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Sin Taxes: Good, Better, Best

Hunt Allcott, Benjamin Lockwood, and Dmitry Taubinsky

Economists have long recognized that is the optimal design of corrective taxes has been a growing belief that some goods selves such as overconfidence, or lapses of self-control. One of the agendas that we have pursued at the intersection of pub-

when consuming a good produces exter- and subsidies to mitigate both externalinalities, welfare can be raised by impos- ties and internalities. Relative to extering corrective taxes. More recently, there nalities, internalities have received much less attention from economists, but they should be taxed because of *internali*- have been a key focus of our work — and, *ties*—harms that people might impose on guantitatively, we have found that they themselves due to limited attention, mis- are as significant as externalities. Taxes Another domain concerns appliances or understanding of financial instruments, addressing externalities and internalities systematically biased beliefs about them- are sometimes referred to colloquially as "sin taxes."

There are several domains where economists and policymakers worry lic economics and behavioral economics about both externalities and internali-

ties. One concerns goods that are ostensibly harmful to health, such as cigarettes, alcohol, and sugary drinks. The externalities include burdens on the health system, and the internalities may range from incorrect beliefs about harmful health effects to lapses of self-control. automobiles that vary in energy or fuel efficiency. Purchasing less-efficient goods increases environmental externalities and may also harm consumers themselves if they misperceive or are inattentive to the energy or fuel costs.



Allcott received his BS and MS in engineering from Stanford in 2002 and his PhD in public policy from Harvard University in 2009. He grew up in Oregon with his wife.

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mal taxation and regulation in settings in applied mathematics in 2009 and his where he currently lives with his wife and where policymakers are concerned about PhD in economics in 2014, both from



reducing inequality and changing behav- Harvard University. ior. He received his BA in philosophy and economics from Amherst College experiments, surveys, and quasi-experi-Harvard University in 2016.

Lockwood grew up in Idaho and Benjamin Lockwood is a faculty now lives in Pennsylvania with his wife and three children.

Dmitry Taubinsky is a research asso-Economics Program and an associate professor of economics at the University of loan borrowers. Lockwood's research focuses on opti- California, Berkeley. He received his BA

Taubinsky

Using a combination of theory, field and now lives in Palo Alto, California in 2008 and his PhD in economics from ments, Taubinsky studies topics such as inattention to and misunderstanding of complex tax incentives, "sin taxes" on goods such as sugary drinks, consumerfacing energy policy, and regulation welfare effects of non-standard policy levers such as information labels, social recognition and financial decision-making by low-income populations such as payday-

Taubinsky grew up in California, two children.

people. Thus, if the sin tax is not combined with some form of progressive redistribution of its revenues, the tax will increase financial inequality.

This summary draws together our research, involving both theory and measurement, which provides a reasonably holistic framework for designing and evaluating sin taxes. This research program takes into account both the difficult task of incorporating internalities and the additional question of optimal redistribution of tax revenue.

A Framework for **Optimal Sin Taxes**

As laid out by Arthur Pigou in the case of externalities, if consuming a good harms others, then people will consume too much in an unregulated market.¹ Thus, taxing a good with negative externalities can raise welfare by reducing consumption toward the efficient level at which marginal social cost equals marginal social benefit.

A similar logic applies to markets with internalities. If behavioral biases cause an individual to ignore some harms from consuming a good, then their demand for that good is higher, at every price, than it would be if they were unbiased. The key to quantifying the welfare-maximizing sin tax is not measuring the overall harms from consumption but rather measuring the extent to which consumers underestimate those harms due to behavioral biases.

When consumers' surplus and government revenues are weighted equally, the optimal tax equals the sum of the average marginal internalities and the average marginal externalities.² This is a slight generalization of the principle of Pigouvian taxation, special cases of which have been previously studied by behavioral economists for parametric models of consumer mistakes like quasi-hyperbolic discounting.³

In our work, we relax the assump-

An additional consideration in tion that surplus is equally valuable for optimal degree of redistribution, which these domains is that "sin goods" are all consumers.⁴ We study a more general we show can be computed by comparmore heavily consumed by low-income framework that can address concerns ing the *correlation* of income and sin about regressive taxes that increase good consumption to the *causal effect* financial inequality. In this framework, of income on sin good consumption. the surplus of lower-income consum-While the above analysis focuses ers receives more weight, which means on linear sin taxes, some taxes/subsithat both their transfer to the govern- dies - such as those on energy use or ment and, more subtly, their welfare savings - are nonlinear, means-tested, gain from internality reduction receive or both. We have extended our analysis more weight. The second point is some- to consider more-flexible tax policies, times omitted from public debates but including nonlinear taxes on sin goods.⁵ it's an important one: even if the finan- In this setting, the extent to which it cial incidence from a tax is regres- makes sense to offset the regressivity of sive — lower-income people consume the commodity tax through other polmore of the good — the impact on icy channels is again determined by the costs from internalities may be progres- difference between the correlational sive. The internality cost change will be and causal associations of income and most progressive when lower-income the taxed good. consumers are the ones making the We have applied these conceptual larger mistakes and responding most to insights in three areas. the tax. This is a key distinction from conventional analyses that only con- Application: Taxes sider externalities: when externalities on Sugary Drinks are borne by all of society, there is no notion of progressive behavior change Taxes on sweetened beverages are in such frameworks.

> The size of the optimal sin tax ities (in this case, health care costs depends on the extent to which it is not paid by the individual) and interregressive or progressive, and on the nalities (such as self-control problems extent to which any financial inequalor lack of information about health ity in its incidence can be mitigated by harms). We have collected the necesprogressive redistribution of its reve- sary empirical parameters to quantify nue. To what extent does it make sense the welfare-maximizing tax level on to distribute the tax revenues progres- sugary drinks.⁶ sively? A corollary of a classic result Figure 1 shows a key fact: lowerfrom public finance — the Atkinson- income people drink more sugary Stiglitz theorem — is that optimal prodrinks. This might suggest that suggressive redistribution of the sin tax ary drink taxes are financially regresrevenue must fully offset the regres- sive: lower-income households will pay sive incidence of the sin tax when the more of these taxes. However, Figure 2 only reason that lower-income peodemonstrates an offsetting fact: lowerple consume more of the sin good is income people have less nutrition that they have less money. However, if knowledge and Figure 3 shows that some of the across-income consumpthey report having less self-control over tion patterns can be explained by difsugary drink consumption. They are ferences in internalities or preferences, more likely to say that they drink more then optimal redistribution of tax rev- sugary drinks than they should. enue will be less progressive because it Quantitatively, we find that the will be more distortionary of labor sup- lowest-income households overestiply. Thus, the optimal sin tax will be mate total utility from sugary drinks lower because on net it will increase by about 1.1 cents per ounce, while financial inequality. Our analysis prothe highest-income households overvides a quantitative result about the estimate utility by about 0.8 cents per

motivated by reducing both external-





Figure 2



ounce. Figure 4 presents our estimates of bias across the income distribution. We also estimate that consumer demand is relatively elastic to sugary this elasticity does not vary significantly by income. The fact that lowerincome households are more biased but tive benefits from sugary drinks taxes are progressive.

effect of income on their consumption is positive. This implies that the negaconsumption and income is due to all income levels benefits from a sug-Thus, it is not optimal to fully offset households may benefit more depend- tentive to electricity costs when buy-

the regressivity of the sugary drinks tax, which lowers its optimal size because of its impact on financial inequality.

We use our theoretical model to drink prices (and thus taxes) but that take into account all of the empirical facts to determine the optimal sugary drink tax. In our model, the welfaremaximizing tax on sugary drinks in the not less elastic implies that the correc- US is 1 to 2 cents per ounce, which is similar to current tax rates in the seven US cities that have such taxes.⁷ If, how-Finally, we estimate that sugary ever, taxes were optimized at a more drinks are a normal good: the causal local level and thus were to lead to some cross-border shopping, their optimal size would be somewhat smaller. tive correlation between sugary drink We find that the average household at differences in preferences and biases. ary drink tax, although higher-income ers are poorly informed about or inat-

ing on how we quantify behavioral bias.

Application: Energy Efficiency

A second application is to energy efficiency policies such as subsidies for energy-saving appliances and corporate average fuel economy standards. One justification for these policies is that they are second-best substitutes when there are political constraints on pollution taxes. Another is that they act like sin taxes - or their opposite-signed counterparts, "virtue subsidies" - that counteract alleged information asymmetries and behavioral biases.

It has been argued that consum-



ing lightbulbs, causing them to buy rather than more efficient options like compact fluorescents and LEDs. To offset these biases, many governments subsidize energy-saving lightbulbs or ban incandescents. As another example, it is sometimes argued that people buying cars don't pay sufficient attention to fuel costs, causing them to buy too many gas guzzlers. Fuel economy standards can offset this by forcing automakers to sell more high-fueleconomy vehicles.

one study, we recruited people shopping for lightbulbs and randomized them into two groups: a treatment group that was given clear information on the electricity costs of different lightbulb technologies and a control group that was not. If lack of information or attention reduces demand for energy-efficient lightbulbs, then the experimental treatment should offset this and increase demand. Across two different experiments, we found some support for this hypothesis, but the effect sizes were not large enough to generate an increase in social surplus from banning incandescent lightbulbs.⁸

We found qualitatively analogous results in our work on fuel economy. Consumers do not appear to pay full attention to gasoline costs, and in our field experiment we found that providing fuel economy information had no effect on vehicle purchases.⁹ A large body of excellent work by other scholars finds similarly mixed results. In one model we developed, the estimated impacts of fuel economy standards are not large enough to increase social surplus.¹⁰

Application: State-Run Lotteries

A final application is to state-run lotteries.¹¹ Such lotteries are subject to an implicit tax because a portion of each ticket's purchase price is retained by the government rather than being distributed to consumers through prizes. The economic principles are

thus similar to those of other sin tax Internalities," Allcott H, Mullainathan too many energy-wasting incandescents applications but they are applied to the S, Taubinsky D. NBER Working Paper general case where the government can differentially tax various characteristics *Public Economics* 112, April 2014, pp. of the sin good.

Do these revenue-generating lot- Return to Text teries raise total welfare? As with the other applications, there are two sides to the debate. On the one hand, staterun lotteries might be a "win-win" that increases both state budgets and consumer surplus if consumers' decisions to buy lottery tickets are not Application to the Optimal Soda Tax," affected by behavioral biases. Although Allcott H, Lockwood B, Taubinsky We have tested these arguments. In these lotteries typically have negative D. NBER Working Paper 25841, May expected monetary value, consumers 2019, and The Quarterly Journal of might still rationally buy them either *Economics* 134(3), August 2019, pp. for entertainment value or because they 1557–1626. generate anticipatory utility from the Return to Text possibility of winning. On the other hand, if consumer demand is primarily driven by behavioral biases such as Income Heterogeneity," Ferey A, overconfidence, self-control problems, or innumeracy, then these lotteries may be welfare reducing, particularly if both lottery demand and biases are disproportionately concentrated among Beverages? An Overview of Theory lower-income people.

Empirically, we find that purchas- B, Taubinsky D. NBER Working ing lottery tickets is associated with Paper 25842, May 2019, and Journal of survey measures of innumeracy, poor *Economic Perspectives* 33(3), Summer 2019, pp. 202–227. statistical reasoning, and other proxies for behavioral bias. Collectively, these Return to Text proxies explain 43 percent of lottery "State and Local Backgrounders: Soda purchases. As with sugary drinks, these Taxes." Urban Institute, March 2022. biases seem to be concentrated among Return to Text "The Lightbulb Paradox: Evidence lower-income people. However, since lottery tickets are cheap — the adminfrom Two Randomized Experiments," istrative costs are modest and about Allcott H, Taubinsky D. NBER 30 percent of proceeds go to states for Working Paper 19713, August 2014. education and other programs — there Published as "Evaluating Behaviorally is a trade-off between overconsump-Motivated Policy: Experimental Evidence from the Lightbulb Market," tion due to bias, normatively respectable consumer surplus, and government American Economic Review 105(8), August 2015, pp. 2501–2538. revenues. In our model, the current designs of the large multistate lotto Return to Text games increase welfare overall although ⁹ "Are Consumers Poorly Informed about Fuel Economy? Evidence from they may harm heavy spenders.

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96(5), December 2014, pp. 779–795. <u>Return to Text</u> ¹¹ "What Drives Demand for State-

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