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ARTICLE

Redistributive Regulations and Deadweight Loss

Daniel J. Hemel

New York University School of Law, New York, NY, USA
Email: daniel.hemel@nyu.edu

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Abstract

Redistribution generates equity benefits and deadweight loss. A canonical result in economic theory holds that policymakers generally cannot escape the problem of deadweight loss by redistributing through non-tax rules. Nonetheless, the Office of Management and Budget (OMB) released a revised framework for regulatory analysis in November 2023 that encouraged federal agencies to consider distributional benefits – but not the deadweight loss of redistribution – when choosing which non-tax rules to promulgate. By omitting deadweight loss from distributional analysis, OMB's framework will lead to inaccurate estimates of the welfare effects of regulatory changes and will leave agencies vulnerable to legal attack on the ground that they have ignored an important aspect of regulatory redistribution in their decision-making. This article illustrates how agencies can incorporate deadweight loss into distributional analysis and thereby place their redistributive rules on firmer economic and legal footing. It shows how the "elasticity of taxable income" approach – widely used by tax economists – can be modified to the regulatory context so that agencies can estimate the deadweight loss of redistributive regulations while incurring relatively modest additional analytical burdens. Explicitly incorporating deadweight loss into distributional analysis will provide the public with a more accurate view of the welfare consequences of regulatory actions and will make regulations more robust to legal challenges.

1. Introduction

Redistribution from high-income individuals to low-income individuals generates societal benefits and societal costs. Potential benefits of redistribution include the satisfaction of altruistic preferences (e.g. Alesina & Giuliano, 2011), greater social stability stemming from a reduction in material inequality (e.g. Alesina & Perotti, 1996), and – under normative frameworks that allow for interpersonal utility comparisons – an increase in aggregate welfare resulting from the movement of resources toward individuals with higher marginal utility of income.[1] The primary cost of redistribution is "deadweight loss" (or "excess

[1] Robbins (1938) famously argued that interpersonal comparisons necessarily rest on normative judgments rather than empirical evidence and, as a result, must come from outside the "economic science." Following Robbins, many economists – especially outside tax and public finance – continue to believe that the proper role for

burden"): progressive redistribution dulls the incentive for individuals to earn additional income, thereby reducing the sum of resources available to society. Redistribution thus entails a tradeoff between "equity" and "efficiency" – between the benefit of a more egalitarian division of the pie and the cost of a smaller pie overall.

The tradeoff between distributional benefits and deadweight loss – between equity and efficiency – is a dominant theme of tax policy analysis in both law and economics. Tax scholars disagree about the *magnitudes* of the equity benefits and deadweight loss resulting from redistribution, but virtually no tax scholar or policy analyst denies the *existence* of equity benefits or deadweight loss. By contrast, federal agencies engaged in benefit–cost analysis (BCA) of non-tax regulations historically have ignored both the equity benefits and deadweight loss of regulations that redistribute resources from the rich to the poor. To be sure, thoughtful defenders of the traditional BCA approach understand that redistribution generates benefits and costs, even when redistribution is effectuated through non-tax mechanisms. But for a range of reasons rooted in analytical parsimony, institutional competence, and political economy, practitioners of BCA have chosen to exclude these benefits and costs from their analysis of non-tax regulations.

In November 2023, the White House Office of Management and Budget (OMB) released a revised version of its guidance to federal agencies on the development of regulatory benefit–cost analysis – a document known as "Circular A-4" – that marks a break from the traditional distribution-neutral approach to regulatory BCA. Revised Circular A-4 encourages agencies to conduct "distributional analyses" as part of their BCAs of proposed regulations and, more specifically, to apply welfare weights that reflect the diminishing marginal utility of consumption. Revised Circular A-4 thus provides a method for agencies to quantify the equity benefits of redistribution. In this respect, Revised Circular A-4 brings regulatory analysis more closely in line with tax policy analysis, a domain in which distributional effects have long been a central concern.

Strikingly, however, the discussion of distributional effects in Revised Circular A-4 says nothing about the deadweight loss of redistribution. Indeed, Revised Circular A-4 never acknowledges the basic point that redistribution generates deadweight loss. In effect, Revised Circular A-4 appears to be treating redistribution as if it were, from a social welfare perspective, a free lunch.

Revised Circular A-4's approach is problematic both intellectually and legally. As an intellectual matter, Revised Circular A-4 places distributional analysis on shaky foundations by implicitly adopting an assumption that economic theory does not support – that the federal government can shift resources from high-income individuals to low-income individuals without affecting labor and savings incentives. And, as a legal matter, Revised Circular A-4 leaves agencies vulnerable to attack under the Administrative Procedure Act, the framework statute for judicial review of federal regulations. Under the Administrative Procedure Act, as interpreted by the Supreme Court, a judge must set aside a regulation as "arbitrary and capricious" if the agency "entirely failed to consider an important aspect of

benefit–cost analysis (and for economic analysis more broadly) is to identify the set of policies that, when combined with compensating transfers, lie along the Pareto frontier (Drakopoulos 2023). According to this view, questions of pure redistribution – questions that the positive science of economics cannot resolve – should be left to philosophers, policymakers, and voters. By contrast, most of the post-1970 optimal tax literature relies on the assumption that utility can be compared across persons and that the marginal utility of income is declining over income (Stiglitz, 1987). The comparability assumption is addressed further at the end of this section.

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the problem."[2] Deadweight loss is, by virtually all assessments, an "important aspect" of the problem of redistribution. If an agency justifies a regulation on distributional grounds but fails to consider the deadweight loss of redistribution, then a court very well might – and arguably should – conclude that the agency has flunked the "arbitrary and capricious" test.[3]

Fortunately for proponents of regulatory redistribution, Revised Circular A-4's omission of deadweight loss is a fixable flaw. Agencies can estimate the deadweight loss of redistribution based on the "elasticity of taxable income" (ETI), a tool that is already widely used in the tax context. Agencies can then choose among various methods for allocating the deadweight loss across income groups, thus facilitating a direct apples-to-apples comparison between redistribution's benefits and costs for each income group. Under Revised Circular A-4's normative framework – which allows for interpersonal utility comparisons based on the assumption of declining marginal utility of income – these estimates of income group-specific effects can be aggregated to generate an estimate of a policy's overall effect on social welfare. Ideally, OMB would issue supplemental guidance providing agencies with a standardized method for ETI-based estimates of deadweight loss, thereby placing non-tax regulations on firmer economic and legal footing.[4] In the absence of OMB guidance, agencies can potentially implement the article's proposed method on their own.

To preview the article's suggested approach: A regulation that redistributes from high-income individuals to low-income individuals will raise the effective income tax rate, since individuals will receive a smaller share of regulatory net benefits as their incomes rise. In the typical case, a higher effective income tax rate will induce individuals to earn less income, since the benefits of earning additional income will decline. The ETI framework provides a simple formula for calculating the percent change in taxable income resulting from a change in the effective tax rate: the ETI (which is an empirically estimable parameter) multiplied by the change in the marginal "net-of-tax" rate (i.e. 1 minus the marginal tax rate). The change in taxable income can then be multiplied by the tax rate to arrive at the budgetary effect of the redistributive regulation. As Feldstein (1999) observed – and the broader tax economics literature has come to appreciate (e.g. Kleven, 2021) – this budgetary effect is a sufficient statistic for measuring the deadweight loss of redistribution.

With that dollar figure in hand, analysts can then estimate how the deadweight loss of redistribution – which manifests initially as a decline in tax revenue – ultimately affects the utility of members of specific groups and (assuming the permissibility of interpersonal utility comparisons) the welfare of society as a whole. To translate budgetary effects into welfare effects, analysts need to make assumptions about how changes in the government's budget influence taxes and spending. One approach is to assume that a decline in government revenue affects individuals on a per-capita basis (e.g. net transfers to low-income individuals decline by a certain dollar amount, and net tax liabilities for higher-income individuals rise

[2] *Motor Vehicle Manufacturers Association v. State Farm Mutual Automobile Insurance Co.*, 463 U.S. 29, 43 (1983).

[3] If an agency conducts a distributional analysis but does not cite that analysis as a justification for its regulation, then a flaw in the distributional analysis most likely will not cause a court to invalidate the agency's rule. However, when an agency relies on the analysis in its rulemaking, "a serious flaw undermining that analysis" may lead to invalidation. *National Association of Home Builders v. EPA*, 682 F.3d 1032, 1040 (D.C. Cir. 2012).

[4] This article focuses on Revised Circular A-4, the framework document for regulatory analysis, but a similar problem plagues OMB's revision of Circular A-94, the framework document for benefit–cost analysis of federal spending programs. On Circular A-94 and its relationship to Circular A-4, see Liscow and Sunstein (2023).

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by the same dollar amount). The article adopts this per-capita approach for illustrative purposes, but the framework is sufficiently flexible that it can accommodate an infinite range of assumptions about the tax-and-spending effects of changes in government revenue.

While economists have long understood that redistributive regulations generate deadweight loss (Hylland & Zeckhauser, 1979; Shavell, 1981), the novel contribution of this article is to demonstrate how the deadweight loss of redistributive regulations can be incorporated into distributional analyses using tools developed by tax economists over the last quarter century. This exercise entails more than a rote application of the ETI approach. It requires analysts to determine how the ETI with respect to changes in regulatory redistribution relates to the traditional ETI used in the tax context, and it requires analysts to take the further step of distributing the deadweight loss of redistribution across income groups. These additional elements entail both empirical and value judgments that the existing BCA literature has yet to explore. The article goes on to provide policymakers and analysts with a step-by-step user's guide for incorporating deadweight loss into distributionally weighted BCAs. The article's contributions are thus both theoretical and practical. On a theoretical level, the article bridges the disciplinary divide between tax policy analysis and BCA, showing how the ETI approach – arguably the most significant innovation in tax economics since the late 1990s[5] – can shed light on the benefits and costs of regulatory redistribution. On a practical plane, the article offers agencies an implementable strategy for ensuring that distributional analyses of redistributive regulations appropriately reflect the welfare consequences of deadweight loss.

The article does not seek to defend the larger enterprise of distributionally weighted BCA. The case for distributionally weighted BCA depends upon answers to several controversial questions: whether it is appropriate for BCA to rely on interpersonal utility comparisons; whether federal executive-branch agencies should defer to Congress's judgments regarding the balance between distributional benefits and deadweight loss; and whether the benefits of distributionally weighted BCA – both in terms of improving regulatory decision-making and in terms of informing policymakers and the public about the welfare consequences of regulatory choices – outweigh the additional analytical burden on agencies. In promulgating Revised Circular A-4, OMB has resolved these questions in favor of distributionally weighted BCA. I set these important questions aside here to focus on the narrower issue of how to translate the deadweight loss of redistribution into welfare terms *if* one is committed to distributionally weighted BCA. Although there are plausible – and potentially compelling – reasons to use distributional weights in regulatory analysis, there is no compelling justification for using distributional weights while categorically ignoring the deadweight loss of redistributive regulations.

Section 2 delineates the scope of the problem: when do non-tax regulations generate deadweight loss? As a general (though not universal) rule, regulations that shift resources from high-income individuals to low-income individuals – in other words, regulations that yield distributional benefits – also lead to deadweight loss. With rare exceptions, distributional benefits and deadweight loss are two sides of the same coin. Section 3 introduces the ETI approach and explains how the ETI is used to calculate deadweight loss in the tax context. Section 4 discusses the traditional approach to BCA for non-tax regulations, which ignores *both* distributional benefits and deadweight loss. Section 5 examines Revised

[5] On the significance of the ETI to tax economics since the late 1990s, see Hemel and Weisbach (2021, 382–383).

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Circular A-4's guidance, highlighting OMB's asymmetrical treatment of redistribution's benefits and costs. Section 6 explains how the ETI approach can be used to estimate deadweight loss in the regulatory context, thus restoring symmetry to distributional analysis of non-tax regulations. Section 7 considers choices that OMB and agencies must make as they apply the ETI approach to real-world regulations, including the parameter values for the tax rate and the ETI as well as the method for distributing deadweight loss across income groups. Section 8 concludes with a step-by-step guide for analysts applying the article's approach. The Appendix provides details of the formal model underlying the analysis in text.

2. When do regulations generate deadweight loss?

The deadweight loss from a tax system is the cost of taxation to the private sector minus the revenue gained by the public sector (Diamond & McFadden, 1974; Auerbach, 1985). It is, in other words, the reduction in total resources available to society as a result of taxation. Our focus here is on non-tax regulations that produce a change in the deadweight loss of redistribution. As we shall see, many – probably most – major non-tax regulations affect deadweight loss.

To illustrate: Imagine that the government collects revenue through an income tax. Assume that individuals choose their labor effort so that they are indifferent, at the margin, between an additional hour of work (which brings more income, and thus more utility from consumption) and an additional hour of leisure. Now imagine that a regulation delivers larger net benefits to lower-income individuals than to higher-income individuals, thereby reducing the amount of consumption utility[6] associated with an extra increment of income. As a result of the regulation, individuals will reallocate a small amount of their time from labor to leisure.

Since individuals previously were indifferent between labor and leisure at the margin, a small reallocation of time from labor to leisure will have no first-order effect on an individual's utility. Thus, the regulation will not affect the cost of taxation to the private sector. However, the substitution effect induced by the regulation – the reallocation of time from labor to leisure – will result in individuals reporting less income and paying less tax. Since the deadweight loss of redistribution is the cost of taxation to the private sector minus the revenue collected by the public sector, and the regulation will reduce the amount of revenue collected by the public sector, the deadweight loss of redistribution will rise.[7]

What sorts of regulations will reduce the amount of consumption utility associated with an extra increment of income (and thus increase the deadweight loss of redistribution)? Most straightforwardly, regulations that explicitly condition benefits on reported income will affect income-earning incentives. For an especially dramatic example, consider President Biden's 2022 student debt cancelation plan – later struck down by the Supreme Court – which provided $10,000 of debt relief for single borrowers with adjusted gross income under $125,000.[8] The plan effectively imposed a marginal tax of 1,000,000 % on an otherwise-

[6] In this context, "consumption utility" refers to all utility other than the utility of leisure, including the utility from consuming private goods as well as public goods such as clean air and clean water.

[7] Note that when the government collects revenue through capital income taxation and a regulation affects the incentive to save, then the same general analysis applies, except that the relevant substitution effect is away from saving and toward current consumption.

[8] For heads of household and married couples filing jointly, the adjusted gross income threshold was $250,000.

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eligible individual's 125,000th dollar of income. Thus, for individuals with incomes near the $125,000 threshold, the Biden plan reduced – significantly – the amount of consumption utility associated with extra income.

A wrinkle with respect to the Biden plan is that the income cutoff was based on returns filed for tax years 2020 and 2021, while the plan was not promulgated until August 2022. In that respect, the Biden plan operated as a tax on past labor and savings decisions – a smaller-scale version of the one-off capital levies that several countries attempted after the First and Second World Wars (Eichengreen, 1990; Kaplow, 2008; O'Donovan, 2021). If individuals believe that a one-time retrospective tax is truly one-time, then the tax will not affect income-earning incentives on a going-forward basis. However, the historical experience with capital levies suggests that – except in wartime – individuals rarely believe that one-off taxes will truly be one-offs. In that case, regulations that explicitly condition benefits on past years' income still will generate deadweight loss because they will cause individuals to expect that earning additional income today will threaten their eligibility for yet-to-be-specified benefits in the future.

Regulations that explicitly condition benefits on reported income represent only a fraction of all regulations that affect deadweight loss. More frequently, regulations change the amount of consumption utility associated with an extra increment of income by generating costs and/or benefits that vary by income even though the regulations themselves do not explicitly condition costs or benefits upon income.

Starting on the cost side of the ledger, consider any regulation that raises the price of a normal good (i.e. a good for which consumption increases with income). For example, a motor vehicle safety standard may raise the price of new cars; a power plant emissions regulation may raise the price of electricity; an Endangered Species Act regulation that affects logging in forest areas may raise the price of wood products; and so on. In all of these cases, the regulation reduces – in real terms – the value of the extra consumption that an individual can purchase with additional income. Just like an income tax or a value-added tax on consumption, the regulation makes labor marginally less attractive and therefore incentivizes individuals to substitute away from labor and toward leisure, contributing to deadweight loss.

Moving to the benefit side of the ledger, consider any regulation that delivers larger benefits to lower-income individuals than to higher-income individuals. For example, a regulation that reduces ground-level ozone concentrations may benefit lower-income individuals disproportionately because higher-income individuals are more likely to have central air conditioning (and thus to keep their windows closed in the summer months, when outdoor ozone levels are highest). Likewise, a motor vehicle safety standard that reduces pedestrian injuries may benefit lower-income individuals disproportionately because higher-income individuals are more likely to drive rather than walk. In both of these examples, the regulation narrows the gap between the consumption utility of lower-income individuals and higher-income individuals. By reducing the extra amount of consumption utility associated with an extra increment of income, the regulation weakens income-earning incentives and increases deadweight loss.[9]

[9] In the air quality case, distributional effects and deadweight loss will depend upon the extent to which the value of higher air quality is passed through to landlords via higher rents (e.g. Grainger, 2012). If lower-income individuals partially pay for the improved air quality through higher rents, then the distributional benefit of the regulation is smaller, but the deadweight loss is smaller too.

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Of course, to evaluate the effect of any given regulation on deadweight loss, we will need to examine both the cost and benefit sides of the equation. For example, a regulation that raises the price of a normal good also might generate benefits that increase with income; it is the relationship between *net* benefits and income that ultimately matters to deadweight loss. The key point for present purposes is that when a regulation changes the overall relationship between income and consumption utility, it will – according to standard economic analysis – affect the deadweight loss of redistribution.

Although many regulations will affect deadweight loss because they produce net benefits that vary by income, not *all* regulations will do so. First, for some regulations, net benefits may be uncorrelated with income. In those cases, regulations will produce nether distributional benefits nor deadweight loss.

Second, for other regulations, net benefits may be correlated with income, but the correlation may be non-causal. For example, imagine that the Federal Aviation Administration (FAA) adopts a regulation setting a minimum distance between rows of seats on commercial airlines. Taller individuals, who typically have longer legs, stand to benefit from the regulation. Although the regulation imposes costs on airlines that may be passed along to passengers through higher airfares, the benefit of extra legroom is worth the cost to taller individuals. Shorter individuals, by contrast, are harmed by the regulation because they do not value the extra legroom but must pay higher fares nonetheless.

Height and income are strongly correlated. By one estimate, an extra inch of height is associated with a 1.4–2.9 % increase in weekly earnings for U.S. workers (Case & Paxson, 2008). The causes of this correlation are unclear: the relationship between height and income may reflect – for example – labor market discrimination against shorter people, greater self-esteem among taller people (which may translate into higher earnings), or a correlation between height and cognitive ability (Mankiw & Weinzierl, 2010). In any event, it seems clear enough that for post-pubescent adults, earning additional income will not cause a person to grow taller. Height is, in this respect, a "tag": an attribute that correlates with income but cannot be changed by earning more or less income (Akerlof, 1978).

Our hypothetical FAA seat-distance regulation will therefore have a distributional effect – on average, benefitting higher-income individuals at the expense of lower-income individuals – but unlike other regressive regulations, it will not reduce deadweight loss. Or if the seat-distance regulation redistributed in the opposite direction (i.e. by reducing the required distance between seat rows), then it would produce a distributional benefit but – unlike other progressive regulations – would not increase deadweight loss.[10] The example is purely hypothetical because the FAA so far has refused to regulate seat distances (Stempel, 2023).

[10] Regulations that redistribute on the basis of geography present additional complications. When affected individuals are renters, then deadweight loss will depend upon the extent to which benefits and costs are passed through to landlords. See *supra* note 9. When affected individuals are homeowners, then a regulation that redistributes from areas with higher home values to areas with lower home values operates like a one-off capital levy in the sense that it redistributes based on a type of capital (housing wealth), and thus based on past labor and savings decisions. Whether such a regulation will generate deadweight loss on a going-forward basis will depend upon individuals' expectations. The benefits of living in a high-home-value area are part of the consumption bundle associated with a higher income. If individuals come to expect that the government will continue to adopt regulations that reduce the relative value of higher-income individuals' consumption bundles, then they are likely to respond in much the same way that individuals respond to anticipated capital levies (e.g. by working less and saving less).

The potential deadweight loss associated with geographic redistribution is a timely issue in light of the Biden administration's Justice40 initiative, which seeks to redirect the benefits of certain federal investments toward

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Nonetheless, the example illustrates the possibility that some regulations may redistribute across income groups without affecting deadweight loss – though real-world examples that fit this bill are hard to find.

Finally, it is important to distinguish the deadweight loss of redistribution from the conventional cost of inefficient regulations. When agencies choose regulations for redistributive reasons, they may select regulations that flunk the traditional BCA test – in technical terms, regulations for which the sum of compensating variations (or the sum of equivalent variations) is negative. In those cases, regulations will reduce the sum of resources available to society even before any consideration of the deadweight loss of redistribution; the deadweight loss of redistribution will be an additional social cost. However, the deadweight loss of redistribution arises whether or not a regulation passes the traditional BCA test, provided that the regulation reduces the incentive to earn additional income.

Summing up so far: Regulations affect the deadweight loss of redistribution when they change the causal relationship between income levels and consumption utilities. That is a frequent – though not universal – consequence of regulations for which net benefits vary by income. The scope of the problem addressed by this article is thus broad but not limitless. Determining whether any given regulation contributes to the deadweight loss of redistribution will require careful analysis of the relationship between income and net benefits.

3. Distributional benefits and deadweight loss in tax policy analysis

Before delving deeper into the deadweight loss of redistributive regulations, it will be helpful to understand how the economics of taxation conceives of distributional benefits and deadweight loss. Since the seminal contributions of Feldstein (1995, 1999), tax economists have come to recognize that under a wide range of conditions, the deadweight loss of taxation can be estimated using a formula based on the elasticity of taxable income, or "ETI." Feldstein's central insight was that in order to calculate the deadweight loss of a small tax reform, all we need to know is how total taxable income responds to the reform and how that change in taxable income ultimately affects revenue.

To illustrate the ETI approach, we will imagine a highly stylized scenario with two taxpayers: Person A, with $100,000 of taxable income, and Person B, with zero dollars of taxable income. We will also imagine a highly stylized fiscal system: a 40 % flat tax with a $20,000 per person "demogrant," or lump-sum transfer. For now, we can think of the demogrant being paid out in cash, but the demogrant also could take the form of public goods and in-kind transfers that Person A and Person B each value at $20,000. We will further simplify analysis by setting aside the issue of saving: Person A and Person B consume all of their income in the present period. Thus, Person A has $80,000 of consumption – $100,000 of taxable income, less $40,000 in taxes, plus the $20,000 demogrant. Person B has $20,000 of consumption, consisting only of the demogrant (see Table 1, Scenario 1).

To keep the example as simple as possible, we will apply a utilitarian social welfare function, with welfare equal to the natural logarithm of consumption (in other words, a "negative elasticity of marginal utility" equal to 1).[11] The natural log assumption – often

disadvantaged areas (Kniesner & Viscusi, 2023). A full analysis of geographic redistribution and deadweight loss lies beyond this article's scope and remains a fruitful topic for future research.

[11] On the range of social welfare functions that might be used in benefit–cost analysis, see Adler (2019).

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Table 1. *Distributional effects and deadweight loss of tax reform*

	Scenario 1 (baseline)			Scenario 2a (no behavioral effect)			Scenario 2b (behavioral effect)		
	Person A	Person B	Total	Person A	Person B	Total	Person A	Person B	Total
Income	$100,000	$0	$100,000	$100,000	$0	$100,000	$99,995	$0	$99,995
Δ Income (from baseline)	–	–	–	$0	$0	$0	−$5	$0	−$5
Tax	$40,000	$0	$40,000	$40,010	$0	$40,010	$40,008	$0	$40,008
Δ Tax (from baseline)	–	–	–	$10	$0	$10	$8	$0	$8
Mechanical	–	–	–	$10	$0	$10	$10	$0	$10
Behavioral	–	–	–	–	–	–	−$2	$0	−$2
Transfer (demogrant)	$20,000	$20,000	$40,000	$20,005	$20,005	$40,010	$20,004	$20,004	$40,008
Δ Transfer (from baseline)	–	–	–	$5	$5	$10	$4	$4	$8
Consumption (income – tax + transfer)	$80,000	$20,000	$100,000	$79,995	$20,005	$100,000	$79,991	$20,004	$99,995
Δ Consumption (from baseline)	–	–	–	−$5	$5	$0	−$9	$4	−$5
Mechanical	–	–	–	−$5	$5	$0	−$6	$4	−$2
Behavioral	–	–	–	–	–	–	−$3	$0	−$3
Welfare weight	0.25	1	–	0.25	1	–	0.25	1	–
Δ Welfare (Δ consumption (mechanical) × welfare weight)	–	–	–	−1.25	5	3.75	−1.50	4	2.50

Note: See text for details.

used in public finance – is especially convenient because the first derivative of the natural log of x equals $1/x$. Thus, the marginal utility of consumption is simply the inverse of consumption. When consumption doubles, the marginal utility of consumption declines by half. When consumption quadruples, the marginal utility of consumption declines by three quarters.

Now imagine that the government implements a small increase in the tax rate – for example, from 40 to 40.01 %. With no behavioral response, the tax increase will mechanically raise an additional $10 of revenue (0.01 % multiplied by $100,000 of taxable income). That $10 in additional revenue will allow the government to raise the demogrant – or equivalently, increase the quantity of public goods or publicly provided private goods – by $5 per person. Person A's consumption will fall by $5 (reflecting the $10 increase in taxes and the partially offsetting $5 increase in the demogrant), and Person B's consumption will rise by $5. Note that the government also could devote the additional revenue to purposes other than raising the demogrant. The assumption that changes in revenue affect individuals on a per-capita basis will be discussed in further detail in Section 7.

For arithmetic ease, we will normalize Person B's marginal utility of consumption to 1, such that Person A's marginal utility of consumption – given logarithmic utility – is 0.25. For present purposes, we can ignore the very small changes in the marginal utility of consumption arising from our hypothetical policy change. Again, our social welfare function is utilitarian, so welfare weights reflect the marginal utility of consumption. Thus, the tax change reduces Person A's welfare by −1.25 and raises Person B's welfare by 5, for a net welfare effect of (positive) 3.75 (see Table 1, Scenario 2a).

So far, we have ignored the behavioral effects of the tax change. Under standard assumptions, however, Person A will indeed adjust her behavior in response to the tax. She will reduce her labor effort, and in a richer model with multiple periods, she may save less as well. Thus, total taxable income will decline.

Feldstein's key contribution was to show this decline in taxable income can be used to estimate the deadweight loss of the tax change. As defined by Feldstein (1995, 1999), the "ETI" is the change in taxable income for a small change in the marginal "net-of-tax" rate (i.e. 1 minus the marginal tax rate). Deadweight loss is, then, the change in taxable income times the tax rate – or equivalently, the diminution in resources available to the government as a result of the behavioral effects (but not the mechanical effect) of the tax change. Estimates of the ETI vary, but a value around 0.3 is typical in the recent public finance literature (e.g. Hendren, 2020; Scheuer & Slemrod, 2020, 128).[12]

In this example, the net-of-tax rate falls from 60 to 59.99 %, a change of approximately −0.01667 %. With an ETI of 0.3, the corresponding change in taxable income is −0.005 %. Thus, Person A's taxable income falls by 0.005 % – from $100,000 to $99,995. Total tax revenue is now 40.01 % of $99,995, or $40,008. Instead of raising $10 (as would be the case with only a mechanical effect and no behavioral response), the tax increase raises only $8. The extra $8 can fund an increase in the demogrant of $4 per person. The deadweight loss is simply the change in taxable income multiplied by the tax rate, or the behavioral effect on tax revenue (Hemel & Weisbach, 2021). Here, the deadweight loss is $2.

[12] For present purposes, we will ignore the distinction between compensated and uncompensated elasticities of taxable income, following the approach in Piketty *et al.* (2014). As a practical matter, the difference between compensated and uncompensated elasticities appears to be small (Gruber and Saez 2002).

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The effect of the tax change on Person B's welfare is straightforward. Person B's consumption rises by $4 relative to the pre-reform baseline (whereas Person B's consumption would have risen by $5 absent behavioral effects). Assuming a welfare weight of 1, the resulting welfare gain to Person A is 4 (as opposed to a gain of five absent behavioral effects).

The effect on Person A's welfare is more nuanced. The Appendix provides a formal analysis of the effect on Person A's welfare, but the basic argument can be explained intuitively. If Person A has chosen her labor effort optimally, she will be roughly indifferent between working slightly more (with a resulting increase in consumption) and working slightly less (with a resulting increase in leisure). Thus, the small change in her labor effort in response to the 0.01 percentage-point tax increase will have approximately zero effect on Person A's welfare. Here, Person A's consumption declines by $9, but $3 out of that $9 is a behavioral effect. The utility loss to Person A resulting from the $3 decline in consumption is offset by the utility gain to Person A resulting from the corresponding increase in leisure.

By contrast, the remaining $6 decline in Person A's consumption does not reflect her choice to substitute labor for leisure – it amounts to an unmitigated loss of consumption utility. That $6 reduction in consumption reflects the $10 mechanical increase in taxes paid due to the rate increase less the $4 increase in the demogrant received. The $6 reduction – the mechanical effect on consumption – *is* welfare-relevant. The effect on Person A's welfare is equal to her welfare weight multiplied by her mechanical change in consumption. Assuming a welfare weight of 0.25, the effect on Person A's welfare is −1.50 (see Table 1, Scenario 2b).

Summing up: The hypothetical tax rate hike of 0.01 percentage points shifts resources from the richer Person A to the poorer Person B, and since Person A's marginal utility of consumption is lower than Person B's, the mechanical shift raises social welfare on net (the equity benefit of redistribution). But the tax increase also has a negative behavioral effect on the tax paid by Person A, which shows up in individual welfare through its effect on the demogrant. The net effect of the reform is still positive: social welfare rises by 2.50. However, factoring in the deadweight loss of redistribution (Table 1, Scenario 2b) reduces the magnitude of the welfare gain by one-third relative to the scenario with no behavioral effects, in which social welfare rose by 3.75 (Table 1, Scenario 2a).

From a utilitarian perspective, the optimal tax-and-transfer schedule sets the tax rate (and the corresponding demogrant) such that the marginal equity benefit of a further increase in the tax rate exactly equals the marginal deadweight loss in welfare terms. At that point, small changes in the quantity of redistribution have only second-order effects on social welfare. The fact that the policy change in Table 1 raises social welfare indicates that the tax rate of 40.01 % is still too low. However, even when the tax rate is suboptimal, social welfare calculations that ignore deadweight loss may significantly overstate the welfare gains from redistribution.

The illustrations in this section and the remainder of the article assume a linear income tax schedule. Of course, the actual U.S. tax-and-transfer schedule is nonlinear. Nonlinearity adds further steps to the deadweight loss calculation but does not change any of the fundamental features. For each income group, the analyst calculates the marginal net-of-tax rate before and after the reform, multiplies the change in the marginal net-of-tax rate by the group's ETI, and then multiplies the change in taxable income by the group's marginal tax rate. That procedure produces an estimate of the budgetary effect of behavioral changes for each income group. The analyst then sums up the budgetary effect of behavioral changes

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for all income groups to arrive at the total deadweight loss (or reduction in deadweight loss) resulting from the reform.

4. The traditional approach to benefit–cost analysis for non-tax regulations

Historically, BCA for non-tax regulations – as practiced by agencies across the executive branch – has ignored both the equity benefits and deadweight loss of redistribution. The traditional Kaldor–Hicks test considers whether the "winners" from a regulatory change could theoretically compensate the "losers" ex post such that the end result – the combination of the regulatory change and the compensating transfer – is "Pareto superior" to the status quo (i.e. at least one individual is better off and no one is worse off than before).[13] The fact that the "winners" are richer than the "losers" – or vice versa – is neither a strike in favor of a regulation or against, except insofar as an individual's income or wealth affects the monetary value that she assigns to a regulation's benefits or costs (Liscow, 2018).[14]

Many regulations – ranging from air and water quality standards to energy efficiency requirements to motor vehicle safety rules – have potentially profound distributional consequences (e.g. Fullerton, 2009; Kniesner & Rustamov, 2018; Hemel, 2022). Defenders of the traditional approach have offered two main justifications for ignoring these distributional effects in BCAs of non-tax regulations. First, as noted above, if the tax-and-transfer schedule is set optimally, small changes in the quantity of redistribution generate only second-order effects on social welfare because the marginal equity benefit approximately equals the marginal deadweight loss. In that case, regulatory policymakers can ignore distributional effects and focus on the traditional Kaldor–Hicks test (Hylland & Zeckhauser, 1979; Shavell, 1981). Insofar as the tax-and-transfer schedule is nonoptimal – either because there is too little redistribution or too much – that concern, according to some scholars, is properly addressed to tax policymakers.[15]

[13] For subtle differences between the Kaldor–Hicks criterion and the standard traditionally used in BCA, see Adler (2015).

[14] The technical reason for the omission of deadweight loss from traditional BCA relates to the thought experiment of hypothetical compensation. The traditional approach asks: If the "winners" from the regulatory change must pay compensation so that their utility levels remain the same as under the status quo – and if the "losers" from the change receive compensation so that their utility levels also remain the same as under the status quo – will the sum of compensating variations (i.e. the amounts paid by the winners minus the amounts paid to the losers) be positive? In other words, will there be a surplus after all compensation is paid and received? Since the distribution of any surplus is not specified in the thought experiment, everyone's utility level remains the same as under the status quo, and thus their labor supply remains the same as under the status quo (Kaplow, 2020, 435). Within the confines of the hypothetical compensation thought experiment, there is no change in redistribution and thus no corresponding deadweight loss. In keeping with this thought experiment, federal agency BCAs historically have not counted the labor supply effects of changes in redistribution when analyzing the effects of regulations (Hemel, 2022, 678).

In 2019, the *Economic Report of the President* stated that agency BCAs should account for changes in the excess burden – or deadweight loss – of taxation, though the report noted that this approach "appears to be uncommon" (Council of Economic Advisers, 2019, 116). Insofar as CEA's report is referring to the deadweight loss of redistribution, the Council's recommendation is inconsistent with the theory of traditional BCA. In any event, agencies do not appear to have followed CEA's suggestion in the succeeding years.

[15] The argument that Congress – rather than federal executive branch agencies – should decide how much to redistribute can be rooted in organizational design principles or in Madisonian political principles. Weisbach (2015)

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Second, if the tax-and-transfer schedule is nonoptimal and the regulatory policymaker cannot correct the schedule to achieve optimality, then presumably that is because some other authority (e.g. Congress) wields ultimate power over taxes and transfers. The regulatory policymaker may be able to shift resources from high-income households to low-income households in the short term, but if Congress sets the tax-and-transfer schedule to achieve its desired long-run balance between equity benefits and deadweight loss, then any redistribution via regulation will crowd out redistribution via the tax-and-transfer system. In that case, regulators should choose rules based on the traditional Kaldor–Hicks criterion, since regulatory changes to the quantity of redistribution will come out in the congressional wash (Kaplow, 2004).[16]

In recent years, critics of the traditional approach have mustered two main arguments for considering distributional effects in regulatory analysis. First, some scholars have observed that particular political and institutional configurations may enable regulatory policymakers to advance distributional objectives without Congress undoing their handiwork (e.g. Fennell & McAdams, 2016). For example, under divided government (or with a very narrow congressional majority), a progressive President may not be able to enact tax legislation that increases redistribution, but she still can instruct agencies in the executive branch to pursue redistribution via non-tax regulations. Moreover, since that President wields the veto pen, she can block any new legislation that seeks to undo her agencies' redistributive efforts.

Second, some scholars have argued that voters – for reasons rooted in social psychology – are more supportive of redistribution when it is effectuated through non-tax mechanisms (e.g. Liscow & Pershing, 2022). Voter resistance may therefore prevent real-world policymakers from achieving the optimal amount of redistribution through the tax-and-transfer schedule. Redistribution through regulation may be the only realistic means for policymakers to push the amount of redistribution closer to the optimum, even though the unconstrained policymaker would choose to redistribute through the tax-and-transfer schedule (Liscow, 2022).

For present purposes, let us assume – arguendo – that the critics are correct: regulatory policymakers ought not leave redistribution to the legislature. Still, none of the arguments for redistribution via regulation implies that regulatory redistribution can be accomplished

argues that for a large institution such as the federal government to operate effectively, it must specialize tasks across its various parts. Regulatory agencies typically specialize in correcting market failures, while other parts of the government (e.g. the tax-writing committees of the House and Senate) specialize in distributional judgments. According to this view, regulatory agencies should defer to the distributional judgments of Congress – even if agency officials might arrive at different judgments themselves – in order to maintain the benefits of task specialization.

Alternatively or additionally, one might argue that federal executive branch agencies should defer to Congress's distributional judgments because the Constitution assigns the taxing and spending powers to the legislature. The origination clause of the Constitution, which provides that tax legislation must be passed in the first instance by the House, arguably reflects a principle that distributional judgments should lie with the officials who are most directly accountable to voters (Kysar, 2013, 7–10, 32–33). Advocates for the traditional approach to BCA might say that regulatory agencies should defer to Congress's distributional judgments not because the tax-and-transfer schedule conforms to optimal tax theory, but because the assignment of distributional decision-making to elected lawmakers conforms to American constitutional and political theory.

[16] A further concern about incorporating distributional preferences into regulatory decision-making is that distributional preferences vary widely across Democratic and Republican administrations. Tying regulatory decisions to the distributional preferences of the President or agency heads may exacerbate policy instability (Weisbach *et al.,* 2018, 9–10).

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without deadweight loss. To the best of my knowledge, advocates for distributional analysis have never denied that redistributive regulations generate deadweight loss. They have simply lacked an easy-to-implement means of incorporating deadweight loss into distributional analysis.

5. Revised circular A-4's approach

Starting with President Reagan's Executive Order 12291 in 1981, every President has required federal agencies across the executive branch to produce a "regulatory impact analysis" for major rules that they propose to promulgate, quantifying – where possible – the benefits and costs of their planned actions. President Clinton's Executive Order 12866, which replaced Reagan's earlier directive, added a requirement for agencies to consider "distributive impacts" and "equity" in their analyses. For the most part, however, agencies' analyses of distributional effects have been either cursory or nonexistent (Ellig, 2016; Robinson *et al.,* 2016; Cecot & Hahn, 2024).

In November 2023, the White House OMB – for the first time – provided concrete guidance to agencies regarding the quantification of distributional effects. That guidance – part of a broader revision of Circular A-4, the framework document for regulatory impact analysis across the executive branch – suggests to agencies that they quantify distributional effects using welfare weights that reflect the diminishing marginal utility of consumption. Specifically, Revised Circular A-4 instructs agencies to construct welfare weights using a negative elasticity of marginal utility (ε) of 1.4, indicating a steeper decline in the marginal utility of consumption than the logarithmic utility assumption in Section 3 would imply.[17] Recall from Section 3 that with logarithmic utility (i.e. a negative elasticity of marginal utility, or ε, equal to 1), a fourfold increase in consumption causes the marginal utility of consumption to decline from 1 to 0.25. With an ε value of 1.4, a fourfold increase in consumption causes marginal utility to decline from 1 to roughly 0.144.[18]

To illustrate Revised Circular A-4's approach in action, consider again the stylized scenario in Section 3 involving a two-person society. As at the outset, Person A earns $100,000 in taxable income; Person B earns zero; and the tax rate is 40 %. As before, all tax

[17] This article takes OMB's chosen value for ε as a given. For an argument that OMB's choice may reflect the inordinate influence of one high-side outlier estimate, see Morgenstern *et al.* (2023, 6–7). In light of the uncertainty regarding the elasticity of marginal utility (as well as the likelihood that elasticities will vary across the population), there is a strong argument – articulated by Coglianese (2023, 37) – that agencies should evaluate the sensitivity of their results to the choice of ε.

[18] More generally, the formula for the marginal utility of consumption, assuming an isoelastic utility-of-consumption function, is $\Delta u/\Delta c = c^{-\varepsilon}$.

Instead of using the ETI approach proposed here, policymakers could – in theory – account for the deadweight loss of redistribution in their regulatory analysis by applying welfare weights based on an ε parameter that is less than the real negative elasticity of marginal utility. However, since the net-of-tax rate and the elasticity of taxable income – and thus the deadweight loss of redistribution – will vary across income and demographic groups, OMB would likely have to produce multiple estimates of ε for different regulatory contexts. Moreover, since deadweight loss changes when the tax-and-transfer schedule changes, OMB would then have to update its ε parameter estimates after every major tax or transfer reform. Finally, the ETI approach has the advantage of making the tradeoff between equity benefits and deadweight loss transparent, whereas the alternative of applying welfare weights based on an ε parameter that is lower than the negative elasticity of marginal utility would submerge the relevant tradeoff in the quantification of distributional benefits.

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revenues are used to fund a $20,000-per-person demogrant. Thus, Person A's consumption is $80,000, and Person B's consumption is $20,000.

Now imagine a hypothetical regulation – say, a new emissions standard for petroleum refineries – that improves air quality but increases gas prices. Since higher-income people tend to drive larger cars and travel more miles – and thus use more gas – they bear a larger share of the costs. For the sake of illustration, we will assume that the regulation provides an air quality benefit of $2 per person (independent of income) and imposes costs that rise by $1 for every additional $10,000 of taxable income. Thus, Person A, with taxable income of $100,000, experiences a net benefit of −$8, while Person B, with taxable income of zero, experiences a net benefit of $2.

Under the traditional approach to benefit–cost analysis, the hypothetical regulation would flunk the benefit–cost test: the sum of net benefits for Person A and Person B is −$6 (i.e. costs exceed benefits in unweighted terms). Under Revised Circular A-4's approach, however, the regulation would be welfare-enhancing. The $8 cost to Person A would be multiplied by her welfare weight (0.144), resulting in a welfare loss of 1.15. The $2 benefit to Person B would be multiplied by her welfare weight (1.0), resulting in a welfare gain of 2.00. The total change in welfare would be (positive) 0.85 (Table 2, Scenario 2a).

Revised Circular A-4 does not prescribe any further steps for distributional analysis. Revised Circular A-4 never mentions the term "deadweight loss" or its synonym, "excess burden," and it never instructs agencies to incorporate deadweight loss into their distributional estimates (OMB, 2023a).[19] But if the analysis ended here, it would leave out a critical component. The additional cost of gasoline imposed by our hypothetical regulation is economically equivalent to a gas tax, and the conventional wisdom in public finance holds that commodity taxes (such as gas taxes) reduce labor incentives because they reduce the amount of consumption utility that can be acquired through additional labor effort (e.g. Atkinson & Stiglitz, 1976).[20] Whatever incentive an individual had to sacrifice leisure and expend more labor effort pre-reform, that incentive is slightly weaker after the regulatory change. As noted in Section 2, a wide range of regulations will similarly reduce the amount of consumption utility associated with an extra increment of labor income.

In Section 7, we will consider circumstances in which redistribution via regulation might generate less (or more) deadweight loss than an equivalent amount of redistribution through the tax-and-transfer system. For now, though, we will focus on the scenario in which net benefits of a regulation are a straightforward function of income, and the deadweight loss of regulatory redistribution tracks the deadweight loss of tax-based redistribution. How might agencies account for deadweight loss in their regulatory analysis?

[19] Revised Circular A-94, the parallel document governing federal spending programs, mentions "deadweight loss" only in defining the "marginal cost of public funds" – the social cost of raising an additional dollar of government revenue (OMB, 2023b, 24). However, the deadweight loss of taxation is conceptually distinct from the marginal cost of public funds: redistributive taxes generate deadweight loss even when the government can raise revenue costlessly (Jacobs, 2018).

For an explanation of the difference between the deadweight loss of redistribution and the marginal cost of public funds, see Weisbach *et al.* (2018, 3–7).

[20] Indeed, when individuals act rationally on the basis of full information and their utility functions are weakly separable between leisure and all consumption goods, uniform commodity taxes have the *exact same* effect on labor incentives as income taxes, and nonuniform commodity taxes *additionally* distort consumption choices.

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Table 2. *Distributional effects and deadweight loss of regulatory reform*

	Scenario 1 (baseline)			Scenario 2a (no behavioral effect)			Scenario 2b (behavioral effect)		
	Person A	Person B	Total	Person A	Person B	Total	Person A	Person B	Total
Direct regulatory benefit	–	–	–	−$8	$2	−$6	−$8	$2	−$6
Income	$100,000	$0	$100,000	$100,000	$0	$100,000	$99,995	$0	$99,995
Δ Income (from baseline)	–	–	–	–	–	–	−$5	$0	−$5
Tax	$40,000	$0	$40,000	$40,000	$0	$40,000	$39,998	$0	$39,998
Δ Tax (from baseline)	–	–	–	$0	$0	$0	−$2	$0	−$2
Mechanical	–	–	–	–	–	–	$0	$0	$0
Behavioral	–	–	–	–	–	–	−$2	$0	−$2
Transfer (demogrant)	$20,000	$20,000	$40,000	$20,000	$20,000	$40,000	$19,999	$19,999	$39,998
Δ Transfer (from baseline)	–	–	–	$0	$0	$0	−$1	−$1	−$2
Consumption (income – tax + transfer)	$80,000	$20,000	$100,000	$79,992	$20,002	$99.994	$79,988	$20,001	$99,989
Δ Consumption (from baseline)	–	–	–	−$8	$2	−$6	−$12	$1	−$11
Mechanical	–	–	–	−$8	$2	−$6	−$9	$1	−$8
Behavioral	–	–	–	–	–	–	−$3	$0	−$3
Welfare weight	0.144	1	–	0.144	1	–	0.144	1	–
Δ Welfare (Δ consumption (mechanical) × welfare weight)	–	–	–	−1.15	2	0.85	−1.30	1.00	−0.30

Note: See text for details.

6. Regulatory redistribution and the elasticity of taxable income

In Section 3, we saw that the ETI allowed tax policy analysts to calculate the deadweight loss of a small tax change. A similar elasticity-of-taxable-income approach will allow us to calculate – to a first approximation – the deadweight loss of a small change in redistribution effectuated through regulatory means. With that calculation in hand, we can assess whether the equity benefits of a redistributive regulation outweigh the costs – including both the direct net costs of the regulation (if static costs exceed static benefits in Kaldor–Hicks terms) and the deadweight loss of redistribution.

Before proceeding further, a note of caution is warranted: Agencies should not adopt this article's method for calculating the deadweight loss of redistribution unless they also are accounting for distributional benefits in their analysis. Just as Revised Circular A-4's approach – counting distributional benefits while ignoring deadweight loss – lacks justification, the mirror approach of *ignoring* distributional benefits while *counting* deadweight loss would be impossible to justify. Whether agencies choose to count distributional effects or not, they should be *symmetrical* in their approach to equity benefits and deadweight loss – at least within the context of any given BCA.

Once an agency decides to consider distributional effects, the next step in the analysis is to estimate how the direct net benefits of the regulation vary by income. This step is required for the welfare-weighted approach in Revised Circular A-4 anyway, so repeating this step as part of the deadweight loss calculation imposes no additional analytical burden on agencies. We can then plot the distribution of net benefits as a function of income, as we do in Figure 1 for the hypothetical petroleum refinery regulation.

At this point, we should pause again and ask whether the relationship between regulatory benefits and income reflected by the slope of the net benefits function is *causal.* Recall from the airline seat-distance example in Section 2 that a regulation can, in theory, have differential effects on different income groups without changing the incentive to earn additional income if the relationship between benefits and income is non-causal. In our

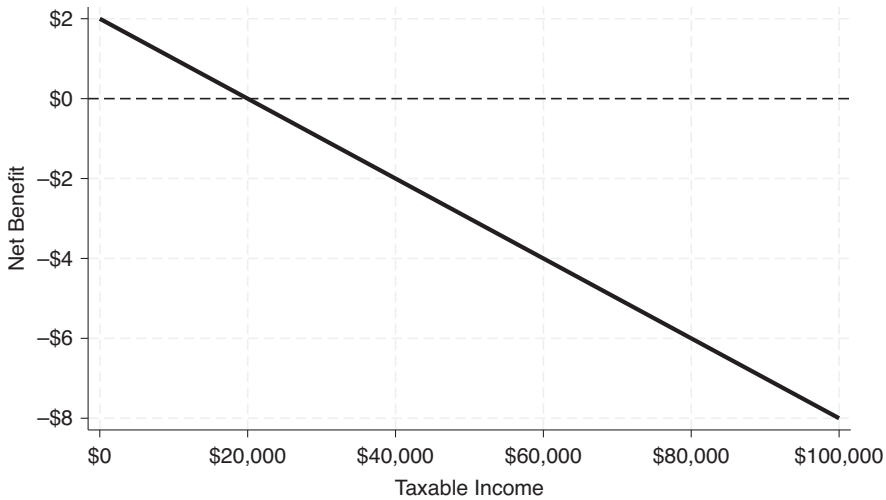

Figure 1. *Net benefits of regulation by income (static).*

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petroleum refinery example, however, this concern about non-causality is almost certainly not relevant: high-income individuals bear a larger share of the regulation's cost *because* their higher incomes allow them to purchase more petroleum, not because of any latent trait that is associated both with income-earning ability and petroleum use. Thus, we can interpret the slope of the net benefits function as the percentage-point change in the net-of-tax rate. Here, the slope is −0.0001 (i.e. a −0.01 percentage-point reduction in the net-of-tax rate).

To translate that −0.01 percentage-point reduction in the net-of-tax rate into an estimate of the change in taxable income, we need to know two more parameter values: (1) the marginal tax rate (and thus the marginal net-of-tax rate) under the status quo and (2) the ETI. In Section 3, we assumed that the marginal tax rate was 40 % (and thus the marginal net-of-tax rate was 60 %), while the ETI was 0.3. In the next section, we will consider – in more detail – the factors that go into choosing those parameters for real-world regulatory analysis. For purposes of this example, we can continue to use the parameter values from Section 3.

With these values in hand, we have all the ingredients for our deadweight loss calculation. The change in government revenue resulting from a regulation is the percent change in the net-of-tax rate multiplied by the ETI multiplied by taxable income multiplied by the tax rate. Continuing with the values from Section 3, the percent change in the net-of-tax rate is −0.01667 % (i.e. −0.0001/0.6); the ETI is 0.3, taxable income is $100,000; and the tax rate is 40 %. Thus, the change in government revenue is −$2, and that the change in government revenue is a sufficient statistic for estimating the deadweight loss of redistribution. Again, the deadweight loss of redistribution is in addition to the conventional efficiency cost of the regulation (here, $6). In this case, the conventional efficiency cost is larger than the deadweight loss of redistribution, though in other cases, that relationship may be reversed.

To incorporate our estimate of deadweight loss into an estimate of the regulation's effect on welfare, we need to distribute the loss across income groups. For now, we will continue to assume – as in Section 3 – that changes in government revenue result in changes to the size of the demogrant. (We will return to this assumption in the next section.) Thus, the $2 reduction in revenue leads to a diminution in the demogrant of $1 per person (see Table 2, Scenario 2b).

Once we have distributed the deadweight loss of redistribution across income groups, we can calculate the regulation's net effect on each individual's money-metric utility. For Person B, this calculation is straightforward: the effect on money-metric utility – or equivalently, the mechanical change in consumption – is the $2 direct regulatory benefit minus the $1 diminution in the demogrant, or $1.

For Person A, the calculation is – as in Section 3 – somewhat more involved. To estimate the effect on Person A's money-metric utility, we must separate the behavioral effect on consumption (which has no first-order effect on utility) from the mechanical effect (which does). Again, when Person A reallocates a little bit of her time from labor to leisure – thus sacrificing $3 of after-tax income ($5 of pre-tax income) – she is not appreciably worse off than before, assuming that she had previously optimized on the labor-leisure margin. Only the mechanical effects – the direct cost of the regulatory change and the decrease in the demogrant – are utility-relevant for Person A. The total mechanical effect on Person A's consumption is −$9, reflecting the $8 direct cost and the $1 diminution in the demogrant.

The final step in the analysis is to translate the regulation's effect on money-metric utility for individuals in each income group to an estimate of the regulation's effect on welfare. Applying the welfare weights from Section 5 (which reflect the welfare weights implied by

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Revised Circular A-4's choice of ε), the effect on Person A's welfare is -1.30 (i.e. a change of $-\$9$ in money-metric utility multiplied by a welfare weight of 0.144), while the effect on Person B's welfare is 1 (i.e. a change of \$1 in money-metric utility multiplied by a welfare weight of 1). Combining the weighted welfare effects for Person A and Person B, the net effect on social welfare is -0.30.

In this example, factoring in the deadweight loss of redistribution causes the regulation to go from welfare-increasing (a total welfare gain of 0.85) to welfare-decreasing (a total welfare loss of 0.30). Of course, in many real-world cases, redistributive regulations that score as welfare-enhancing under Revised Circular A-4's approach still will be welfare-enhancing once the deadweight loss of redistribution is considered. Given the value that OMB has chosen for the negative elasticity of marginal utility (1.4), and with elasticities of taxable income in a realistic range, redistribution remains welfare-increasing at the margin. Thus, incorporating deadweight loss into Revised Circular A-4 would not be fatal to OMB's goal of effectuating redistribution via non-tax regulations. Rather, regulations still could be justified on distributional grounds – but without misleadingly high estimates of welfare benefits that, because they are economically unsound, put the project of regulatory redistribution in legal peril.

7. Applying the ETI approach to real-world regulations

The previous section illustrated the ETI approach using a hypothetical linear income tax schedule and an off-the-shelf value of the ETI (0.3). Of course, the actual U.S. tax-and-transfer schedule is much more complicated, and the value of the ETI varies across demographic groups and income levels. In applying the ETI approach to real-world regulations, OMB and federal agencies will have to make potentially consequential choices about the net-of-tax rates and ETI values to use in their calculations, as well as the method by which additional revenues are assumed to be raised or rebated. This section considers those choices.

7.1. Net-of-tax rate

For ETI purposes, the marginal net-of-tax rate is the share of additional pre-tax earnings retained by an individual after factoring in all changes in taxes and benefits resulting from a change in income. An individual's marginal net-of-tax rate is not simply 1 minus her federal marginal income tax rate, as net-of-tax rate calculations must account for changes in payroll tax contributions, tax credits, and means-tested in-kind transfers such as Medicaid and housing assistance (as well as for changes in regulatory benefits if regulatory benefits depend upon income).

The Organisation for Economic Co-operation and Development (OECD) produces annual estimates of marginal effective tax rates for workers in the United States and other high- and middle-income countries that seek to account for both tax and transfer changes (but not changes in regulatory benefits). As of 2022, according to the OECD, the marginal effective tax rate for an average-wage U.S. worker who increases her hours from half-time to full-time is 29 % for a single individual without children, 38 % for a single individual with two children, and 33 % for a married individual with two children and a working spouse, translating into marginal net-of-tax rates of 0.71, 0.62, and 0.67, respectively. Notably, the

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OECD estimate does not account for federal, state, or local commodity taxes (e.g. sales taxes), which disincentivize labor effort in standard models (e.g. Atkinson & Stiglitz, 1976). Thus, the OECD estimates plausibly set lower bounds on marginal effective tax rates (in which case marginal net-of-tax rates calculated on the basis of OECD estimates would be upper bounds).

As the OECD estimates illustrate, marginal effective tax rates (and thus marginal net-of-tax rates) differ across demographic groups (e.g. single individuals vs. married couples and childless taxpayers vs. taxpayers with children). Rates also differ across income levels. Although the federal income tax schedule is progressive, some lower-income taxpayers face very high marginal effective tax rates due to phaseouts of means-tested benefits. For example, according to the OECD, a married individual in the United States with two children and a working spouse who earns the minimum wage and increases her hours from half-time to full-time faces a marginal effective tax rate of 62 %, almost twice the rate of an average-wage worker under otherwise similar circumstances (OECD, 2023).

In applying the ETI approach, OMB and federal agencies will need to decide whether to use a single net-of-tax rate as a starting point for all regulatory analyses or to adjust net-of-tax rate estimates based on the characteristics of the individuals affected by a particular regulation. In other contexts, such as the value of a statistical life, federal agencies sometimes use uniform parameter values notwithstanding observed heterogeneity across individuals and groups (Sunstein, 2004; Kniesner & Viscusi, 2023). The choice between uniform and tailored values reflects a tradeoff between the benefits of analytical precision and the costs of saddling agencies with additional computational burdens (see Hemel, 2022, 720–724 for further discussion of this tradeoff). If OMB and federal agencies choose to use tailored values, they can calculate the net-of-tax rate, the change in the net-of-tax rate, and the budgetary effect for each income group or demographic group and then can add up the budgetary effects for all income groups to arrive at the total deadweight loss. This additive approach accommodates nonlinear tax-and-transfer schedules as well as regulations for which the net benefits are a nonlinear function of income.

7.2. Elasticity of taxable income

Along with the change in the net-of-tax rate, the other important input to deadweight loss calculations is the value of the ETI. As noted, estimates of the ETI vary widely, from as low as 0.1 to as high as 3. A recent analysis by Kumar and Liang (2020) seeks to reconcile much of the variation in previous studies, arriving at a preferred estimate of 0.571 for the ETI and 0.172 for the elasticity of broad income (EBI).

To understand the difference between the ETI and the EBI, consider a small change in the federal income tax brackets (e.g. a 0.01 percentage-point increase in all bracket rates). The change will induce two main sets of responses. First, individuals may change the amount that they work and/or save, thus reducing their broad income (i.e. salaries, wages, interest, and dividends, among other items). Both the EBI and the ETI capture those effects. Second, individuals may make changes that affect their taxable income but not their broad income. For example, individuals may claim larger business expense deductions for items such as meals and travel; they may claim larger itemized deductions (e.g. charitable contributions); they may reallocate some of their salary toward tax-exempt fringe benefits such as employer-provided health insurance; and so on. The ETI reflects this second set of changes in taxable

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income, while the EBI does not. Estimates of the EBI are therefore almost always lower than estimates of the ETI.[21]

In calculating the deadweight loss of regulatory redistribution, there is a plausible case for using the EBI rather than the ETI. Consider the hypothetical petroleum refinery rule analyzed in Sections 5 and 6, which we analogized to a 0.01 percentage-point tax increase. As with an explicit increase in statutory rates, we might expect the rule to affect labor incentives. We would not, though, expect the rule to have a significant effect on the size of business meal deductions, or on charitable giving decisions, or on the choice between taxable wages and employer-sponsored health insurance. Thus, the EBI – which captures real labor and savings responses but not changes in tax deductions and exclusions – might seem to be the more useful figure in estimating deadweight loss.

Under certain circumstances, agencies may be able to justify using elasticity values below the general EBI. If a redistributive regulation raises the price of a commodity that is complementary to leisure, then the regulation may induce individuals to substitute away from leisure and toward labor (Corlett & Hague, 1953).[22] Indeed, the hypothetical petroleum refinery emissions standard considered above may be an example of such a regulation, since gas appears to be strongly complementary to leisure (West *et al.,* 2007). But just as redistributive regulations may raise the prices of commodities that are complementary to leisure, they also may raise prices of commodities that are complementary to labor. For example, while gasoline appears to be a leisure complement, car ownership appears to be a labor complement (Raphael & Rice, 2002). Regulations such as motor vehicle safety standards that raise the cost of cars may have especially strong negative effects on labor incentives, resulting in especially large deadweight losses.[23]

There are, moreover, at least two colorable arguments for using elasticities that equal or exceed the ETI as a general matter. First, Congress's choice to redistribute based on taxable income rather than broad income – in other words, its choice to incorporate various exemptions and deductions into tax law – arguably reflects a view that redistribution based on taxable income is preferable, from a social welfare perspective, to redistribution based on broad income. For example, taxable income – which makes modifications for large medical expenses and disaster losses – arguably offers a better approximation of the marginal utility of consumption than broad income does. Insofar as Congress seeks to redistribute from households with low marginal utility of consumption to households with high marginal utility of consumption, then taxable income possibly provides a better index of economic

[21] EBI estimates may overstate the "real" (i.e. labor and savings) responses to changes in the tax rate insofar as individuals respond by hiding items of income from tax authorities. However, many illegal tax avoidance responses – for example, misclassifying or inflating expenses for deduction purposes – will not bias EBI estimates because they do not affect the amount of gross income reported.

[22] For applications of the Corlett–Hague principle to BCA that assume offsetting adjustments to the tax-and-transfer schedule, see Kaplow (2020) and Boadway and Smart (2023).

[23] Another possibility is that individuals may be inattentive to the income-differential effects of non-tax regulations and may therefore fail to adjust labor supply in response to regulatory redistribution. If redistributive regulations are less salient than income taxes, then the elasticity of taxable income with respect to changes in regulatory redistribution may be lower than the EBI for explicit tax changes. Alcott *et al.* (2018) raise a related possibility in the commodity tax context, though they note that this would contravene the canonical Atkinson–Stiglitz theorem. Note also that if individuals fail to adjust their labor supply in response to changes in redistribution, then they will experience utility losses from budgetary misallocations, and those utility losses would need to be incorporated into any comprehensive welfare analysis (Goldin, 2015).

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wellbeing.[24] Moreover, some of the differences between broad income and taxable income are designed to incentivize socially desirable behaviors such as adoption, charitable giving, and support for state and local governments. If we think that Congress's judgment is correct – that redistribution based on taxable income is preferable to redistribution based on broad income – then it might not make sense to use an estimate for the social cost of broad income-based redistribution that is *lower* than our estimate for the social cost of taxable income-based redistribution.

Proponents of using the EBI in regulatory analysis might respond to this first argument for a higher elasticity estimate by disputing the premise that "taxable income" reflects a considered congressional choice among potential distributional indices. For example, the charitable contribution deduction might reflect the political power of particular interest groups (e.g. elite universities, hospitals, and art museums) rather than Congress's careful balancing of social benefits and costs.[25] Indeed, an essential premise of the argument for regulatory redistribution is that Congress is *not* setting the tax-and-transfer schedule optimally. (Recall from Section 4 that if the tax-and-transfer schedule is optimal, then marginal changes in the amount of redistribution and deadweight loss have offsetting effects on social welfare, allowing analysts to ignore both effects.) Concededly, Congress could – in theory – choose the optimal tax base yet set suboptimal rates on that base, but once we have assumed that the rates are suboptimal, it would seem strange to say that the base is somehow optimal.[26]

A second argument for using a higher elasticity estimate in regulatory analysis arises from the uncertainty generated by OMB's approach. A thought experiment helps to illustrate the argument: Imagine that the government announces that it will redistribute an unspecified amount from higher-income households to lower-income households each year. Presumably, the fact that the government fails to specify the tax-and-transfer schedule will not eliminate the deadweight loss of redistribution. To the contrary, individuals will develop their own expectations about the effective tax rates implied by the government's peculiar policy. If those expectations are on average correct, the deadweight loss will likely exceed the deadweight loss of an equivalent amount of redistribution via a pre-specified tax-and-transfer schedule because of the uncertainty baked into individual's expectations. Risk-averse individuals will prefer a guaranteed 40 % tax over a coin flip with a one-in-two chance of a 30 % tax and a one-in-two chance of a 50 % tax.[27] Accordingly, the labor and savings disincentives of the coin-flip tax will exceed the labor and savings disincentives of the certain tax.

[24] This argument becomes weaker in the presence of well-functioning private insurance markets (Kaplow, 1991).

[25] Non-tax regulations also may reflect the political power of special interest groups (e.g. Stigler, 1971), and the case for using the EBI in regulatory analysis does not imply otherwise. Rather, the argument for using the EBI rather than the ETI is that "broad income" – a measure constructed by researchers rather than lawmakers – does not itself reflect special interest group lobbying, and taxpayers cannot easily manipulate their broad income by taking advantage of loopholes created for political purposes. On the measurement of broad income, see Gruber and Saez (2002, 30). To be sure, if agencies started to use a measure of broad income for redistributive purposes, it is possible that special interest groups would begin to lobby for changes to that measure as well.

[26] Proponents of using the EBI in regulatory analysis also might accept that taxable income is, overall, a better distributional index than broad income but argue that redistribution on the basis of broad income is preferable at the margin. See Gamage (2015) for an argument that redistribution on the basis of multiple tax measurements can reduce deadweight loss relative to redistribution on the basis of a single measurement, provided that the various measurements are significantly non-overlapping.

[27] Note, moreover, that a negative elasticity of marginal utility of 1.4 implies a substantial degree of risk aversion, thus raising the social cost of the uncertainty generated by unspecified effective tax rates. On the relationship between the negative elasticity of marginal utility and the coefficient of relative risk aversion, see Chetty (2006).

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Advocates for a higher elasticity estimate might analogize Revised Circular A-4's approach to an unspecified tax. In effect, OMB is urging agencies to redistribute from higher-income households to lower-income households, but because we do not know how often agencies will adopt redistributive regulations or how much redistribution they will accomplish in those cases, we cannot estimate with precision the effective tax increase that those regulations will generate. Instead, we are (or so the argument goes) in the same position as individuals in the thought experiment who face a progressive but unspecified tax-and-transfer schedule. And, because of the additional deadweight loss of uncertainty, the ETI for an explicit tax change imposes a lower bound on the ETI with respect to the unspecified change.

Importantly, this argument for using a higher elasticity in regulatory analysis depends upon taxpayer perceptions: How, if at all, will taxpayers respond to the Revised Circular A-4's implicit promise of an unspecified amount of future redistribution? The details of Circular A-4 may be too technical to generate a significant uncertainty-driven response, though this may change if politicians and the media draw attention to regulatory redistribution. Note, moreover, that even if taxpayers do not respond to Revised Circular A-4 itself, they still may – and under standard assumptions, will – adjust their labor supply in response to redistributive regulations that affect the value of the consumption bundles that they can purchase with additional income.

As with the net-of-tax rate, estimates of the EBI and the ETI vary widely across income and demographic groups. For example, Blomquist and Selin (2010) estimate an ETI of 0.19–0.21 for married male workers and 0.96–1.44 for married female workers based on Swedish data – a result that is broadly consistent with U.S. research finding that the lower-earning member of a married couple generally has a higher elasticity of labor supply (McClelland *et al.,* 2014). Again, OMB and federal agencies will have to decide whether to use one-size-fits-all elasticity estimates or to adjust estimates based on the income levels and demographic characteristics of the individuals and households affected by a regulation – with the same tradeoff between accuracy and analytical costs as above.

7.3. Distribution of deadweight loss

Finally, OMB and federal agencies must decide how to translate budgetary effects into welfare effects. The ETI approach produces a money-metric estimate of deadweight loss, but for purposes of distributional analysis using welfare weights, it is important to know *who* bears that loss. The illustrations above all assumed that the deadweight loss, which takes the form of a revenue reduction, would pass through to individuals on a per-capita basis. Of course, no one – not even the members of the tax-writing and appropriations committees in Congress – knows for sure where an additional dollar of federal revenue will go or where how an additional dollar of federal revenue will be raised. If a redistributive regulation reduces tax revenue, Congress could respond by raising taxes on the very rich, cutting spending programs for the very poor, or making any number of intermediate adjustments (Hemel & Rozema, 2017).

One advantage of this article's per-capita approach is that it significantly simplifies analysis. Since the dollar effects of a change to the demogrant are (by definition) equal for all individuals, raising or rebating revenues per capita does not change the net-of-tax rate. By

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contrast, if we made a different assumption about the distribution of the deadweight loss, then we would have to recalculate the change in the net-of-tax rate resulting from the regulation.[28] Note as well that an essential premise of the argument for regulatory redistribution is that Congress redistributes too little. The notion that lower-income individuals would bear a significant portion of any revenue loss – as the per-capita assumption implies – coheres with the implicit view that Congress's distributional preferences are insufficiently progressive.

Although the per-capita assumption has the benefit of analytical parsimony, the ETI framework is flexible enough to accommodate other assumptions about the distribution of the deadweight loss. If higher-income households bear the lion's share, then the deadweight loss of redistributive regulations will be even larger than under the per-capita assumption. From a task specialization perspective, it would make sense for OMB to apply a uniform assumption about the distribution of deadweight loss in its Circular A-4 revision rather than leaving it to federal agencies to generate their own prognostications about how Congress will raise or spend additional revenue.

Readers familiar with general equilibrium (GE) analysis may recognize the per-capita approach as analogous to fiscal closure methods often used in GE models (e.g. Anderson *et al.,* 2013, 866). In those models, which seek to account for interactions of supply and demand across the entire economy, a fiscal closure rule is a mechanism for bringing government revenues and spending into alignment. The ETI is a partial equilibrium approach, not a general equilibrium approach (Feenberg, 2009), but the assumption that revenue shortfalls will be passed through to individuals on a per-capita basis is the same assumption that many GE models adopt to achieve fiscal closure.

Revised Circular A-4 authorizes agencies to engage in GE analysis but adds that "if you use lump-sum transfers to close a fiscal shortfall in your general equilibrium analysis, the corresponding distributional analysis should report the effects on people excluding the effect of these lump-sum transfers" (OMB, 2023a, 43). Revised Circular A-4 does not state whether this same guidance applies to the distribution of deadweight loss in partial equilibrium analysis. When redistributive regulations increase deadweight loss, which manifests initially as a reduction in government revenue, then that reduction in government revenue must affect *someone*'s welfare. Although the assumption that deadweight loss will be distributed to individuals on a per-capita basis may not always be accurate, the assumption that *no one* will bear the deadweight loss is obviously impossible: if redistribution reduces the sum of resources available to society, then it must reduce the sum of resources available to at least some individuals in that society. Ideally, OMB would clarify that the discussion of GE modeling in Circular A-4 does not preclude agencies from incorporating deadweight loss into distributional analysis using a reasonable method such as the per-capita approach outlined here.

[28] For example, in the previous section, we calculated the change in the net-of-tax rate from the hypothetical petroleum refinery standard to be −0.01 percentage points, assuming that the $2 deadweight loss passes through to Person A and Person B on a per-capita basis. If the entire loss were passed through to Person A, then the change in the net-of-tax rate would be −0.012 percentage points, and the deadweight loss would be $2.40. If the additional $0.40 of deadweight loss were passed through to Person A, then the change in the net-of-tax rate would be −0.0124 percentage points, and the deadweight loss would be $2.48. Applying the formula for an infinite geometric series, and assuming full passthrough to Person A at each step, the ultimate deadweight loss would be $2.50.

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8. Conclusion

If federal agencies consider the equity benefits but not the deadweight loss of redistribution in their regulatory analysis, they will leave themselves open to attack on the ground that they have ignored an important aspect of the problem of redistribution. Happily for proponents of regulatory redistribution, the ETI approach offers agencies a straightforward method for incorporating deadweight loss into distributional analysis. To summarize the discussion above, Table 3 provides a nine-step checklist for agencies to follow when applying the ETI approach.

Table 3. *Checklist for calculating the deadweight loss of redistributive regulations*

Step	Notes
1. Decide whether to account for distributional effects	Agencies should incorporate the deadweight loss of redistribution into their regulatory analysis only if they are also incorporating distributional benefits. (Otherwise, **stop here.**)
2. Estimate the relationship between net benefits and taxable income	For each income group, the agency should estimate the direct net benefit from the regulation (r). The first derivative of regulatory benefits as a function of taxable income, $r'(y)$, is the change in the net-of-tax rate. (If $r'(y) = 0$, **stop here.**)
3. Determine whether taxable income has a causal effect on net benefits	If taxable income has a causal impact on direct net benefits, the regulation will affect deadweight loss positively or negatively. (If the correlation between income and net benefits is non-causal, **stop here.**)
4. Estimate the marginal tax rate (t) and net-of-tax rate ($1 - t$) for each income level	The marginal tax rate should account for changes in transfers as well as explicit taxes.
5. Select value for elasticity of taxable income (ETI)	If an agency chooses an elasticity above or below the ETI for explicit tax changes, the agency should explain why it believes that the regulatory context warrants a higher or lower elasticity.
6. Calculate deadweight loss	For each income group, deadweight loss is $ETI \times \frac{r'(y)}{(1-t)} \times t \times y$. Total deadweight loss is the sum of deadweight losses for all income groups.
7. Distribute deadweight loss	Agencies should justify their method for distributing deadweight loss across the population (see Section 7 for a justification for the per-capita approach).
8. Calculate effect on money-metric utility for each income group	The effect on money-metric utility is the direct net benefit from the regulation (r) less the group's share of the distributed deadweight loss.
9. Calculate welfare effect for each income group and for society as a whole	The welfare effect for each income group is the effect on money-metric utility multiplied by the group's welfare weight. The effect on social welfare is the sum of the welfare effects for all groups.

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As emphasized in Section 6, agencies should incorporate the deadweight loss of redistribution into regulatory analysis only when they are also counting distributional benefits. Otherwise, they would be replicating Revised Circular A-4's asymmetrical treatment of benefits and costs – but in the reverse direction. Once an agency decides to incorporate distributional benefits and costs into its analysis, it should estimate the relationship between net benefits and taxable income (i.e. the net benefits function illustrated in Figure 1). The slope of the net benefits function should be interpreted as a change in the effective tax rate if (and only if) the relationship between benefits and income is causal.

Assuming the relationship is indeed causal, agencies will face three significant implementation choices: choosing an appropriate net-of-tax rate (step 4), choosing a value for the ETI (step 5), and choosing a method for distributing deadweight loss across income groups (step 7). As we saw in the previous section, there are plausible arguments for adjusting the ETI upward or downward when transferring that parameter value from the tax context to the regulatory context. Moreover, there are plausible arguments for distributional methods that allocate more deadweight loss or less deadweight loss to lower-income groups than the per-capita assumption illustrated above. By contrast, Revised Circular A-4's approach – which categorically excludes deadweight loss from welfare analysis – lacks any apparent justification.

Most importantly, and beyond the step-by-step specifics of the ETI approach, agencies should acknowledge that redistribution is rarely costless, and a full benefit–cost analysis cannot consider the benefits of redistribution while ignoring the costs. When agencies undertake distributional analysis, they should make a good-faith effort to calculate those costs, explaining the reasoning for their particular parameter value choices and methodological assumptions. The resulting rules will be more likely to survive judicial review, and the accompanying analyses will provide the public with a fuller view of the welfare consequences of regulatory actions.

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A. Appendix

Following the approach in Chetty (2009), we first model individual utility (u) as quasilinear in consumption and money metric:

$$u = (1-t)wl + d + r - \psi(l), \tag{1}$$

where t is the linear tax rate, w is the wage rate, l represents labor effort (e.g. hours worked), d is the demogrant, r represents the net benefit to the agent from regulations, and $\psi(l)$ is the disutility of labor effort. Because our example involves only two individuals (A and B), with all tax revenue raised from Person A, $d = \frac{1}{2}twl$.

Consider a change in policy, Δx, which can represent either a tax rate change or a regulatory reform. If Δx represents a tax rate change, then $\frac{\Delta r}{\Delta x} = 0$. Likewise, if Δx represents a regulatory reform, then $\frac{\Delta t}{\Delta x} = 0$.

The individual chooses her labor effort, l, such that

$$(1-t)w\frac{\Delta l}{\Delta x} - \frac{\Delta \psi}{\Delta l}\frac{\Delta l}{\Delta x} = 0. \tag{2}$$

In other words, the individual is indifferent – on the margin – between the after-tax income of an additional increment of labor effort and the disutility of an additional increment of labor effort.

The change in an individual's utility for a small change in x is

$$\frac{\Delta u}{\Delta x} = (1-t)w\frac{\Delta l}{\Delta x} - wl\frac{\Delta t}{\Delta x} + \frac{\Delta d}{\Delta x} + \frac{\Delta r}{\Delta x} - \frac{\Delta \psi}{\Delta l}\frac{\Delta l}{\Delta r}. \tag{3}$$

Substituting the terms in Equation (2)), we arrive at

$$\frac{\Delta u}{\Delta x} = -wl\frac{\Delta t}{\Delta x} + \frac{\Delta d}{\Delta x} + \frac{\Delta r}{\Delta x}. \tag{4}$$

Thus, the change in individual utility for a small change in policy is equal to the mechanical effect on the amount of tax paid ($-wl\frac{\Delta t}{\Delta x}$), plus the effect on the amount of the demogrant received ($\frac{\Delta d}{\Delta x}$), plus the direct effect of the regulatory change ($\frac{\Delta r}{\Delta x}$). When the policy change is a regulatory reform rather than a tax reform, then $\frac{\Delta t}{\Delta x} = 0$, and we arrive at

$$\frac{\Delta u}{\Delta x} = \frac{\Delta d}{\Delta x} + \frac{\Delta r}{\Delta x}. \tag{5}$$

Recall that $d = \frac{1}{2}twl$. Thus,

$$\frac{\Delta d}{\Delta x} = \frac{1}{2}w\left(t\frac{\Delta l}{\Delta x} + l\frac{\Delta t}{\Delta x}\right). \tag{6}$$

When the policy change is a regulatory reform rather than a tax reform, then $\frac{\Delta t}{\Delta x} = 0$, and

$$\frac{\Delta u}{\Delta x} = \frac{1}{2}tw\frac{\Delta l}{\Delta x} + \frac{\Delta r}{\Delta x}. \tag{7}$$

So far, we have assumed that individual utility is quasilinear in consumption. However, the weighted-utility approach in Revised Circular A-4 implies that individual welfare is an isoelastic function of money-metric utility:

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$$W(u) = \begin{cases} \dfrac{u^{1-\epsilon} - 1}{1-\epsilon}, & \epsilon \geq 0, \epsilon \neq 1, \\ \ln(u), & \epsilon = 1. \end{cases} \tag{8}$$

The first derivative of the isoelastic function with respect to u is $u^{-\varepsilon}$, or $\frac{1}{u^{\varepsilon}}$. If we normalize r and $\psi(l)$ to zero prior to the policy experiment, such that $u = (1-t)wl + d$ at the outset, then the change in individual welfare is given by

$$\frac{\Delta \mathrm{W}}{\Delta \mathrm{x}} = u^{-\epsilon}\left(-wl\frac{\Delta \mathrm{t}}{\Delta \mathrm{x}} + \frac{\Delta \mathrm{d}}{\Delta \mathrm{x}} + \frac{\Delta \mathrm{r}}{\Delta \mathrm{x}}\right). \tag{9}$$

For a regulatory reform,

$$\frac{\Delta \mathrm{W}}{\Delta \mathrm{x}} = u^{-\epsilon}\left(\frac{\Delta \mathrm{d}}{\Delta \mathrm{x}} + \frac{\Delta \mathrm{r}}{\Delta \mathrm{x}}\right) = u^{-\epsilon}\left(\frac{1}{2}tw\frac{\Delta \mathrm{l}}{\Delta \mathrm{x}} + \frac{\Delta \mathrm{r}}{\Delta \mathrm{x}}\right), \tag{10}$$

and the change in social welfare is the summation of the changes in each individual's weighted welfare.

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