comes from three months at a law firm). If hit by a consumption tax, both may be able to rely on credit to get them through their tight times. But if so the ultimate burden of paying off those loans will be far lighter for the Students. For the Busdrivers, the additional payments will always be a significant chunk of household income, while someday the Students' credit-card bills will represent only a tiny fraction of their budget.²⁵³ So the welfare effect of the tax this year is equal for both households,

²⁴⁹ Bull et al., *supra* note 15, at 148; Hassett et al., *supra* note 245, at 2--4; Jacobsen et al., *supra* note 36, at 478; see Fullerton & Lim Rogers, *supra* note 245, at 278 (observing that workers with "average permanent income" but volatile incomes may be misidentified as poor).

²⁵⁰ Metcalf, *supra* note 4, at 14.

²⁵¹ Harsanyi, *supra* note 42, at 254.

²⁵² Hassett et al., *supra* note 245, at 2; see Bull et al., *supra* note 15, at 148 ("[E]lderly people drawing down their savings in retirement will look poor when in fact they may be comfortably well off in a lifetime context.").

²⁵³ Of course, it is also possible that the Busdriver family will not borrow to make up for lost present consumption -- for example, because they anticipate their future liquidity crunch, and thus refrain from incurring more debt. But

but in time the Busdrivers struggle more. If society has many more Students than Busdrivers, what looks like an unfair tax this year may turn out to be a minor nuisance.

One problem with this argument is that it appears to assume that the social welfare function is based on long-term rather than current utility. To remind our readers, the social welfare function is the sum of everyone's preferences, including their preferences for the distribution of other goods.²⁵⁴ In this way, the hardships of poor families can enter the social welfare function two ways: directly, and also through the preferences of others for societies with much or little such hardship.²⁵⁵ Thus, a society in which most people would prefer to see extensive redistribution from rich to poor might be made worse off by a policy change that increased total wealth by transferring money from poor to rich.²⁵⁶

Accordingly, in asserting that lifetime well-being is more important than current utility, lifetime equity proponents are actually making two separate claims, one normative, the other descriptive. On the normative side, the proponents are assuming that future welfare effects should be counted as part of the total welfare effect of a current-year policy.²⁵⁷ We agree that is a sensible thing to do --- no one would want to make everyone \$1 richer today by bankrupting us all next year --- but it raises the question of whether there ought to be a time discount. Most bankers would rather have money now than next year.²⁵⁸ Should the social welfare function

in that case we can easily measure the difference between the two families, based on their borrowing behavior. The more difficult case, which we take the lifetime equity proponents to be focused on, is the one in which present observers cannot distinguish the well-being of the two families.

²⁵⁴ ADLER & POSNER, *supra* note 22, at 23.

²⁵⁵ ADLER & POSNER, *supra* note 22, at 25.

²⁵⁶ See Inge Mayeres & Stef Proost, *Marginal Tax Reform, Externalities and Income Distribution*, 79 J. PUB. ECON. 343, 355 (2001) (arguing that social welfare function should include measure of society's aversion to inequality).

²⁵⁷ That is, the lifetime equity position seems to be that in deciding whether a consumption tax is unfair, we must measure not by what happens this year, but instead what happens over the entire lifetime of those affected.

²⁵⁸ Solum, *supra* note 23, at 196.

count effects fifty years hence as having the same value as those that happen now? There is a complex literature on this question, which we want only to flag and sidestep for now.²⁵⁹

On the descriptive side, preferences for fair present distributions might outweigh any other welfare effects. Even if lifetime equity is superior as a normative matter, it is possible that popular distributive preferences rest on judgments about *current* welfare.²⁶⁰ That is, people may care that others suffer now, even if those same others will be better off later (or vice-versa). That preferences might be present-oriented in this way strikes us as both plausible and morally defensible.²⁶¹ If people care about what their society looks like, they may care about what it looks like *now*, or what it looks like by measures that are more readily observable than lifetime welfare. In any event, for a welfarist who takes preferences largely as given, whether society prefers to measure distribution on a yearly or lifetime basis is a descriptive question --- a question of fact. A society with strong preferences for current distributions might view itself as worse off as a result of a consumption tax even if the directly-entering lifetime utility portion of the social welfare function is positive. Neither we nor lifetime-equity proponents can resolve the issue through abstract debate.

²⁵⁹ For extended discussion, see Nancy J. Altman, *Social Security and Intergenerational Justice*, 77 GEO. WASH. L. REV. 1383 (2009); Neil H. Buchanan, *What Do We Owe Future Generations?*, 77 GEO. WASH. L. REV. 1237 (2009); Daniel Shaviro, *The Long-Term U.S. Fiscal Gap: Is the Main Problem Generational Inequity?*, 77 GEO. WASH. L. REV. 1298 (2009).

²⁶⁰ See Solum, *supra* note 23, at 199 (noting that presentists would count welfare of future lives only to the extent that current generation has preferences for the treatment of the future).

²⁶¹ While the moral question is, again, one that we wish largely to bracket, we should say a word or two to suggest the plausibility of the “presentist” view. (We owe this term to Solum, *supra* note 23, at 198.) One possibility is that moral obligations to provide for the welfare of others are cabined by our ability to know others’ well-being. We cannot be held responsible for what we cannot reasonably know. Lifetime utility may well be sufficiently unknowable that it cannot serve as the basis for our responsibilities. See Dinan & Lim Rogers, *supra* note 5, at 218 (“It is not possible to actually observe lifetime income for individual households . . .”). Another possibility would be that our obligations flow to others with whom we are engaged in an ongoing project of mutual governance. We share that project only partially with those who will follow us; perhaps they will honor our decisions, but perhaps not. If not, it may be reasonable for us to assume that the long-term results of our decisions are largely out of our hands, in the same way that the welfare of citizens of other nations is only tenuously connected to our own acts. *But cf.* JOHN RAWLS, JUSTICE AS FAIRNESS: A RESTATEMENT 160 (Erin Kelly ed. 2001) (arguing that members of community owe obligation to leave as many resources to next generation as members would have wanted previous generation to leave to them).

Even if lifetime wealth were the appropriate theoretical yardstick for household welfare, the policy implications would likely be small. Again, the upshot of the lifetime equity critique we are discussing now is that current wealth or income are sometimes poor predictors of welfare. However, according to the literature, these errors are all false positives --- instances where a family that looks poor is not.²⁶² But false positives here are much less significant for policy design than false negatives. The cost of a false positive is relatively small: society grants a rebate to a family that does not need one.²⁶³ The cost to society is the opportunity cost of the use of these funds --- that is, the money for the rebate reduces general funds available for other uses. So we must either give up that much in other programs, or raise taxes by an equivalent amount. If we choose to raise taxes, the cost of the false positive is the incremental deadweight loss of the higher tax rate.²⁶⁴ Unless false positives are large relative to the size of the entire population, the change in tax rates needed to pay for them will be minor.²⁶⁵

²⁶² Hassett et al., *supra* note 245, at 2; *see* Bull et al., *supra* note 15, at 148.

²⁶³ Note that the amount of the erroneous transfer to the Student family is not a loss to society, since the Students' welfare also counts towards the social welfare function.

²⁶⁴ "Deadweight loss" refers to the welfare cost to society of raising taxes. For example, if I prefer watching hockey to watching curling, but hockey is taxed, I may attend a curling match instead of a hockey game. That decision lowers my welfare, without raising any additional revenue for the government. This loss of welfare is the "deadweight loss" of the tax. RICHARD A. MUSGRAVE & PEGGY B. MUSGRAVE, *PUBLIC FINANCE IN THEORY AND PRACTICE* 280 (5th ed. 1989).

Measuring the deadweight loss of carbon taxes is a complex undertaking because of the way in which they can interact with existing taxes and policies. Ekins & Barker, *supra* note 15, at 82--89. However, there is no particular reason society must use higher carbon taxes to pay for extra rebates. In theory, a policy-setter should choose the revenue instrument with the least deadweight loss. Estimates of U.S. taxes have found deadweight losses of some forms of tax as low as 17%. Charles L. Ballard et al., *General Equilibrium Computations of the Marginal Welfare Costs of Taxes in the United States*, *AM. ECON. REV.* 128, 128 (1985).

Even if the increased costs are to be paid strictly out of carbon tax revenues, that choice might actually increase welfare. It seems likely that any carbon price will initially be set below optimal because of political opposition from industries that will bear some of the burden of the tax. *Cf.* James Murray, *Climate Bill Democrats Unveil Free Pollution Permit Proposals*, *BUSINESSGREEN*, Oct. 26, 2009 (reporting likelihood of "giveaways" of carbon dioxide permits in proposed legislation). In that case, increases in the carbon tax rate will actually improve overall efficiency.

²⁶⁵ For example, suppose a rebate of \$1,200, the average current estimate. *See supra* note 11. At 17%, *see* Ballard et al., *supra* note 264, at 128, that implies a deadweight loss per error of \$204. We assume here that recipients of false-positive rebates are, on average, no richer or poorer than the general population, so that the erroneous redistribution has no other welfare effects.

In contrast, the utility losses from false negatives are large. We define a false negative here as a failure to award a rebate to a family that would suffer disproportionately from a consumption tax in the absence of the rebate --- failing to recognize a poor household as poor. Thus, the social cost of a false negative is the amount of welfare that would have resulted from transferring the rebate to a poor family.²⁶⁶ As we have discussed, evidence from the cost of credit and other factors suggests that the welfare consequences of these accidental redistributions can be dramatic for impoverished families.²⁶⁷ And in addition to the cost to these families directly, society would also experience a loss of welfare from failing to achieve its own subjectively-defined preferred fair distribution.

The relative sizes of false positives and negatives are important because they imply that policies aimed at eliminating false positives are quite likely to be misguided. In order for a false-positive-reducing policy to increase social welfare overall, we would need to be confident that we eliminated many more false positives than negatives with the policy. Considering that the very premise of the false-positives argument is that measurements are difficult and take generations to assess,²⁶⁸ it is hard to believe we could draw that conclusion with any confidence. So, for instance, a policy aimed at denying rebates to families with long-term borrowing potential would likely be a welfare loser: while it would cut off the rebate from some Students, it would also accidentally deny rebates to some needy Busdrivers. Unless the policy successfully

²⁶⁶ Put another way, the cost of the false negative is the utility of the rebate in the poor family's hands minus the average utility of that same amount in the hands of other taxpayers.

²⁶⁷ Recall that many households are willing to pay fees on the order of \$30 to \$135 in order to accelerate a paycheck by no more than two weeks, for an annual percentage rate between 150 and 300%. *See supra* text accompanying notes 109--113. At the lower bound, that is roughly twenty to thirty times what middle-income borrowers would pay. Although some of these excess payments may be due to mistakes, for rational borrowers this price differential implies a very substantial difference in the perceived utility of additional funds. *But cf.* Alvin Warren, *Would a Consumption Tax Be Fairer Than an Income Tax?*, 89 YALE L.J. 1081, 1100 (1980) (doubting that preferences for present over deferred income can be used to measure the utility of use of that income). Unfortunately, we cannot put a precise number on this cost, as (somewhat infamously) economics has no established tools for doing so.

²⁶⁸ Bull et al., *supra* note 15, at 148.

finds many more Students than Busdrivers, it will reduce social welfare. It may be true that some families that look poor by some measures in fact would not be not heavily burdened by a consumption tax. But that is small comfort to those that are persistently poor.

2. Even Steven Theories

A third version of the lifetime equity claim, albeit one mostly inchoate in the economics literature, seems to assume that inequalities even out over time, regardless of whether income smoothing is possible.²⁶⁹ Seinfeld fans might call this the “even steven” theory.²⁷⁰ In this view, lifetimes have more moral significance than any arbitrary unit of measured time, so that a policy that is unfair to some is justifiable if it is later unfair in favor of those same individuals.²⁷¹ For example, though the elderly are hit harder by a consumption tax because they spend a larger portion of their budget,²⁷² we should not be concerned, because in their youths they mostly saved and so avoided much of the burden of the tax.²⁷³

²⁶⁹ For example, the so-called “additive” lifetime utility function presumes that we ought to compare individuals simply by adding up all the good and bad that happens to them throughout their life. See Jorgenson et al., *supra* note 27, at 400 (measuring equity of carbon tax assuming an “additive intertemporal utility function”). Thus, the claim that a carbon tax is not regressive over the lifetime, utilizing an additive utility function, assumes that good events happening later in life can counterbalance bad events earlier, and vice-versa.

²⁷⁰ *Seinfeld: The Opposite* (NBC television broadcast May 19, 1994).

²⁷¹ See Fullerton & Lim Rogers, *supra* note 245, at 278 (asserting that one measure of distributive fairness of a tax is its total lifetime burden). We assume this view does not contemplate the charlie browns of the world, who justifiably ask, “Why isn’t [life] ever unfair in my favor?”

We concede that this may be a straw-man version of the argument, but we are unaware of any more sophisticated articulation.

²⁷² Malcolm Gillis, Peter Mieszkowski and George R. Zodrow, *Indirect Consumption Taxes: Common Issues and Differences Among the Alternative Approaches*, 51 TAX L. REV. 725, 746-48 (1996).

²⁷³ See Bull et al., *supra* note 15, at 161 (“[B]ecause energy taxes have different incidence effects across the life cycle, it is important to measure the burden of taxes in terms of lifetime incidence...”); Fullerton & Lim Rogers, *supra* note 245, at 278 (stating that patterns of income and spending across age groups should be factored into analysis of the fairness of the incidence of a tax).

This theory depends, however, on several questionable assumptions. First, it presumes that what happens to a person later in life is morally relevant to their earlier experiences. That is not necessarily the case, as Professor Zelenak has recently argued.²⁷⁴

Next, while we would not go as far as Zelenak suggests his arguments can be taken, we agree with Lee Fennell that any sophisticated “even steven” theory must explain how to account for gaps in time between good and bad events.²⁷⁵ Even putting aside the diminishing marginal utility of wealth, families may prefer to have good events happen sooner and bad events later. Studies suggest that most people in fact have preferences for the timing of their consumption.²⁷⁶ If government policy disrupts this pattern, it ought arguably to overpay in order to compensate for the time value of the misplaced consumption.²⁷⁷ In addition, of course, there is the basic question of the time value of gains and losses.²⁷⁸

Lastly, the even-stein analysis assumes a perfectly designed set of transition rules.²⁷⁹ At the time of implementation, a new consumption tax will affect households at all stages of life. If the tax evens out only over a lifetime, many will never even out. Thus, for lifecycle balancing to work, already-existing households must get special rules, whether grandfathering, extra rebates, or something else.

²⁷⁴ Lawrence Zelenak, *Tax Policy and Personal Identity Over Time*, 62 TAX L. REV. 333, 338, 357--66 (2009).

²⁷⁵ Fennell, *supra* note 30, at 12--13; *see also* Neil Buchanan, *The Case Against Income Averaging*, 25 VA. TAX REV. 1151, 1178--81 (2006) (doubting that multi-year comparisons between most taxpayers are meaningful).

²⁷⁶ Browning & Lusardi, *supra* note 30, at 1811; *see* Fennell & Stark, *supra* note 12, at 51--52 (summarizing other studies).

²⁷⁷ *Cf.* Brian Galle, *Federal Fairness to State Taxpayers: Irrationality, Unfunded Mandates, and the “SALT” Deduction*, 106 MICH. L. REV. 805, 849--50 (2008) (arguing that in order for the benefits and burdens of government to even out over time, government must compensate citizens who must wait for the benefits). Further, both planning for and adjusting to misfortunes may carry additional costs, Shaviro, *supra* note 34, at 772--73, which would also have to be accounted for in order to balance the welfare ledger.

²⁷⁸ *See* Joseph E. Stiglitz, *Utilitarianism and Horizontal Equity: The Case for Random Taxation*, 18 J. PUB. ECON. 1, 30 (1982) (observing that the opportunity for savings implies that lifetime smoothing of year-to-year inequalities may still be inequitable).

²⁷⁹ *Cf.* ADLER & POSNER, *supra* note 22, at 20--21 (stating that Kaldor-Hicks claim that utilities can even out over time fails to account for transition costs).

B. Paternalism

Another common argument against government policies aimed at remedying cognitive or willpower failures is that they are paternalistic. In the strongest form of the paternalism objection, the complaint is that the government cannot second-guess choices other individuals make; if an individual acts, we must presume that her actions maximize her welfare.²⁸⁰ A less-sweeping version of the objection acknowledges that people can make mistake with their own choices, but claims that government should not help to correct those errors, because government intervention reduces our incentives to learn to make better decisions for ourselves.²⁸¹ We have both taken issue with these kinds of arguments in more detail elsewhere.²⁸²

For our purposes here, we simply accept the possible validity of either form of the paternalism objection, but note that neither has much bite in the context of the consumption tax problem and the solutions we recommend for it. In the case of the strong form of the objection, claiming that government should not second-guess revealed preferences is futile because second-guessing here is inevitable. As Sunstein and Thaler have pointed out, designers of a government service must make decisions about how to structure their program, and every possible structure

²⁸⁰ See Claire A. Hill, *Anti-Anti-Antipaternalism*, 2 NYU J. L. & LIBERTY 444, 445 (2007) (arguing that consumer choice is best available evidence of what consumers want); Robert Sugden, *On Nudging*, 16 INT'L J. ECON. BUS. 365, 365--73 (2009) (reviewing RICHARD H. THALER & CASS R. SUNSTEIN, *NUDGE* (2008)) (claiming that "nudging" allows policy makers to substitute their own preferences for those of the public). *But cf.* On Amir & Orly Lobel, *Stumble, Predict, Nudge: How Behavioral Economics Informs Law and Policy*, 108 COLUM. L. REV. 2098, 2120--23 (2008) (acknowledging claim that nudges impose normative judgment of public officials but arguing that this is both inevitable and desirable).

²⁸¹ Jonathan Klick & Gregory Mitchell, *Government Regulation of Irrationality: Moral and Cognitive Hazards*, 90 MINN. L. REV. 1620, 1626, 1633--41 (2006). Glaeser argues in addition that in the abstract governments will be less apt at identifying cognitive errors. Edward L. Glaeser, *Paternalism and Psychology*, 73 U. CHI. L. REV. 133, 142--49 (2006). But this argument is less trenchant as a reason to oppose responses to an already-identified error, although it does suggest that any third party should be appropriately modest in their beliefs that their solution is the right one.

²⁸² Brian Galle, *Federal Fairness to State Taxpayers: Irrationality, Unfunded Mandates, and the "SALT" Deduction*, 106 MICH. L. REV. 805, 819--23 (2008).

may well have cognitive implications.²⁸³ Responsible designers who wish to maximize welfare must attempt to assess the welfare consequences of each alternative. In Sunstein and Thaler's example, a cafeteria must decide which food to put nearest to the register; those foods will sell better than others.²⁸⁴ So, does the cafeteria want to sell more fruit or more Twinkies? It is no answer to say that we should simply respect consumers' revealed preferences, because which preference is revealed itself depends (literally, in the cafeteria example) on the architecture of the choice.²⁸⁵

Similarly, designing a consumption-tax rebate offers a choice of evils. If the rebate is issued at the end of the year, some individuals will fail to smooth that income forward over the course of the year. Arguably, that is evidence of a preference for savings, which an anti-paternalist would say ought to be respected.²⁸⁶ If instead the government issues a prebate, some individuals will spend the money immediately, again failing to smooth over the year. That, too, is a preference arguably entitled to respect. So a responsible welfare-maximizing planner choosing between these alternatives (or, as we will explain, some hybrid combinations) must necessarily make a judgment about which set of preferences she would prefer to satisfy.

Sunstein and Thaler also emphasize that the paternalism objection is blunted when government policies preserve opportunities for choice.²⁸⁷ No one has to buy a banana just because it sits, all yellow and temptingly packed with potassium goodness,²⁸⁸ beside the register. Similarly, prebate recipients need not spend down their prebate in the month after it hits their

²⁸³ Thaler & Sunstein, *supra* note 18, at 240--41, 249--50.

²⁸⁴ *Id.* at 1--3.

²⁸⁵ *See id.* at 2 (arguing that attempting to arrange food in way that consumers would want begs question of how to know which choice consumers would prefer).

²⁸⁶ Of course, this assumes we are confident there are no liquidity constraints.

²⁸⁷ *See* Thaler & Sunstein, *supra* note 18, at 240 (distinguishing their suggestions from other forms of paternalism because theirs still "retain freedom of choice").

²⁸⁸ *See* HESTER H. VORSTER AND FRANS J. KOK, INTRODUCTION TO HUMAN NUTRITION, 192--93 (Michael J. Gibney ed., Blackwell 2002).

mailbox. Policy options that merely structure, rather than determine, outcomes are more consistent with individual freedom.²⁸⁹

In an important recent draft, Lee Fennell largely agrees with these points but argues that “an unheeded nudge leaves the opter-out worse off than before.”²⁹⁰ She claims it is unclear whether the cost of this added burden for those who (wrongly) override the government’s default outweighs the benefits of nudging others in the right direction.²⁹¹ We think this worry is overstated. As we have argued, part of the efficacy of defaults is that they trade on the inherent present-bias of time-inconsistent actors. The actual cost of overcoming the default is tiny; it is only the fact that it must be incurred *now* that makes it loom large.²⁹² Thus, while we agree that the costs of opting out can be deadweight losses for some individuals, those losses are likely to be small (viewed *ex post*) relative to the benefits that would accrue to those who abide by the default.

Under the second form of paternalist objection, though, even choice architecture and default rules are suspect. For example, Klick and Mitchell aver that default rules weaken our ability to correct our own errors by rendering us mentally lazy, dependent on the government to spot our mistakes and design defaults to avoid them.²⁹³ That is, government aid induces a kind

²⁸⁹ We acknowledge that this position does not fully answer the objection that government lacks adequate information to set the correct default position. *See, e.g.*, Glaeser, *supra* note , at 151 (claiming that libertarian paternalism is unattractive to those who think that problem with paternalism is government errors). The opportunity for individual choice, however, will tend to limit the size of any government error, because if the default is wrong by a sufficiently large amount then we should expect a larger portion of the population to reject it.

²⁹⁰ Fennell, *supra* note 30, at 44–45.

²⁹¹ *Id.* at 45–46.

²⁹² This feature allows policy makers to design defaults that are specifically targeted at people who are present-biased; individuals who do not heavily discount future costs & benefits simply override the default and choose their own rule.

²⁹³ Klick & Mitchell, *supra* note 281, at 1626; see also Fennell, *supra* note 30, at 28 (noting this possibility).

of moral hazard, which individuals fail to invest in efforts to reduce cognitive errors because the government is insuring them against cognitive losses.²⁹⁴

If we have understood the “cognitive hazard” argument correctly, though, it does not follow that government should refuse to prevent cognitive errors. Insurance that induces moral hazard is not always welfare-reducing, depending on the costs of under-investment and the value of insurance.²⁹⁵ So the appropriate cognitive policy analysis for Klick and Mitchell should be a balancing between hazard costs and “insurance” benefits.

While we admit hazard costs are difficult to specify, there is reason to think that the “insurance” benefits of a well-designed consumption tax are very large. For one thing, as we have seen, errors in income smoothing can be very costly in utility terms for low-income families. Perhaps more importantly, there is evidence that self-help mechanisms for overcoming those errors are simply ineffectual.²⁹⁶ If taxpayers are using their rebates as a form of forced savings to overcome their temptation to immediate spending, they are doing an extremely poor job of it: many save only until the end of the year, then quickly dissipate the rebate.²⁹⁷ Yet there is little reason to think that May of the following year is consistently the best time to spend a year’s savings.

In the face of such persistent failures, it would not be surprising if a hands-off government policy actually weakened willpower by demoralizing those who try and repeatedly fail to restrain themselves. A well-designed policy might actually increase incentives to invest in willpower by

²⁹⁴ Klick & Mitchell, *supra* note 281, at 1626.

²⁹⁵ On the tradeoffs between insurance and moral hazard, see Martin Neil Baily, *Some Aspects of Optimal Unemployment Insurance*, 10 J. PUB. ECON. 379, 379--402 (1978).

²⁹⁶ See GEORGE AINSLIE, BREAKDOWN OF WILL 143--60 (2001) (discussing commitment devices and their failures); Angeletos et al., *supra* note 84, at 59 (describing how use of illiquid investments as commitment device lowers overall welfare); Barr & Dokko, *supra* note 120, at 20--21 (finding that taxpayers are inefficiently overwithholding to generate tax rebates).

²⁹⁷ *Id.* at 16.

increasing the returns to investment. We hope that our proposals would move policy in that direction.

VI. CONCLUSION

Overall, it seems clear that the consumption tax literature has yet to truly grapple with the welfare implications of major transactional consumption taxes. That is especially true of economic dislocations that will surely attend any efforts to slow the onset of global climate change. We have attempted to set out here evidence that, at a minimum, human cognition and credit markets will play large roles in the ultimate fairness of any carbon tax. We have also suggested several novel solutions that could mitigate these distributional impacts while still allowing climate-change prevention to move forward. No doubt, however, there are other and better solutions; we hope our contributions offer a small step towards finding them.

