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ABSTRACT

This paper evaluates Laffer curves produced by reforms to nonlinear income taxes, focusing on individual taxpayers. A reform puts a taxpayer on the "wrong" side of the Laffer curve if it increases their tax burden while reducing tax payments. There always exist potential reforms with this property – and in particular, tax increases restricted to high-income taxpayers are guaranteed to consign some to the wrong side of the Laffer curve. The original design of the 2024 Australian tax reform would have put 15% of the taxpaying population on the wrong side of the Laffer curve, though subsequent modifications reduced this to 5%. Standard tax progressivity measures that ignore the endogeneity of taxable income generally understate the redistributive impact of progressive tax reforms.

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1. Introduction.

The Laffer curve is a familiar depiction of the relationship between tax rates and total government tax revenue. The Laffer curve has certain well-known properties: at a 0% tax rate, tax revenue is zero; whereas at a 100% tax rate, taxpayers have no incentives to earn taxable income, so tax revenue again is zero. Since it is possible to raise positive tax revenue with an intermediate tax rate, there must be a revenue-maximizing tax rate that lies between zero and 100% – and this is the peak of the Laffer curve. Higher tax rates – those to the right of this peak – lie on the "wrong" side of the Laffer curve, in that the government could obtain greater revenue by reducing the tax rate, which would also benefit affected taxpayers.

The Laffer curve was originally conceived as a relationship between a flat tax rate and aggregate tax revenues. The concept can also be applied to individual taxpayers, or groups of taxpayers, mapping the relationship between tax rates and total tax payments. Since individuals differ in their incomes, tax-relevant personal situations, and responsiveness to tax rate changes, it can readily be the case that some lie on the "wrong" side of the Laffer curve, while others lie on the "right" side. Available estimates suggest that, for recent tax reforms in Spain, New Zealand, Australia, and elsewhere, this is indeed the case.

Income taxes seldom subject all taxpayers and all incomes to the same tax rate. In practice, tax rates usually rise with income, and tax systems offer exclusions, deductions and credits that can significantly mitigate or offset tax obligations. Furthermore, governments frequently contemplate or enact reforms that change tax schedules in highly nonlinear ways. Consequently, in order to apply the Laffer framework to realistic settings it is necessary to generalize the analysis beyond the simple specification of a flat tax applicable to everyone.

This paper considers the effect of arbitrary tax reforms on tax payments by individuals and groups of individuals. The goal is to understand the relationship between tax burdens and tax payments, including identifying the extent to which taxpayers lie on either side of the peak of the Laffer curve. Laffer curve positioning is generally reform- and taxpayer-specific, as differently-situated taxpayers will have different incomes, face different burdens, and encounter different incentives from the same tax reform.

Generalizing the domain of the Laffer curve concept requires interpreting a taxpayer to lie on the "wrong" side of the Laffer curve if a reform increases their tax burden while reducing their tax payment (or reduces their tax burden while increasing their tax payment). Applying this interpretation, it becomes immediately apparent that for many potential tax reforms it will be the case that significant numbers of taxpayers lie on the wrong side of the Laffer curve. In these cases, the mechanical effects of higher tax rates applied to given income levels are more than offset by behavioral responses that depress taxable income and therefore tax obligations. This is obviously more likely to occur if behavioral effects are large; but it is also more likely to occur if mechanical effects are small. The relative sizes of behavioral and mechanical effects depend in part on the responsiveness of taxable income to incentives, and in part on the nature of the reform. Indeed, it is possible to show that any taxpayer who faces a nonzero marginal tax rate will be on the wrong side of the Laffer curve for some potential tax reforms, while being on the right side of the Laffer curve for others.

Governments commonly consider reforms that change tax rates only above given income thresholds. For example, a progressive tax system might have marginal and average tax rates that rise with income, imposing a top marginal tax rate of 40% on incomes exceeding $200,000; and reformers could propose to increase this top marginal rate to 44% on incomes over $250,000, making no changes elsewhere. The analysis in this paper shows that this proposed reform is guaranteed to reduce tax collections from some high-income taxpayers even if the aggregate impact on government revenues is positive. Taxpayers lying on the wrong side of the Laffer curve will be concentrated among those with taxable incomes just above $250,000. These taxpayers would pay no additional tax on the first $250,000 of their incomes; and while they would pay additional tax on anything above $250,000, their behavioral responses cause their taxable incomes and tax payments to decline.

Australia in 2018 and 2019 introduced a three-part phased tax reduction. This paper uses Australian tax return data together with standard behavioral estimates to identify properties of the third stage of this reform, which took effect in 2024. As originally enacted, the 2024 tax reductions would have put 15% of Australian taxpayers on the wrong side of the Laffer curve. The intervening election of a more liberal government prompted progressive modifications, as a result of which the changes implemented in 2024 put just 5% of the taxpaying population on the wrong side of the Laffer curve.

Higher tax rates impose additional burdens, whether or not they are accompanied by greater tax payments. Consequently, in order to understand who bears the burden of a tax reform, it is necessary to look beyond simple measures of average tax obligations. Despite this reality, common methods of evaluating the burdens of a tax reform rely on changes in tax payments by different groups in the population. This can present misleading pictures, particularly for reforms that change marginal tax rates unevenly across the income distribution. This paper proposes modifications to standard tax reform progressivity measures, applying them to the 2024 Australian tax reform.

2. Laffer curves in theory and practice.

While observers have long noted that higher tax rates will reduce aggregate tax revenues over sufficiently high ranges,[1] the modern revival and development of this theory traces to the observation, attributed to Arthur Laffer in the 1970s,[2] that any feasible level of tax revenue can be obtained with either of two (flat) tax rates. The accompanying depiction of the relationship between tax rates and tax revenues calls attention to the region over which higher tax rates reduce tax revenues; and subsequent strides in estimating the responsiveness of taxable income made it possible to gauge the approximate boundaries of this region. Numerous studies identify combinations of tax rates and elasticities of taxable income that lie on the "wrong" side of the Laffer curve, based on available estimates of behavioral responsiveness.[3] This work has been explicitly extended to consider Laffer curves in complex tax systems with progressive rate structures, individual-specific tax deductions, and multiple overlapping taxes such as consumption and social security taxes, in addition to income taxes.[4]

Subsequent work applies Laffer curve concepts to broader contexts, including dynamic settings, where tax rates can influence not only labor supply, but also physical and human capital accumulation, with associated effects on productivity and therefore tax revenue.[5] Other studies

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[1] Though not the first to call attention to the possibility of an inverse relationship between tax rates and tax revenues, Dupuit (1844) independently offers a cogent and surprisingly modern analysis of the Laffer curve.
[2] Wanniski (1978).
[3] See Fullerton (1982), Bender (1984), Malcomson (1986), Saez (2004), Giertz (2009), Saez, Slemrod and Giertz (2012), Creedy (2011, 2015), Zanetti (2012), Guner, Lopez-Daneri and Ventura (2016), Creedy and Gemmell (2006, 2017), and Holter, Krueger, and Stepanchuk (2019).
[4] See Sanz-Sanz (2016a, 2016b, 2022) and Lefebvre, Lehmann, and Sicsic (2022).
[5] See, for example, Ireland (1994), Pecorino (1995), Agell (2001), Novales and Ruiz (2002), Trabandt and Uhlig (2011), Van Oudheusden (2016), and Badel, Huggett and Luo (2020).

consider the role of taxpayer attitudes, tax base definitions, and tax enforcement on the tax rate responsiveness of government tax collections.[6] Evidence from laboratory experiments,[7] changes in tax payments over time,[8] and international comparisons of tax rates and tax collections[9] provide investigators with opportunities to estimate features of aggregate Laffer curves in realistic tax settings.

Some studies explore the impact of taxpayer heterogeneity. Guner, Lopez-Daneri, and Ventura (2016), Holter, Krueger, and Stepanchuk (2019), and Kindermann and Krueger (2022) find that taxpayer heterogeneity generally increases the responsiveness of aggregate tax payments to tax rates, shifting the Laffer curve leftward, and reducing the marginal tax rate at the peak. And a small literature, including Creedy (2015), Creedy and Gemmell (2013, 2015, and 2017), Sanz-Sanz (2016a), and Gamarra, Sanz-Sanz and Arrazola (2024), identifies Laffer effects for individual taxpayers impacted by specified reforms. These studies call attention to important possibilities, but leave open the question of under what circumstances reforms will put significant numbers of taxpayers on the wrong side of the Laffer curve.

3. Individual Laffer curves.

This section considers the behavior of individuals who respond to incentives created by an income tax system. If $T(y)$ is the tax obligation for someone with income y, then the taxpayer's marginal tax rate is $\tau(y) = T'(y)$, and their average tax rate is $\overline{\tau} = A(y) \equiv T(y)/y$. A taxpayer chooses taxable income y, which is a function not only of the taxpayer's income-earning opportunities, but also of incentives created by the applicable marginal tax rate τ as well as the taxpayer's average tax rate and any exogenous after-tax income. One complication is that the marginal tax rate is itself a function of y. In order to apply standard price theory formulations, it is helpful to express the taxpayer's optimizing choice of y as $y(\tau, m)$, which is the amount of income the taxpayer would choose if facing a flat tax at rate τ while receiving exogenous income m,

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[6] See Feige and McGee (1983), Forte (1987), Sanyal, Gang and Goswani (2000), Kopczuk (2005), Vogel (2012), and Kotamäki (2017)

[7] Such as Swenson (1988), Sutter and Weck-Hannemann (2003), Ortona et al. (2008), Lévy-Garboua, Masclet, and Montmarquette (2009), and Hamza (2017).

[8] See Goolsbee (1999).

[9] Including Saez (2004), Trabandt and Uhlig (2013), and Lundberg (2017).

neither of which the taxpayer considers to be under their own control. This expression accurately captures taxpayer behavior as long as the flat tax rate is set equal to $\tau(y)$, and exogenous income satisfies $m = b + (\tau - \overline{\tau})$, with b a truly exogenous base amount, and the income supplement $(\tau - \overline{\tau})y$ reflecting that not all income is taxed at the taxpayer's marginal rate.

3.1. Laffer curve analytics.

It is useful to decompose potential tax reforms into their effects on marginal and average tax rates. Denoting a reform's (arbitrarily small) legislated change in the marginal rate at income y by $d\tau$, and the legislated change in the average tax rate at income y by $d\overline{\tau}$,[10] it follows that the change in total tax payment is

$$dT = \tau dy + y d\overline{\tau} . \tag{1}$$

The variable dy in (1) is the response of taxable income to the legislated changes in average and marginal rates. The first term on the right side of (1), τdy, is the behavioral effect of the reform on tax obligations; the second term, $y d\overline{\tau}$, is the mechanical effect. The significance of the standard Laffer curve analysis is that behavioral effects can be so large that $dT < 0$ in response to a higher flat tax rate. In order to apply the Laffer curve method to a progressive income tax, certain adjustments are necessary.

In response to a tax reform,

$$dy = \frac{\partial y(\tau, m)}{\partial \tau} d\tau + \frac{\partial y(\tau, m)}{\partial m} y (d\tau - d\overline{\tau}). \tag{2}$$

From the Slutsky equation, $\frac{\partial y(\tau, m)}{\partial \tau} = \frac{\partial y^c}{\partial \tau} - \frac{\partial y(\tau, m)}{\partial m} y$, in which $\frac{\partial y^c}{\partial \tau}$ is the compensated effect on taxable income of a change in the marginal tax rate. Consequently, (2) can be rewritten as

$$dy = \frac{\partial y^c}{\partial \tau} d\tau - \frac{\partial y(\tau, m)}{\partial m} y d\overline{\tau} , \tag{3}$$

[10] If the reform consists of legislated changes in marginal tax rates $d\tau(y)$, then $d\overline{\tau}(y) = \frac{1}{y}\int_0^y d\tau(z) dz$.

which is entirely intuitive. The first term on the right side of (3) is the substitution effect of changing the marginal tax rate, and the second term is the income effect of the reform. Defining $\varepsilon \equiv \frac{\partial y}{\partial \tau}^{c} \frac{\tau}{y}$ to be the compensated tax elasticity of income production,[11] and denoting the income effect $\frac{\partial y(\tau, m)}{\partial m}$ by η, (3) becomes

(4) $$dy = y\left(\frac{\varepsilon}{\tau} d\tau - \eta d\overline{\tau}\right).$$

Together, (1) and (4) imply that

(5) $$dT = yd\overline{\tau}\left(1 + \varepsilon\psi - \eta\tau\right),$$

in which $\psi = \frac{d\tau}{d\overline{\tau}}$ is the ratio of the change in the marginal tax rate to the change in the average tax rate.

3.2. Interpreting the Laffer curve condition.

Equation (5) reflects the forces commonly associated with Laffer curve analysis, though in this case it is applied to individuals and groups subject to a nonlinear income tax. An extension of this equation that explicitly incorporates a stepwise tax schedule is provided in Appendix A. The standard Laffer analysis considers a flat tax, in which case $d\tau = d\overline{\tau}$, $\psi = 1$, and the right side of (5) is $yd\overline{\tau}\left(1 + \frac{\partial y(\tau, m)}{\partial \tau} \frac{\tau}{y}\right)$, so the sign of dT depends on the magnitude of the uncompensated elasticity of taxable income. In more general cases, the nature of the contemplated tax reform, captured by ψ, is also of central importance.

The mechanical effect of a tax reform on tax collections is $yd\overline{\tau}$, which accounts for the first parenthetical entry on the right side of (5); in the absence of any behavioral responses, a higher

[11] The compensated elasticity can be alternatively defined relative to the after-tax rate, $\tilde{\varepsilon} \equiv \frac{\partial y}{\partial(1-\tau)}^{c} \frac{(1-\tau)}{y}$. Since $\frac{\partial y}{\partial(1-\tau)}^{c} = -\frac{\partial y^{c}}{\tau}$, this substitution would not change the subsequent analysis, other than by replacing ε with $-\tilde{\varepsilon}\tau/(1-\tau)$.

average tax rate will increase tax collections by this amount. The behavioral components of the revenue effect consist of $yd\bar{\tau}\left(\varepsilon\psi-\eta\tau\right)$. Since ε is a compensated elasticity, it cannot be positive, so this term depresses any additional tax collections associated with higher tax rates. The income effect, $-\eta$, can be positive or negative, though if most taxable income is the product of labor, and leisure is a normal good, then $-\eta$ will be positive.[12] Consequently, the behavioral effect of taxation consists of the sum of these substitution and income effects, mediated by features of the reform as captured by ψ.

The ψ term in (5) is the ratio of the change in the marginal tax rate to the change in the average tax rate. Higher values of ψ correspond to cases in which reforms more strongly affect marginal incentives than they do average tax burdens on inframarginal income. From (5), reforms that increase tax burdens $\left(d\bar{\tau}>0\right)$ will reduce tax collections $\left(dT<0\right)$ if

$$\psi>\frac{1-\eta\tau}{-\varepsilon}. \tag{6}$$

Taxpayers and tax reforms for which (6) holds will lie on the wrong side of the Laffer curve. It follows that, for any taxpayer with a nonzero marginal tax rate, and who therefore has a nonzero value of ε, there must exist tax reforms for which they are on the wrong side of the Laffer curve, and other reforms for which they are on the right side.[13]

It is important to distinguish cross-sectional from panel effects of tax reforms on tax payments. Any reform for which $d\bar{\tau}>0$ will entail greater tax collections at that level of income – so holding the income level fixed, a reform cannot be on the wrong side of the Laffer curve. The critical feature of the Laffer analysis is that income is endogenous to taxation – so for any individual taxpayers, or groups of taxpayers, it is indeed possible to be on the wrong side of the Laffer curve.

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[12] The analysis that follows assumes that $-\eta$, if negative, is not too large in magnitude, so that $\left(1-\eta\tau\right)>0$. This rather minor restriction is almost certain to be satisfied in practice – since a violation would correspond to an instability in which the government could augment its net revenue by giving consumers lump-sum distributions that trigger more than offsetting tax collections due to higher taxable incomes.

[13] A lump sum tax increase features $\psi=0$, which from (6) puts all taxpayers on the right side of the Laffer curve.

4. Average tax rates.

The Laffer curve condition (5) carries analogous implications for average tax rates. From the definition of the average tax rate, $A(y) \equiv T(y)/y$, it follows that a tax reform changes a taxpayer's average tax rate by

$$dA = \frac{1}{y} dT - \frac{T}{y^2} dy . \quad (7)$$

Applying (4) and (5), and imposing that $T = y\overline{\tau}$, it follows from (7) that

$$dA = d\overline{\tau}\left[1 + \left(\frac{\tau - \overline{\tau}}{\tau}\right)(\varepsilon\psi - \eta\tau)\right]. \quad (8)$$

Equation (8), describing the effect of tax reform on the average tax rate, evokes (5), the Laffer equation. It is clear from a comparison of (5) and (8) that an important difference between these equations is that, in (8), $\left(\frac{\tau - \overline{\tau}}{\tau}\right)$ premultiplies $(\varepsilon\psi - \eta\tau)$. The difference between marginal and average tax rates drives the behavioral effect of a tax reform on average tax rates. If marginal and average tax rates were equal, then the behavioral response has no effect on average tax rates; whereas if the tax system is progressive, so marginal rates exceed average rates, then behavior that reduces taxable income in response to a tax increase puts downward pressure on average rates.

Equation (8) implies that a reform that increases a taxpayer's tax burden $(d\overline{\tau} > 0)$ will nonetheless reduce their observed average tax rate $(dA < 0)$ if

$$\psi > \frac{\left[\frac{\tau}{(\tau - \overline{\tau})} - \eta\tau\right]}{-\varepsilon}. \quad (9)$$

Expression (9) indicates that, in order for a reform to have this paradoxical property, it must increase marginal rates to a sufficient degree relative to its effects on average rates. The critical value of ψ in (9) is inversely related to the progressivity of the tax system and the magnitude of ε, the compensated tax elasticity of income production, so more elastic behavioral responses require less in the way of marginal tax rate increases in order for higher tax burdens to be associated with reduced average tax rates.

Instances in which higher tax burdens are associated with reduced average tax rates are special cases of taxpayers lying on the wrong side of the Laffer curve. This relationship follows from a comparison of (6) and (9), which differ only in that 1 in the numerator of the right side of (6) is replaced by $\left[\frac{\tau}{(\tau-\overline{\tau})}\right]$ in (9). Since $\left[\frac{\tau}{(\tau-\overline{\tau})}\right]>1$, if a tax reform satisfies (9) then it must also satisfy (6), so a necessary condition for higher taxes to reduce the observed average tax rate is that the higher taxes also reduce tax collections. The converse does not hold, since it is entirely possible for a tax reform to reduce tax collections without reducing average tax rates.

As with the Laffer curve expressed in (5), the average tax rate equation (8) expresses the effects of tax reform on average tax rates of individuals or groups of individuals. It remains the case that, holding income fixed, a reform for which $d\overline{\tau}>0$ will increase the average tax rate of taxpayers at that income level. But an individual's taxable income level need not, and generally will not, remain unaffected by marginal and average tax rate changes – and any income changes will also change average tax rates.

5. Representative tax reforms.

Complex tax reforms can be decomposed into combinations of simple tax changes, making it instructive to consider the implications of equation (5) for representative tax reforms. This section estimates the properties of hypothetical Australian tax reforms, applying specified behavioral parameters to data drawn from the tax returns of a 10% sample of the taxpaying population for the 2017/2018 tax year.[14] The specifications take a taxpayer's compensated substitution elasticity to be given by $\varepsilon=\varepsilon_0-0.01\ln(1+y)$, so elasticities increase gradually in magnitude as incomes rise. The baseline specification is $\varepsilon_0=0.140$, yielding compensated substitution elasticities in the neighborhood of -0.245. The analysis also considers alternatives: a low elasticity specification with $\varepsilon_0=0.020$, producing compensated elasticities close to -0.125, and a high elasticity specification with $\varepsilon_0=0.400$, producing compensated elasticities near -

[14] The sample excludes non-residents, who account for 1.52% of the taxpaying population. Data for 2017/2018 are applied to tax changes in subsequent years by assuming that incomes and numbers of taxpayers in each bracket grow by common factors that match aggregate changes.

0.505.[15] Appendix Table B1 presents implied average compensated substitution elasticities for eight different income ranges for each of these alternative elasticity specifications. Additionally, the specifications posit that income elasticities take the form $\eta = \frac{\eta_0}{1+0.01\ln(1+y)}$, with $\eta_0 = 0.009$ in the baseline scenario, $\eta_0 = 0.005$ in the low elasticity scenario, and $\eta_0 = 0.018$ with high elasticities. As noted in Table B1, all of the implied income elasticities are of small magnitude.

Australia has a piecewise linear income tax, with higher incomes subject to higher tax rates. The second column of Table 1 presents marginal income tax rates for specified income brackets in 2023. As the table indicates, the first AU$18,200 of income was exempt from tax, and a marginal tax rate of 19% applied to incomes between AU$18,201 and AU$45,000; at the top of the income distribution, a marginal tax rate of 45% applied to incomes exceeding AU$180,000.

5.1. Uniform tax changes.

One potential reform is to increase all tax rates by the same amount, so that the 19% tax bracket becomes 21%, the 32.5% bracket becomes 34.5%, the 37% bracket becomes 39%, and the 45% bracket becomes 47% – and those with low incomes who were previously exempt from paying income tax now pay 2%. In such a reform, $\psi = 1$, and equation (5) is the standard Laffer condition that tax revenue increases unless the uncompensated elasticity of taxable income with respect to the tax rate is greater than one in absolute value. Expressed in compensated elasticity terms, what is required to be on the wrong side of the Laffer curve is that

$$-\varepsilon > 1 - \eta\tau, \quad (10)$$

thereby confirming that the standard Laffer analysis applies unchanged to tax systems with progressive rates, if the contemplated reform increases every tax rate by the same amount.[16] In

[15] In their survey of the empirical literature, Saez, Slemrod and Giertz (2012) conclude that estimates of the compensated elasticity lie in a range roughly centered on -0.25, with magnitudes that increase with income; Gruber and Saez (2002) and Kopczuk (2005) report similar findings. The low elasticity scenario aligns more closely with some recent estimates for Australian taxpayers (Johnson et al. 2024; Zaresani, Olivo-Villabrille, and Breunig 2024).

[16] By analogous reasoning, the compensated income elasticity necessary for higher tax burdens to be associated with reduced average tax rates is that $-\varepsilon > \frac{\tau}{(\tau - \overline{\tau})} - \eta\tau$, which arises in fewer cases than (10).

neither the baseline case nor the low or high elasticity alternatives is (10) satisfied for any group of taxpayers, so a uniform tax increase leaves everyone on the correct side of the Laffer curve.

5.2. Radial tax changes.

Alternatively, a tax reform might increase all tax rates by the same percentage of their prior levels, so that $d\tau = k\tau$ and $d\overline{\tau} = k\overline{\tau}$, for some value of *k*. Table 1 illustrates one such potential reform of the Australian system. As a result, $\psi = \tau/\overline{\tau}$, and (5) implies that a reform for which $d\overline{\tau} > 0$ will nonetheless feature $dT < 0$ if

(11) $$-\varepsilon > \frac{\overline{\tau}}{\tau} - \eta\overline{\tau} .$$

Comparing (11) to (10), it is clear that a radial tax rate expansion increases the likelihood that higher tax rates reduce tax collections compared to the alternative in which all tax rates increase by the same amount. This arises because radial expansions raise considerably less revenue from new taxes on inframarginal income.[17] Table 1 presents the results of applying (11) to the Australian data, showing that, in the baseline case, 5% of taxpayers would lie on the wrong side of the Laffer curve – whereas in the high elasticity scenario, the fraction on the wrong side of the Laffer curve rises to 31%.

[17] A similar process is at work with average tax rates. Applying $\psi = \tau/\overline{\tau}$ to equation (8), it follows that, for a reform with $d\overline{\tau} > 0$, it will be the case that $dA < 0$ if $-\varepsilon > \frac{\overline{\tau}}{(\tau - \overline{\tau})} - \eta\overline{\tau}$. Since $\overline{\tau} < \tau$, it follows that this condition is more apt to be satisfied than is the corresponding condition for uniform tax increases.

Table 1: Taxpayers on the Wrong Side of the Laffer Curve for a Radial Tax Increase

Income bracket (AU$)	2023 rates	Radial increase	Low scenario		Baseline scenario		High scenario	
(1)	(2)	(3)	(4)	(5)	(4)	(5)	(4)	(5)
0-18,200	0.000	0.000	0%	0%	0%	0%	0%	0%
18,201-45,000	0.190	0.194	2%	8%	5%	22%	18%	72%
45,001-120,000	0.325	0.332	0%	0%	0%	0%	14%	31%
120,001-135,000	0.370	0.377	0%	0%	0%	0%	0%	0%
135,001-180,000	0.370	0.377	0%	0%	0%	0%	0%	0%
180,001-190,000	0.450	0.459	0%	0%	0%	0%	0%	0%
190,001-200,000	0.450	0.459	0%	0%	0%	0%	0%	0%
>200,000	0.450	0.459	0%	0%	0%	0%	0%	0%
All brackets			2%		5%		31%	

Notes: Column 4 reports the share of taxpayers on the wrong side of the curve relative to the entire taxpaying population, while Column 5 reports the share within each tax bracket.

5.3. *Tax changes restricted to high incomes.*

A third possibility is that a tax reform increases rates uniformly, but only for taxpayers above a specified income level $\overline{y}$. Table 2 illustrates such a reform with $\overline{y}$ =AU$180,000. Since the reform increases all rates above $\overline{y}$ by the same amount *k*, $d\tau = k$ and $d\overline{\tau} = k\frac{(y-\overline{y})}{y}$, so $\psi = \frac{y}{(y-\overline{y})}$. It then follows from (5) that $dT < 0$ if

(12) $$y(1+\varepsilon-\eta\tau) < \overline{y}(1-\eta\tau).$$

Since $\varepsilon < 0$, $(1+\varepsilon-\eta\tau) < (1-\eta\tau)$. Consequently, for any $y > \overline{y}$, (12) is satisfied if $(1+\varepsilon-\eta\tau) < 0$. If instead $(1+\varepsilon-\eta\tau) > 0$, then (12) is satisfied if

(13) $$y < \overline{y}\left[1-\frac{\varepsilon}{(1+\varepsilon-\eta\tau)}\right].$$

Condition (13) implies that taxpayers with incomes exceeding $\overline{y}$ are on the wrong side of the Laffer curve if their incomes are sufficiently close to $\overline{y}$. With a continuous distribution of incomes, it is guaranteed that some taxpayers will satisfy (13), with numbers that increase with the magnitude of ε.

A reform that increases marginal tax rates only above a specified income level will discourage income production by affected taxpayers, while generating relatively little tax revenue from taxing inframarginal incomes, particularly for those near the cutoff income level. This is why some taxpayers are guaranteed to lie on the wrong side of the Laffer curve. Furthermore, the same considerations influence the effect of high income bracket tax increases on average tax rates, which are guaranteed to decline for some affected taxpayers.[18] The low elasticity scenario in Table 2 indicates that 2% higher marginal tax rates on incomes exceeding AU$180,000 would put all taxpayers with incomes between AU$180,000 and AU$200,000 on the wrong side of the Laffer curve. In the baseline case, an additional 43% of those with incomes exceeding AU$200,000 will also be on the wrong side of the Laffer curve, and this fraction rises to 79% in the high elasticity scenario.

Table 2: Taxpayers on the Wrong Side of the Laffer Curve for Higher Rates in Top Brackets

Income bracket (AU$)	2023 rates	Post-reform rates	Low scenario		Baseline scenario		High scenario	
(1)	(2)	(3)	(4)	(5)	(4)	(5)	(4)	(5)
0-18,200	0.000	0.000	0%	0%	0%	0%	0%	0%
18,201-45,000	0.190	0.190	0%	0%	0%	0%	0%	0%
45,001-120,000	0.325	0.325	0%	0%	0%	0%	0%	0%
120,001-135,000	0.370	0.370	0%	0%	0%	0%	0%	0%
135,001-180,000	0.370	0.370	0%	0%	0%	0%	0%	0%
180,001-190,000	0.450	0.470	1%	100%	1%	100%	1%	100%
190,001-200,000	0.450	0.470	1%	100%	1%	100%	1%	100%
>200,000	0.450	0.470	0%	11%	2%	43%	3%	79%
All brackets			2%		3%		5%	

Notes: Column 4 reports the share of taxpayers on the wrong side of the curve relative to the entire taxpaying population, while Column 5 reports the share within each tax bracket.

[18] Applying $\psi = \frac{y}{(y-\bar{y})}$, (8) implies that $dA < 0$ if $y\left[\frac{\tau}{(\tau-\bar{\tau})}+\varepsilon-\eta\tau\right] < \bar{y}(1-\eta\tau)$. By a similar reasoning to before, if $\left[\frac{\tau}{(\tau-\bar{\tau})}+\varepsilon-\eta\tau\right] < 0$, then $dA < 0$. If not, then $dA < 0$ whenever $y < \bar{y}\left\{1-\varepsilon \Big/ \left[\frac{\tau}{(\tau-\bar{\tau})}+\varepsilon-\eta\tau\right]\right\}$.

6. Australian Stage 3 2024 Tax Cuts.

This section analyzes the effects of the 2024 Australian planned and actual income tax rate reductions. Prior legislation dictated that the 2023 tax rate schedule, appearing in the second column of Table 3, would be supplanted in 2024 by the (selectively lower) tax rates presented in the third column. Subsequent economic and political developments caused a new government, elected in 2022, to redirect the 2024 tax cuts toward lower income taxpayers, as reflected in the tax rates actually adopted; these rates are presented in Table 4.

Table 3: Taxpayers on the Wrong Side of the Laffer Curve for the Planned 2024 Tax Cut

Income bracket (AU$)	2023 rates	Planned 2024 rates	Low scenario		Baseline scenario		High scenario	
(1)	(2)	(3)	(4)	(5)	(4)	(5)	(4)	(5)
0-18,200	0.000	0.000	0%	0%	0%	0%	0%	0%
18,201-45,000	0.190	0.190	0%	0%	0%	0%	0%	0%
45,001-120,000	0.325	0.300	6%	13%	13%	29%	34%	77%
120,001-135,000	0.370	0.300	0%	0%	1%	42%	3%	100%
135,001-180,000	0.370	0.300	0%	0%	0%	0%	6%	100%
180,001-190,000	0.450	0.300	0%	0%	1%	92%	1%	100%
190,001-200,000	0.450	0.300	0%	0%	0%	0%	1%	100%
>200,000	0.450	0.450	0%	0%	0%	0%	0%	0%
All brackets			6%		15%		44%	

Notes: Column 4 reports the share of taxpayers on the wrong side of the curve relative to the entire taxpaying population, while Column 5 reports the share within each tax bracket.

The tax cuts originally planned for 2024, and those actually implemented, put some taxpayers on the wrong side of the Laffer curve. Since the 2024 changes were tax rate reductions, a taxpayer on the wrong side of the Laffer curve paid more tax while benefitting from a tax cut. In the baseline elasticity scenario, the planned 2024 tax cuts had 15% of the taxpaying population on the wrong side of the Laffer curve; Table 3 offers a breakdown by income bracket. In the high elasticity scenario, the planned reform put 44% of taxpayers on the wrong side of the Laffer curve; in the low elasticity scenario, the reform put 6% on the wrong side.

Table 4: Taxpayers on the Wrong Side of the Laffer Curve for the Actual 2024 Tax Cut

Income bracket (AU$)	2023 rates	Actual 2024 rates	Low scenario		Baseline scenario		High scenario	
(1)	(2)	(3)	(4)	(5)	(4)	(5)	(4)	(5)
0-18,200	0.000	0.000	0%	0%	0%	0%	0%	0%
18,201-45,000	0.190	0.160	2%	8%	5%	22%	18%	72%
45,001-120,000	0.325	0.300	0%	0%	0%	0%	0%	0%
120,001-135,000	0.370	0.300	0%	0%	0%	0%	3%	100%
135,001-180,000	0.370	0.370	0%	0%	0%	0%	0%	0%
180,001-190,000	0.450	0.370	0%	0%	0%	8%	1%	100%
190,001-200,000	0.450	0.450	0%	0%	0%	0%	0%	0%
>200,000	0.450	0.450	0%	0%	0%	0%	0%	0%
All brackets			2%		5%		22%	

Notes: Column 4 reports the share of taxpayers on the wrong side of the curve relative to the entire taxpaying population, while Column 5 reports the share within each tax bracket.

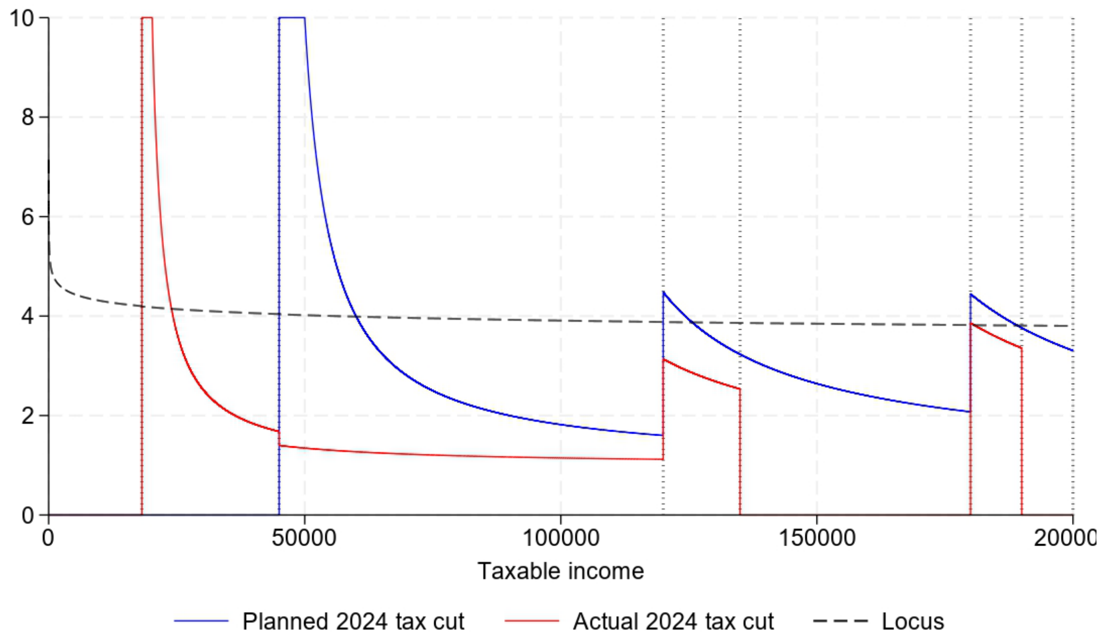
In redirecting the 2024 tax cuts toward low-income tax brackets, the government's revisions reduced the number of taxpayers on the wrong side of the Laffer curve. In the baseline case, 5% of taxpayers fall on the wrong side of the Laffer curve for the tax change actually implemented. Table 4 provides detailed breakdowns by income bracket and elasticity scenario, which indicate that, even with high elasticities, the revised 2024 reform had just 22% of taxpayers on the wrong side of the Laffer curve.

The derivation of expression (6) implies that a reform puts a taxpayer on the wrong side of the Laffer curve if $\psi > \frac{1-\eta\tau}{-\varepsilon}$. Figure 1 plots values of ψ, by level of taxable income, for the planned 2024 tax reform and for the tax reform actually implemented.[19] It is evident from the figure that ψ sharply increases in the neighborhood of discrete tax changes. Compared to the originally announced reform, the actual 2024 reform reduced levels of ψ over wide income ranges, though not in the AU$18,201-45,000 bracket that received a 3% lower tax rate in the revised version of the tax cut plan. Superimposed in Figure 1 is the locus of $\frac{1-\eta\tau}{-\varepsilon}$ for the baseline

[19] Since ψ is based on derivatives and therefore defined only for infinitesimal changes, whereas the 2024 tax cuts were discrete tax reductions, the figure plots ratios of reform-induced changes to marginal and average tax rates at every income level.

case. Figure 1 is consistent with the results reported in column 4 of Tables 3 and 4 under the baseline scenario. It is clear from the figure how the revision to the 2024 reform significantly reduced the portion of the taxpaying population – particularly among those with higher incomes – who were on the wrong side of the Laffer curve. And the figure illustrates how the same taxpayer can fall on different sides of the Laffer curve depending on the reform considered.

Figure 1: Properties of Planned and Actual 2024 Australian Tax Cuts



Notes: This figure plots the distribution of ψ across income for the entire taxpaying population and the locus $\frac{1-\eta\tau}{-\varepsilon}$ for the baseline case. Very high values of ψ are truncated at 10 for expositional purposes.

7. Optimal and suboptimal taxes.

Two well-known features of the Mirrlees-style optimal nonlinear income tax are that, with a finite distribution of types, marginal tax rates are zero for the lowest- and highest-income taxpayers.[20] For taxpayers at neither the top nor the bottom of the income distribution, the effects of potential tax reforms on tax payments are important considerations in determining efficient tax

[20] See Mirrlees (1971), Sadka (1976) and Seade (1977); these findings are reviewed in Auerbach and Hines (2002).

rates, but do not carry similarly clear tax rate implications. The first-order condition in the optimal tax rate problem weighs the costs of a higher marginal tax rate in distorting the behavior of affected taxpayers against the gains of collecting additional revenue from those at higher incomes (Auerbach and Hines, 2002); Saez (2001) shows that these behavioral responses can be expressed in familiar elasticity form.

Individualized Laffer curves offer insights into these standard optimal tax findings. In particular, the zero tax rate implications at the top and bottom of the income distribution follow directly from (5), as the positive marginal tax rates at either the top or the bottom of the income distribution means that taxpayers at those income levels are on the wrong side of the Laffer curve. Positive tax rates make it possible to introduce a reform that would make these taxpayers better off without changing their tax payments.

Equation (5) implies that $dT = 0$ if

$$d\tau = d\overline{\tau}\left(\frac{1-\eta\tau}{-\varepsilon}\right). \qquad (14)$$

A positive marginal tax rate ensures that $1/-\varepsilon$ is finite.[21] As a result, equation (14) implies that, if taxpayers at the top end of the income distribution face positive marginal tax rates, it is possible to reduce their average and marginal tax rates in a way that satisfies (14) and therefore does not change their tax payments. Since individual values of η and ε differ, the choice of $d\overline{\tau}$ and $d\tau$ would necessarily be based on income-group averages; and while individuals with the same incomes may react to the tax changes differently, $d\overline{\tau} < 0$ guarantees that all experience welfare gains.

A similar dynamic applies at the bottom of the income distribution. If there is a positive marginal tax rate on the lowest incomes, then a combination of a higher lump-sum tax and a reduced marginal tax rate, chosen so that $d\overline{\tau} = 0$ and $d\tau < 0$, will generate additional tax revenue without imposing welfare costs on the lowest-income taxpayers. Equivalently, it is possible to

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[21] This follows from the definition $\varepsilon \equiv \frac{\partial y^c}{\partial \tau}\frac{\tau}{y}$ and the standard assumption of diminishing marginal rates of substitution, which guarantees that $\frac{\partial y^c}{\partial \tau}$ is finite.

reduce tax rates without changing tax collections from this group of taxpayers, if the marginal and average tax reductions satisfy (14). In fact, by applying (14) uniformly throughout the income distribution, it is possible to lower every taxpayer's average tax rate while leaving unchanged the total tax payments by members of every income group. Such a reform would make every taxpayer strictly better off – though its feasibility relies on the government's ability to implement (14), which in turn requires that marginal tax rates are nonzero.[22]

A simple example illustrates the possibility of a reform that raises no revenue from any income group. If $d\tau$ takes the form $d\tau = \alpha y^{\gamma}$, it follows from $d\overline{\tau}(y) = \frac{1}{y}\int_0^y d\tau(z)dz$ that $d\overline{\tau} = \frac{\alpha}{(1+\gamma)} y^{\gamma} = \frac{d\tau}{(1+\gamma)}$. If $\eta = 0$ and the average value of ε is the same at all income levels, then (14) is satisfied if $(1+\gamma) = 1/-\varepsilon$, or $\gamma = (1+\varepsilon)/-\varepsilon$. Consequently, if a tax reform entails

$$d\tau = \alpha y^{\frac{1+\varepsilon}{-\varepsilon}}, \tag{15}$$

then even if $\alpha < 0$, so the reform reduces every marginal (and average) tax rate, the reform will not change tax payments by any income group. This arises because the schedule of marginal income tax rate reductions implied by (15) means that mechanical effects of lower average tax rates are exactly offset by behavioral effects of reduced marginal tax rates.

The reform scheme described by (15) is regressive, with larger tax cuts at higher incomes. For example, if $\varepsilon = -0.5$, then (15) implies that $d\tau = \alpha y$, so marginal tax rate increments are proportional to income. If \$1 billion represents the top end of the distribution of taxable annual income, and the reform would impose a 5% lower marginal tax rate at that income level, then the implied change to the marginal tax rate at \$1 million is 0.005%, with even smaller rate reductions at lower income levels. The required degree of tax reform regressivity implied by (15) decreases as taxable income becomes more responsive to marginal tax rates, converging to a flat tax

[22] A tax reform that does not change tax payments by any income group, and therefore does not change aggregate tax collections, but nonetheless entails $d\overline{\tau} < 0$ for every taxpayer, would clearly represent a Pareto improvement – so if such a reform is feasible, then the existing tax system is Pareto-inefficient. Werning (2007) and Bierbrauer, Boyer and Hansen (2023) consider the characteristics of Pareto-inefficient tax systems.

reduction as $\varepsilon \to -1$; and conversely, the required degree of reform regressivity increases as ε shrinks in magnitude, reflecting that taxable income becomes less responsive to incentives.

Application of (14) and (15) illustrates the reform-contingent nature of the Laffer curve. If the population contains a finite distribution of types, and marginal tax rates are positive either at the top or the bottom of the income distribution, then there exists a reform for which the tax system currently lies on the wrong side of the Laffer curve. And for many potential tax reforms, there will be significant numbers of taxpayers on the right and wrong sides of the Laffer curve.

8. *Distributional analysis of tax reforms.*

One of the important considerations in evaluating the 2024 Australian tax cut, and other actual and potential tax reforms, is their effect on the distribution of tax burdens among different groups in the population. The framework developed in sections 3 and 4 can be readily applied to assist in distributing tax reform burdens, and to correct calculations based on tax payments.

8.1. Tax burdens.

It is common practice to associate tax burdens with tax payments, as is implicitly done whenever comparing average tax rates across income groups.[23] Following a reform, the economy produces a new distribution of average tax rates. A simple comparison of pre-reform and post-reform average tax rate distributions offers one measure of the distributional properties of the reform. The difficulty is that, since tax payments differ from true economic burdens, this method typically misrepresents the distribution of tax burdens imposed by the reform. For example, if a somewhat extreme tax reform satisfies (14) over a portion of its range, then higher tax rates would generate no additional revenue, and therefore no apparent tax burdens, while nonetheless imposing significant additional burdens.

From the envelope condition, $yd\overline{\tau}$ is the money-metric measure of the burden of a tax reform – it is the amount that a taxpayer would willingly pay to avoid the reform being enacted. Since $yd\overline{\tau}$ is also the mechanical effect of a tax reform on tax payments, and the effect of a reform on tax payments is the sum of its mechanical and behavioral effects, it follows that tax payments

[23] This is a common practice of government agencies (e.g., U.S. Congress, Joint Committee on Taxation, 1993, 2011), though occasionally also of other analysts (e.g., Saez and Zucman, 2023).

differ from true economic burdens by the behavioral effects of a reform. For a reform that generates dT in additional average tax revenue from a group of taxpayers, it follows from (5) that

$$dB \equiv yd\overline{\tau} = \frac{dT}{\left(1+\varepsilon\psi-\eta\tau\right)} \tag{16}$$

is the accompanying burden change.

Instead of distributing tax reform burdens based on values of dT distinguished by population group, analysts could instead distribute burdens based on dB as given by (16). Since dB is the mechanical effect of reform on tax collections, it is considerably easier to calculate than is dT, as it relies on less information and fewer assumptions. The total burden of a tax reform would then be the sum of dB, weighted by population shares; and shares of total burdens could be distributed accordingly.[24]

8.2 Measurement of effective progressivity.

Following the canonical framework introduced by Kakwani (1977), tax progressivity is typically assessed by comparing the Lorenz curve of pre-tax income, L_y, with the concentration curve of a tax-related variable, L_h^C.[25] While a natural application is to evaluate the progressivity of a tax reform using the resulting change in this difference, two important limitations of the Kakwani index are that it takes the distribution of pre-tax income to be unaffected by tax rates, and that it is based on the distribution of tax payments rather than tax burdens. Since it is clear from (16) that reform-induced changes in tax burdens may differ significantly from changes in tax payments, it follows that a burden-based measure of tax reform progressivity requires adjustments to the Kakwani method.

[24] Calculating tax reform burdens based on willingness to pay rather than tax payments means that the change in aggregate tax burdens will differ from the change in aggregate tax revenue. Tax burdens are customarily calculated so that the sum of the burdens of a reform equals the total change in tax obligations, which will not be the case if burdens are taken to be true economic burdens. An obvious way to reconcile the difference is to distribute the costs of a reform based on shares of true economic burdens of the reform, scaled so that assigned costs sum to the change in tax revenue occasioned by the reform. One limitation of this expedient is that the distribution of tax reform burdens can then depend on how the tax reform process is structured, since if a single tax reform is broken into two components, and enacted separately, then the distribution of the calculated tax burdens for the sum of the two parts will generally differ from the distribution calculated tax burdens for the combined reform.

[25] The Lorenz curve for an income distribution y is defined as $L_y = \frac{1}{\mu_y}\int_0^y y\, f(y)dy$ where $\mu_y$is the mean of y and $f(y)$ its density function. Similarly, the concentration curve of any tax-related variable $h(y)$ (e.g., tax payments or total burdens) is given by $L_h^C = \frac{1}{\mu_h}\int_0^y h(y)f(y)dy$, where μ_h is the mean of $h(y)$.

Prospective tax reforms are commonly evaluated using a Kakwani index given by

(17) $$K_T = C_T - G_{y_0},$$

in which C_T is the concentration index of post-reform tax liabilities and G_{y_0} is the Gini index of pre-reform pre-tax income. Taking incomes to be unaffected by tax incentives, the Kakwani index is the effect of the income tax on the after-tax income Gini coefficient, scaled by the net tax rate. Since the pre-reform Kakwani index is given by $K_0 = C_{T_0} - G_{y_0}$, with C_{T_0} the concentration of pre-reform tax liabilities, the change in the Kakwani index is therefore $\left(C_T - C_{T_0}\right)$, the reform-induced change in the concentration of tax liabilities.

An alternative is to measure the impact of reform by

(18) $$K_{TC} = C_{TC} - G_{y_1},$$

in which C_{TC} captures the concentration of pre-reform tax payments plus the change in burdens given by (16), and G_{y_1} is the Gini index of pre-tax incomes following the tax reform. The measure in (18) incorporates tax reform burdens that taxpayers bear but that do not materialize in tax payments, and therefore offers a more comprehensive treatment of reform than does (17). Furthermore, the measure in (18) is based on the distribution of incomes following the reform, so it is informative about progressivity as it would be understood by observers of the post-reform economy.

The measures K_{TC} and K_T will differ both because they rely on different tax burden measures, and because they consider different distributions of pre-tax income. The more progressive a tax reform, the more these measures are apt to differ. For example, a tax rate increase restricted only to the top income group, and that collects greater total tax revenue from members of the group,[26] will increase K_T by increasing C_T. But the reform should have an even larger

[26] Though as noted in section 5.3, such a reform is guaranteed to reduce tax collections from at least some members of the group.

impact on K_{TC}, since by encouraging top bracket taxpayers to reduce their incomes the reform increases C_{TC} by more than it does C_T, and for the same reason produces a value of G_{y_1} that is smaller than G_{y_0}. Standard progressivity measures that ignore the endogeneity of taxable income will generally underestimate the impact of progressive tax reforms, relative to measures such as (18) that treat the endogeneity explicitly.[27]

8.3. Evaluation of the 2024 Australian tax reform.

The Australian government's decision to amend the features of its planned 2024 tax reform prior to implementation prompted spirited political reaction among those who preferred the original design. The government justified its changes largely on the basis of tax fairness and a desire to direct more of the tax reduction to taxpayers with modest incomes. It is possible to use the framework developed in sections 8.1 and 8.2 to evaluate the impact of the changes on tax progressivity in Australia.

Prior to the 2024 reform, the Australian income tax had a Kakwani index of 0.1841, representing the difference between the tax concentration of 0.6660 and a pretax income Gini coefficient of 0.4819. Table 5 presents this information, where it is also apparent that a standard analysis of the planned 2024 reform in the baseline elasticity scenario produces a K_T value of 0.1769, which is 0.0072 lower than the pre-reform Kakwani due to the tax reductions being somewhat concentrated in higher brackets. A corresponding analysis of the actual 2024 reform produces a K_T value of 0.1894, which is 0.0053 higher than the pre-reform Kakwani, and 0.0125 higher than K_T for the planned reform. It is clear from these comparisons that the 2024 revisions increased the progressivity of the tax cut implemented later that year.

The alternative measure K_{TC} offers a more dramatic picture of the 2024 changes. Table 5 indicates that the planned 2024 reform would have produced a K_{TC} value of 0.1749 in the baseline

[27] Similarly, the redistributive impact of a tax reform can be assessed through the Reynolds–Smolensky (RS) index (with no reranking): $RS = \frac{t}{1-t}K$, where t denotes the overall average tax rate and K is the Kakwani index. When based on observed liabilities RS becomes: $RS_T = \frac{t_T}{1-t_T}K_T$ and when based on total burdens: $RS_{TC} = \frac{t_{TC}}{1-t_{TC}}K_{TC}$, with $t_T = \frac{\mu_T}{\mu_{y_0}}$ and $t_{TC} = \frac{\mu_{TC}}{\mu_{y_1}}$. Given that behavioral responses reduce income ($\mu_{y_1} < \mu_{y_0}$) and raise total burden ($\mu_{TC} > \mu_T$), we obtain that $\frac{t_{TC}}{1-t_{TC}} > \frac{t_T}{1-t_T}$. Therefore, in conjunction with the typical finding that $K_{TC} > K_T$, this implies that relying on observed tax payments understates not only the effective progressivity of the reform but also its actual redistributive impact.

case, which is 0.0092 smaller than the pre-reform Kakwani, and 0.0020 smaller than measured K_T for the same reform. While both measures suggest that the planned 2024 reform was regressive, the difference between K_{TC} and K_T implies that the reform was even more regressive than appears from standard calculations. The actual 2024 tax reform produced a K_{TC} value of 0.2004 in the baseline case, which is 0.0110 larger than the corresponding value of K_T, and therefore implies that the reform was substantially more progressive. Consequently, the K_{TC} measure described in (18) illuminates the source of some of the political controversy over changes to the 2024 tax cuts, since the planned reductions were more regressive, and the actual changes more progressive, than is evident from standard measures.

Table 5: Distributional Impact of the Australian Stage 3 2024 Tax Cuts

	Low scenario		Baseline scenario		High scenario	
	Planned (1)	Actual (2)	Planned (1)	Actual (2)	Planned (1)	Actual (2)
G_{y_0}	0.4819	0.4819	0.4819	0.4819	0.4819	0.4819
G_{y_1}	0.4834	0.4801	0.4846	0.4783	0.4871	0.4745
C_{T_0}	0.6660	0.6660	0.6660	0.6660	0.6660	0.6660
C_T	0.6592	0.6749	0.6588	0.6713	0.6582	0.6639
C_{TC}	0.6595	0.6787	0.6595	0.6787	0.6595	0.6787
K_0	0.1841	0.1841	0.1841	0.1841	0.1841	0.1841
K_T	0.1773	0.1930	0.1769	0.1894	0.1761	0.1819
K_{TC}	0.1761	0.1986	0.1749	0.2004	0.1724	0.2042

9. Conclusion.

The Laffer curve serves as a reminder that tax reforms produce behavioral responses that influence tax collections. As a result, changes in tax payments can be – and will be – misleading indicators of tax reform burdens, particularly in ranges of the income distribution over which marginal tax rates change more dramatically than average rates. It can readily be the case that a tax reform that lowers tax rates reduces burdens on significant numbers of taxpayers while collecting more from them in tax payments. Available evidence suggests that the 2024 Australian tax reform had this property, albeit to a lesser degree than in its original design.

Standard tax progressivity measures rely on observed incomes and tax payments, both of which are influenced by tax incentives. Consequently, there is a tendency for such measures to understate the effectiveness of progressivity-enhancing reforms – which appears to be the case for the 2024 Australian reform. Adjusting these measures to account for the endogeneity of taxable income and tax payments affords a more reliable evaluation of potential reforms, as well as a better understanding of what tax systems are already doing.

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Appendix A: Extending Equation (5) to Explicitly Account for Stepwise Tax Schedules

From equation (5), the change in the tax liability for an individual taxpayer i is given by:

(A1) $$dT_i = y_i \, d\bar{\tau}_i \, [1 + \varepsilon_i \, \psi_i - \eta_i \, \tau_i].$$

Accordingly, the aggregate change in tax revenue across the entire population of N taxpayers is:

(A2) $$dT = \int_0^{\infty} y \, d\bar{\tau} \, [1 + \varepsilon \, \psi - \eta \, \tau] \cdot f(y) \cdot dy$$

If taxable income is subject to a piecewise linear tax schedule with K brackets defined over thresholds $\{a_k\}_{k=1}^{K}$, the aggregate revenue captured in equation (A2) can be equivalently expressed as:

(A2') $$dT = N \cdot \sum_{k=1}^{K} \int_{a_k}^{a_{k+1}} y \, d\bar{\tau} \, [1 + \varepsilon \, \psi - \eta \, \tau] \cdot f(y) \cdot dy$$

This expression integrates the individual tax changes over the full income distribution $f(y)$, accounting for both behavioral and mechanical components of the reform at each income level.

The aggregate mechanical effect in (A2') is given by,

(A3) $$dT_M = N \cdot \sum_{k=1}^{K} \int_{a_k}^{a_{k+1}} y \, d\bar{\tau} \cdot f(y) \cdot dy = N \sum_{k=1}^{K} \bar{A}_k \cdot \left[F_1^{A_k}(a_{k+1}) - F_1^{A_k}(a_k)\right].$$

where $\bar{A}_k$ is the per capita mechanical effect (over the entire population) generated by the taxpayers in the $k-th$ bracket and $F_1^{A_k}(a)$ is the value of the first-moment distribution function for taxpayers with taxable income equal to or less than a:

$$F_1^{A_k}(a) = \frac{\int_0^a y \, d\bar{\tau}(y) \cdot f(y) \cdot dy}{\int_0^{\infty} y \, d\bar{\tau}(y) \cdot f(y) \cdot dy}$$

Thus, $F_1^{A_k}(a_{k+1}) - F_1^{A_k}(a_k)$ captures the proportion of the mechanical revenue change attributable to the $k-th$ tax bracket.

The aggregate behavioral effect in (A2') is given by,

$$dT_B = N \cdot \sum_{k=1}^{K} \int_{a_k}^{a_{k+1}} y\, d\bar{\tau} \cdot\ [\varepsilon\, \psi - \eta\ \tau]\ \cdot f(y) \cdot dy$$

(A4)

$$dT_B = N\{\textstyle\sum_{k=1}^{K} \bar{B}_k \cdot [F_1^{B_k}(a_{k+1}) - F_1^{B_k}(a_k)] - \sum_{k=1}^{K} \tau_k \cdot \bar{C}_k \cdot [F_1^{C_k}(a_{k+1}) - F_1^{C_k}(a_k)]\},$$

where $\bar{B}_k$ and $\bar{C}_k$ denote the per capita substitution effect, $y_i d\bar{\tau}_i \varepsilon_i \psi_i$, and income effect, $y_i d\bar{\tau}_i \eta_i$, respectively, generated by taxpayers in the $k-th$ bracket. The corresponding first-moment distribution functions, $F_1^{B_k}(a)$ and $F_1^{C_k}(a)$, measure the cumulative shares of these effects for individuals with income up to a. Thus, $F_1^{B_k}(a_{k+1}) - F_1^{B_k}(a_k)$ and $F_1^{C_k}(a_{k+1}) - F_1^{C_k}(a_k)$ capture the proportions of the total substitution and income effects attributable to the $k-th$ tax bracket.

Substituting (A3) and (A4) into (A2') yields the expression for the total change in tax revenue when a stepwise schedule applies,

(A5) $dT = N \sum_{k=1}^{K}\{\bar{A}_k[F_1^{A_k}(a_{k+1}) - F_1^{A_k}(a_k)] + \bar{B}_k[F_1^{B_k}(a_{k+1}) - F_1^{B_k}(a_k)] - \tau_k \bar{C}_k[F_1^{C_k}(a_{k+1}) - F_1^{C_k}(a_k)]\}$

Equation (A5) provides a general formula for evaluating the impact of marginal tax rate changes within any income bracket. It captures both mechanical and behavioral effects, explicitly incorporating the distribution of taxpayers across brackets and allowing for individual-specific parameters – $d\bar{\tau}$, $d\tau$, ε, ψ, η – through first-moment distribution functions. This formulation enables policy evaluation without relying on restrictive assumptions about behavioral responses or elasticities, providing a flexible and robust tool for tax analysis in real-world multi-rate schedules.

Appendix B

Table B1: Distribution of key parameters

Income bracket (AU$)	y	N	Baseline elasticities		Low elasticities		High elasticities	
			ε	η	ε	η	ε	η
0-18,200	7,263	2,446,010	-0.213	0.008	-0.093	0.005	-0.473	0.017
18,201-45,000	31,263	3,744,570	-0.243	0.008	-0.123	0.005	-0.503	0.016
45,001-120,000	75,425	6,656,360	-0.252	0.008	-0.132	0.004	-0.512	0.016
120,001-135,000	127,006	522,330	-0.258	0.008	-0.138	0.004	-0.518	0.016
135,001-180,000	154,068	827,690	-0.259	0.008	-0.139	0.004	-0.519	0.016
180,001-190,000	184,811	102,570	-0.261	0.008	-0.141	0.004	-0.521	0.016
190,001-200,000	194,895	85,340	-0.262	0.008	-0.142	0.004	-0.522	0.016
>200,000	376,996	653,490	-0.266	0.008	-0.146	0.004	-0.526	0.016
All brackets	73,991	15,038,360	-0.245	0.008	-0.125	0.005	-0.505	0.016

Notes: Column 2 reports mean taxable income by bracket; Column 3 shows the number of Australian taxpayers in each bracket. Columns 4 and 5 present the mean compensated elasticity (ε) and income elasticity (η), respectively, based on the functional forms $\varepsilon = \varepsilon_0 - 0.01\ln(1+y)$ and $\eta = \frac{\eta_0}{1+0.01\ln(1+y)}$, with baseline parameters ε_0= 0.140 and η_0 = 0.009. For sensitivity analysis, alternative parameter sets are used: (a) Low scenario: ε_0= 0.020 and η_0 = 0.005; (b) High scenario: ε_0= 0.400 and η_0 = 0.018. Columns 6–9 report the corresponding mean elasticities under these scenarios. All parameters are population-weighted.