

Motivated or Frustrated? Aspirations and Optimal Taxation

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Abstract

Standard optimal tax formulas treat the equity-efficiency tradeoff as independent of how taxation reshapes social comparisons and the social incentives to provide effort. I show this omits an important mechanism: when aspirations are socially determined, tax-induced changes to the income distribution alter individuals' reference points, generating behavioral responses beyond the classic labor-leisure tradeoff. Embedding preferences with endogenous aspirational thresholds into a Mirrlees model, I derive sufficient statistics formulas for optimal linear and nonlinear income taxes. These formulas require three new objects: (i) the aspiration formation function, which specifies whose incomes shape reference points; (ii) the (dis)utility from higher aspirations; and (iii) the behavioral response of taxable income to changes in aspirations. The sign of this behavioral response across the income distribution determines whether higher aspirations motivate (or frustrate) labor supply, which in turn calls for lower (or higher) optimal tax rates. The aspiration formation function determines who contributes to the aspiration externality, whether the corrective motive is uniform or concentrated at the top of the income distribution, and the structure of a feedback-driven aspiration multiplier that amplifies or dampens the aggregate aspiration wedge. Using an online survey of US respondents, I estimate this behavioral response across the income distribution. The hypothetical choice scenarios yield an income-weighted average elasticity of 0.26, with aspirations predominantly motivating effort across the income distribution. The information provision experiment yields positive but imprecise estimates for the average-income reference point. Consistent with this evidence, standard formulas can overstate optimal progressivity.

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1 Introduction

How should a government design income taxes when the distribution of income it induces shapes the social aspirations that drive individual effort? The classic Mirrlees framework in optimal taxation studying the equity-efficiency tradeoff assumes that individuals' preferences over consumption and leisure are independent of the distribution of economic outcomes around them. But empirical evidence suggests otherwise. People evaluate their economic position relative to peers, and these social comparisons shape both well-being *and* behavior. When aspirations are socially determined, the level and shape of the tax schedule does more than distort the labor-leisure tradeoff. It shifts the reference points against which individuals judge their own outcomes, creating a new channel through which equity impacts efficiency.

This paper incorporates endogenous, socially-determined aspirations ([Genicot and Ray, 2017](#)) into optimal income tax design. I allow individual preferences to be a function of aspirational reference points in a standard Mirrlees model, creating an equilibrium feedback through which aspirations depend on the income distribution, and importantly impact the marginal return to effort. I derive sufficient statistics formulas for optimal linear and nonlinear income taxes that augment the standard formulas with a new term: the elasticity of taxable income with respect to the aspirational threshold. This elasticity captures whether higher aspirations motivate individuals to work more (to keep up with their reference group) or frustrate them into working less (when the benchmark feels unattainable).

The theoretical contribution fills a gap in the optimal tax literature. A long tradition following [Boskin and Sheshinski \(1978\)](#) emphasizes that social comparisons generate positional externalities, creating a corrective motive for income taxation (distinct from its standard redistributive role). This insight has been derived using models with relative consumption and other-regarding preferences (e.g., [Oswald \(1983\)](#); [Kanbur and Tuomala \(2013\)](#); [Aronsson and Johansson-Stenman \(2010, 2023\)](#)), and related work compares welfare and paternalist treatments of these concerns ([Aronsson and Johansson-Stenman \(2018\)](#)). More recently, [Stostad and Cowell \(2024\)](#) models income inequality itself as an externality affecting society-wide outcomes such as crime and political polarization, showing how optimal top tax rates can be highly sensitive to the magnitude of such effects.

A common modeling assumption in this literature is leisure separability: relative concerns affect utility but leave the labor-leisure margin unaffected. Under this restriction, social comparisons affect optimal taxes primarily through externality correction, but not

through a direct behavioral channel where shifts in reference points change incentives to provide effort. I depart from this approach by modeling aspirational thresholds, following [Genicot and Ray \(2017\)](#) and [Genicot and Ray \(2020\)](#), which shift the marginal return to effort. In my framework, tax reforms that alter the income distribution also reshape aspirations, and thereby labor supply, generating a fiscal externality distinct from the standard corrective term. This yields new sufficient statistics for optimal tax design, in addition to the standard elasticity of taxable income, income effects, and social welfare weights. Three objects are needed: (i) the *aspiration formation function*, which specifies whose incomes feed into the socially-determined reference points, (ii) the *direct utility effect of aspirations*, ϕ_a , measuring how higher reference points affect welfare holding behavior fixed, and (iii) the *behavioral response to aspirations* $\partial z / \partial a$, capturing whether higher aspirations motivate or frustrate effort.

This approach nests the leisure-separable models above as the special case in which the reference point does not interact with the earnings margin, captured by the cross derivative $\phi_{za} = 0$. The behavioral response (iii) then vanishes, and my formulas collapse to the standard formulas augmented only with the corrective externality motive, as in [Oswald \(1983\)](#), [Kanbur and Tuomala \(2013\)](#), and [Aronsson and Johansson-Stenman \(2010\)](#). This nesting carries over to measurement: the sufficient statistics $(\phi_a, \partial z / \partial a)$ can be elicited empirically without taking a stand on functional forms, and the restrictions imposed by the existing models (i.e., $\partial z / \partial a = 0$) become testable hypotheses rather than maintained assumptions. The survey evidence in Section 5 partly rejects $\partial z / \partial a = 0$. Stated responses in hypothetical scenarios are positive across the income distribution, with an income-weighted mean of 0.26, while the complementary information experiment IV estimates are positive but small and too imprecise to reject a zero causal response to perceived *average* US income.

Relative *consumption* (versus income) formulations map into the framework with one important difference—tax reforms then shift reference points mechanically and not only behaviorally—making income taxation a more direct tool, which I characterize in Appendix D.

The aspiration formation function plays a central role. It determines who contributes to the aspiration externality. If aspirations are atmospheric, for example driven by average income, each marginal dollar of income contributes equally to the reference point, making the corrective motive uniform across income levels. If aspirations are driven by top earners (e.g., the average income above a cutoff, say the top 10% of earners), then only top earners' incomes feed into the aspirational reference point, concentrating the corrective

motive (which may be positive or negative) at the top and generating a rationale for higher (or lower) marginal rates on high earners. The formation function also governs the structure of the aspiration multiplier: because aspirations feed back into labor supply, which in turn shifts aspirations, a tax reform triggers a sequence of adjustments. This logic mirrors that of externalities of top earners on the earnings capacity studied by [Kleven \(2025\)](#), whose proposed mechanism operates via technology, while aspirations operate via individuals' preferences. The resulting multiplier amplifies the aggregate elasticity of taxable income when aspirations predominantly motivate effort, or dampens it when they predominantly frustrate. The size and structure of this multiplier depend directly on which agents' behavioral responses feed back into the socially-determined reference point. This aspiration multiplier also amplifies (or dampens) the total externality from relative income concerns, because larger (smaller) income responses to a tax reform imply a larger (smaller) change in the aspirational benchmarks.

The optimal tax formulas yield several results. For a linear income tax, the standard formula is augmented with both a corrective term for the relative income externality, as in prior work, and a new behavioral term capturing aspiration-driven labor supply responses. When the income-weighted average worker is motivated by aspirations, this behavioral term pushes toward lower optimal tax rates. When workers are predominantly frustrated, it pushes toward higher rates. For a fully nonlinear schedule, we obtain a parallel “aspiration wedge” that shifts the standard [Diamond \(1998\)](#) “ABC” marginal tax formula by the social value of changing the aspiration level. This wedge combines the direct welfare effect of shifting reference points with the revenue effect of aspiration-induced labor supply responses. In a tractable benchmark where aspirations correspond to average income in society ($a = \bar{z}$), the wedge admits a simple multiplier representation: equilibrium shifts in aspirations amplify (or dampen) the usual substitution and income effects depending on whether higher aspirations raise or depress effort on average. As a result, optimal marginal tax rates must internalize not only redistribution and standard labor-supply distortions, but also the equilibrium feedback created by endogenous aspirations.

Allowing aspirations to be group-specific (e.g. to vary by occupation, age, or education level) reveals a new composition channel in nonlinear tax design. If individuals compare themselves to the average income of their own reference group, the aspiration correction is no longer a uniform shift of the entire tax schedule. Instead, marginal tax rates are adjusted differently at different points of the income distribution, depending on which groups are represented at each income level and how strongly their earnings respond to changes in aspirations (i.e., how comparative each group is). Thus, income levels with similar standard redistributive motives may call for different marginal tax adjustments

if they differ in their group composition and the groups' aspiration responsiveness. For example, if professors, lawyers, or investment bankers are especially comparative within their occupation, then tax reforms affecting income ranges where these groups are concentrated also shift the reference incomes that shape their effort decisions. The optimal nonlinear tax schedule will deviate more from the standard "ABC" formula at those income levels.

There is a normative debate on whether comparative concerns (captured by the direct effect of aspirations on utility) should enter the social welfare criterion. [Harsanyi \(1977\)](#) argues that preferences such as envy over others' income are antisocial and should thus be excluded from welfare calculations, a position supported by survey evidence showing that a majority of US respondents reject envy-based redistribution even when told it increases aggregate welfare ([Weinzierl, 2018](#)). Others contend that such preferences are no different in principle from standard noise or pollution externalities. If they affect experienced utility, consistency with the Pareto principle requires including them in the social criterion ([Kaplow and Shavell, 2001](#); [Kaplow, 2024](#)). This paper does not take a stand on this debate but instead highlights that socially-determined aspirations generate behavioral responses which have real fiscal impacts irrespective of whether the planner includes their direct utility impact in the welfare criterion.

Implementing the formulas requires estimates of the aspiration elasticity across the income distribution, together with the magnitude of the externality effect. Studies of subjective well-being typically find that higher reference incomes reduce happiness, pointing to a negative externality, which is often described as "envy" ([Luttmer, 2005](#); [Ferrer-i Carbonell, 2005](#); [Clark et al., 2008](#)). Evidence on behavioral responses is less clear. Some studies find that higher reference points motivate effort: pay transparency increased job search among below-median earners ([Card et al., 2012](#)), and information about managers' salaries raised hours worked and sales ([Cullen and Perez-Truglia, 2022](#)). Other evidence points to discouragement: randomly increased wage inequality reduced productivity and attendance ([Breza et al., 2018](#)), and uneven pay raises increased separations ([Dube et al., 2019](#)). Models of aspiration failure emphasize that higher aspirations can encourage forward-looking investment, but can also discourage effort when the gap to the benchmark becomes too large ([Dalton et al., 2016](#); [Lybbert and Wydick, 2018](#); [Genicot and Ray, 2017, 2020](#)). Empirically, aspiration-raising interventions can positively affect forward-looking behavior and human-capital investment in low-income settings ([Bernard et al., 2026](#); [Orkin et al., 2023](#)), but their effects are heterogeneous and need not be positive ([Janzen et al., 2017](#); [Ross, 2019](#)). Consistent with the frustration interpretation, [McKenzie et al. \(2022\)](#) find that raising financial aspirations among poor entrepreneurs in the Philippines re-

duced borrowing and business investment.

To shed light on this question for the United States, I conduct an online survey combining an information provision experiment with hypothetical choice scenarios. The information experiment yields causal estimates for compliers by randomly informing respondents about the true average income among US workers, generating exogenous variation in beliefs. The hypothetical scenarios elicit estimates across the income distribution of how respondents' intended income would change if average US income were higher than expected. I find that aspirations predominantly motivate labor supply across the income distribution, with elasticity estimates ranging from 0.35 at low incomes to 0.2 at high incomes. Lower-income respondents exhibit larger elasticities than higher-income respondents, consistent with an increasing and concave aspirational utility component (in z). These findings imply that, holding the direct positional externality fixed, standard formulas that omit aspiration-driven behavioral responses may overstate the desirable degree of progressivity.

While the model's margin of effort is most easily interpreted as a labor supply decision, it readily extends to other margins such as education and parental investments. [Landersø and Heckman \(2017\)](#) stress that welfare-state policies also impact intergenerational mobility through the incentive environment they create, as compressed returns can weaken incentives to invest in education. I argue that these incentive effects partly reflect comparative motives, insofar as taxation compresses the income distribution that shapes individuals' aspirations. [Doepke and Zilibotti \(2019\)](#) show that parental investment intensity depends on income inequality and the variance of economic returns to education, also consistent with a role for comparative motives.

Looking ahead, and as argued by [Imas \(2026\)](#), recent advances in AI may increase the importance of comparative motives in people's preferences. If AI advances help automate the production of standardized goods and services (and reduce scarcity), they are likely to raise the relative value of status and exclusivity (vs. basic needs) and strengthen the case for incorporating externalities from socially determined aspirations into tax design.

The remainder of the paper is structured as follows. Section 2 presents the baseline economy with endogenous aspirations and characterizes the aspiration-driven behavioral response. Sections 3 and 4 derive the optimal linear and nonlinear income tax formulas, showing how aspirations modify standard efficiency-equity tradeoffs. Section 5 provides empirical evidence on the key behavioral elasticity using survey data from US respondents. Section 6 conducts policy simulations quantifying the implications for optimal linear tax rates. Section 7 concludes.

2 Model

2.1 Environment, Preferences, and Aspirations

The economy is populated with a continuum of agents which differ along their earnings-ability type $w \in \mathbb{R}_+$. The *exogenous* distribution of types is described by the cumulative distribution function F , with density f . Agents derive utility from consumption c and incur disutility from generating earnings z .

Agents also derive utility from their income relative to a socially-determined aspirational reference point, denoted by a . I assume preferences are additively separable between the standard (type-specific) material utility component and the aspirational component

$$U(c, z, a; w) \equiv u(c, z; w) + \phi(z, a; w). \quad (1)$$

The term $\phi(\cdot)$ captures the psychological or social payoff from achieving earnings z relative to the benchmark a .

Socially-Determined Aspirations. Following [Genicot and Ray \(2017\)](#), I model aspirations as endogenous to the income distribution. In the general case, the aspirational threshold can be a function of one's type, and society's taxable income distribution (with cumulative distribution function denoted by H^1):

$$a(w) \equiv \Psi(w, H). \quad (2)$$

This approach allows us to think about type-specific aspirational thresholds, where a type- w agent may place greater weight on individuals with incomes similar to their own $z(w)$, and allow for narrower “aspiration windows.” For example, we could define the socially-determined aspirational threshold to be $a(w) = \mathbb{E}[z | z \geq z(w)]$. I will mostly restrict attention, however, to aspirational thresholds that are shared society-wide, and weighted averages of income in the economy:

$$a = \int \omega(w) z(w) dF(w), \quad (3)$$

where $\omega : \mathcal{W} \rightarrow \mathbb{R}_+$ satisfies $\int \omega(w) dF(w) = 1$.² The weighting function ω determines

¹Formally, H is induced by the mapping $w \mapsto z(w)$, where $z(w)$ is a type- w 's optimal choice of taxable income, and $H(z(w)) = \Pr(z \leq z(w)) = F(w)$ when $z(\cdot)$ is monotone.

²The weighted-average class in (3) is a natural restriction that nests the two leading cases I focus on to preserve tractability.

which agents' incomes feed into the reference point. As I show in Sections 3–4, the choice of ω is a key determinant of optimal tax policy: it governs the structure of the aspiration multiplier, the magnitude of the corrective motive, and whether this motive is uniform across income levels or concentrated at the top. I consider two main specifications.

Atmospheric aspirations ($a = \bar{z}$). Setting $\omega(w) = 1$ for all w yields

$$a = \bar{z} \equiv \int z(w) dF(w). \quad (4)$$

Every dollar of taxable income contributes equally to aspirations regardless of who earns it.

Top-earners aspirations ($a = \bar{z}^+$). For a fixed ability cutoff $\tilde{w}$, setting $\omega(w) = \frac{1}{p} \mathbf{1}(w \geq \tilde{w})$ with $p \equiv 1 - F(\tilde{w})$ yields

$$a = \bar{z}^+ \equiv \frac{1}{p} \int_{w \geq \tilde{w}} z(w) dF(w). \quad (5)$$

Only top earners' incomes (above a certain threshold) shape aspirations. A one-dollar increase in a top earner's income raises a by $1/p$; a one-dollar increase below the cutoff has no effect. Under the monotonicity condition that $w \mapsto z(w)$ is increasing, this is the average income among those earning at least $z(\tilde{w})$. The atmospheric case $a = \bar{z}$ is the limit as $\tilde{w} \rightarrow \underline{w}$ (i.e., $p \rightarrow 1$).

Both specifications yield a (society-wide) shared threshold, so the planner faces a single fixed-point constraint linking a to the schedules of taxable income in society $\{z(w)\}_w$.³ While the threshold a is shared across individuals, the specification $\phi(z, a; w)$ allows for heterogeneity in how aspirations affect different types across the income distribution. I also consider finite group-specific thresholds in Section 3.5, where agents are characterized by a two-dimensional type (w, θ) , and each group θ has its own reference point $a_\theta = \bar{z}_\theta$.

2.2 Individual Optimization

In the general case, income may be taxed nonlinearly, and thus each agent's tax liability is given by $T(z)$. Taking T and a as given, each agent chooses taxable income z and consumption c to maximize utility subject to a budget constraint. Indirect utility can thus be

³Both satisfy the properties in Genicot and Ray (2017): monotonicity in the income distribution (in the sense of first-order stochastic dominance), range-boundedness, and scale-freeness.

written as:

$$\begin{aligned}
v(w) &\equiv \max_{c,z} \{u(c, z; w) + \phi(z, a; w) : c = z - T(z)\} \\
&= \max_z \{u(z - T(z), z; w) + \phi(z, a; w)\} \\
&= u(z(w) - T(z(w)), z(w); w) + \phi(z(w), a; w),
\end{aligned} \tag{6}$$

where $z(w) \equiv \arg \max_z \{u(z - T(z), z; w) + \phi(z, a; w)\}$, with $u_c > 0$, $u_{cc} \leq 0$, $u_z < 0$, $u_{zz} < 0$, and $\phi_z \geq 0$.

Assumption 1 (Regularity of the Individual Problem). *For each ability type w and fixed aspiration level a , the objective function $z \mapsto u(z - T(z), z; w) + \phi(z, a; w)$ is jointly twice continuously differentiable in (z, a) , strictly concave in z on $\mathbb{R}_+$, and attains its maximum at a unique interior point $z(w) > 0$, at which $\mathcal{Y}_z(z(w), a; w) < 0$ (defined below). All individual-level derivatives are assumed integrable across types.*

Under assumption 1, type- w 's optimal choice of income $z(w)$ is characterized by the following first-order condition

$$-\frac{U_z(z(w), a; w)}{U_c(z(w), a; w)} = -\frac{u_z(z(w); w) + \phi_z(z(w), a; w)}{u_c(z(w); w)} = 1 - T_z(z(w)). \tag{7}$$

This allows us to rewrite the individual first-order condition as $\mathcal{Y}(z(w), a; w) = 0$, and apply the implicit function theorem where

$$\mathcal{Y}(z, a; w) \equiv (1 - T_z(z)) \cdot u_c(z - T(z), z; w) + u_z(z - T(z), z; w) + \phi_z(z, a; w) \tag{8}$$

The second-order condition holds with strict inequality at $z(w)$ by Assumption 1, and is given by

$$\mathcal{Y}_z(z(w), a; w) \equiv (1 - T_z)^2 \cdot u_{cc} + 2(1 - T_z) \cdot u_{cz} - T_{zz} \cdot u_c + u_{zz} + \phi_{zz} < 0. \tag{9}$$

2.3 The Aspiration-Driven Behavioral Response

The sign of the aspiration-driven behavioral response dz/da , i.e. the change in taxable income driven by a change in the aspirational threshold is given by the sign of the cross-derivative ϕ_{za} . To see this, consider first economic intuition stemming from the utility function. Suppose, as in Figure 1, that the aspirational component of utility is increasing in $z - a$, convex if $z < a$, and concave for $z > a$. This is a standard increasing S-shaped function, anchored at the reference point a . In this case, ϕ_{za} captures the partial derivative of the marginal benefit of z (the return to effort) with respect to an increase in a . If

the marginal benefit of z , ϕ_z , increases with a (we are located on the concave portion of ϕ), then an increase in a will lead to an increase in the optimal choice of z . If instead, the social return to effort ϕ_z decreases with a (we are located on the convex portion of ϕ), then an increase in a will lead to a decrease in the optimal choice of z .

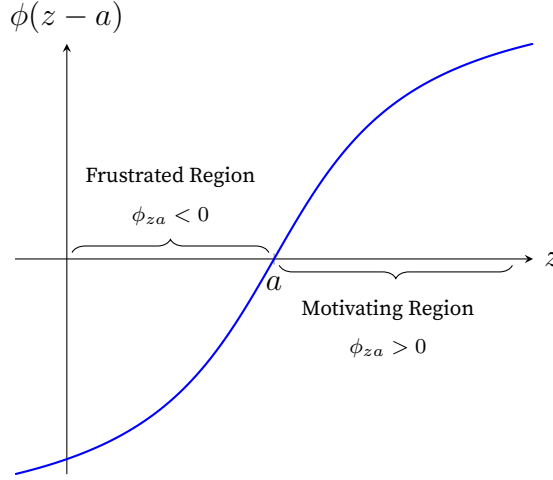


Figure 1. S-shaped example of the aspiration utility component

Note: This figure shows a simple example for the aspirational utility component $\phi(z, a) = \arctan(z - a)$. In this special case, those choosing taxable income z below the aspirational threshold a are in the “frustrated region”, where an increase in a reduces the social (relative) return to effort. Those choosing taxable income z above the aspirational threshold a are in the “motivating region”, where an increase in a increases the social (relative) return to effort.

Figure 2 shows an alternative possibility for the shape of $\phi(z, a)$, where individuals at all levels of income are motivated by an increase in the aspirational threshold, but where the aspiration-driven behavioral response is decreasing with income (lower income individuals respond more to a change in aspirations relative to higher income individuals). Whether aspirations enter the utility as shown in Figure 1 vs. Figure 2 is ultimately an empirical question. I shed light on this question in Section 5.2. Note that Figures 1 and 2 are two illustrative examples within a much larger admissible class. The theory places no restriction on the shape of ϕ , which need not depend on z and a only through the gap $z - a$, and the derivations that follow use a general $\phi(z, a; w)$, and hence treat the signs of ϕ_a and ϕ_{za} , as unrestricted and potentially heterogeneous across types.

A more analytical way to see that $\text{sign}(dz/da) = \text{sign}(\phi_{za})$ relies on the implicit function theorem. Differentiate the individual’s first-order condition with respect to a , and obtain:

$$\frac{dz}{da} = -\frac{\mathcal{Y}_a}{\mathcal{Y}_z} = -\frac{\phi_{za}}{(1 - T_z)^2 \cdot u_{cc} + 2(1 - T_z) \cdot u_{cz} - T_{zz} \cdot u_c + u_{zz} + \phi_{zz}}. \quad (10)$$

where we know that the denominator is strictly negative from assumption 1.

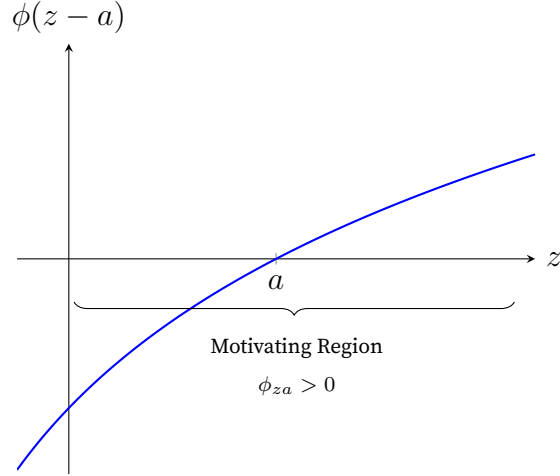


Figure 2. Concave example of the aspiration utility component

Note: This figure shows an alternative example for the aspirational utility component $\phi(z, a) = v(z - a)$, where v is strictly increasing and concave. In this specification, the entire domain constitutes the “motivating region”, where an increase in the aspirational threshold a increases the social (relative) return to effort for all levels of taxable income z .

3 Optimal Linear Income Tax

I start by considering linear income taxation. This simplifies the exposition while building intuition and capturing some of the main mechanisms at play. Earnings are taxed at a linear rate τ , and individuals receive a universal lump-sum transfer T . Agents face the budget constraint $c = (1 - \tau)z + T$. Budget balance requires $T = \tau \bar{z}$, with $\bar{z} = \int z(w) dF$. The indirect utility of type w is

$$v(w) = u((1 - \tau)z(w) + \tau \bar{z}, z(w); w) + \phi(z(w), a; w). \quad (11)$$

3.1 Planner’s Problem

The social planner chooses the tax rate τ to maximize

$$W(\tau) = \int G(v(w)) dF, \quad (12)$$

subject to budget balance, individual optimization, and the aspiration formation function linking a to $\{z(w)\}_w$, where G is an increasing and concave transformation, capturing the planner’s preferences for redistribution. Write $\gamma(w) \equiv G'(v(w))$ for the marginal social value of type w ’s utility.

By the envelope theorem, the effect of a marginal tax increase on type w ’s indirect utility

is

$$\frac{dv}{d\tau} = u_c(w) \left[\bar{z} - z(w) + \tau \frac{d\bar{z}}{d\tau} \right] + \phi_a(w) \frac{da}{d\tau}, \quad (13)$$

where the first term captures the mechanical transfer $(\bar{z} - z(w))$ and the fiscal cost of behavioral responses $(\tau d\bar{z}/d\tau)$, both evaluated at u_c , while the second captures the welfare effect of the reform-induced shift in aspirations. Aggregating and setting $dW/d\tau = 0$, we can decompose the planner's first-order condition, which captures the impact of an infinitesimal reform to the linear tax rate, into three effects:

$$0 = \underbrace{\int \gamma(w) \cdot u_c(w) (\bar{z} - z(w)) dF}_{\text{Net Redistribution Effect}} - \underbrace{\int \gamma(w) \cdot u_c(w) \tau \frac{d\bar{z}}{d(1-\tau)} dF}_{\text{Aggregate Behavioral Response}} + \underbrace{\int \gamma(w) \cdot \phi_a(w) \frac{da}{d\tau} dF}_{\text{Aspiration Externality Effect}}, \quad (14)$$

where $e \equiv \frac{1-\tau}{\bar{z}} \frac{d\bar{z}}{d(1-\tau)}$ is the aggregate elasticity of taxable income. Importantly, the aspirational threshold a depends on other people's income, and thus also depends on the degree of progressivity of the tax and transfer system (τ, T) . By choosing τ , the social planner also implicitly chooses a which directly impacts individuals' utility.

3.2 Behavioral Responses

The aggregate “policy” (or “macro”) elasticity e will differ in our setup with aspirations relative to the standard setup with no aspirations. In equilibrium, $z(w) = z(w, \tau, T, a)$, so a change in τ affects earnings through the net-of-tax rate, the lump-sum transfer, and aspirations:

$$\frac{dz(w)}{d\tau} = \left. \frac{dz(w)}{d\tau} \right|_{da=0} + \frac{\partial z(w)}{\partial a} \frac{da}{d\tau}, \quad (15)$$

where the first term collects the standard substitution and income effects (holding aspirations fixed), and the second captures the aspiration-driven behavioral response. Expressing the individual response in terms of elasticities:

$$\frac{dz(w)}{d(1-\tau)} = \frac{z(w)}{1-\tau} \varepsilon_{z_u}^{1-\tau}(w) - \frac{\bar{z}}{1-\tau} \eta(w) + \frac{\tau}{1-\tau} \eta(w) \frac{d\bar{z}}{d(1-\tau)} + \frac{z(w)}{1-\tau} \varepsilon_{z,a}^{1-\tau}(w), \quad (16)$$

where

$$\varepsilon_{z_u}^{1-\tau}(w) \equiv \frac{1-\tau}{z(w)} \frac{\partial z(w)}{\partial(1-\tau)}, \quad \eta(w) \equiv (1-\tau) \frac{\partial z(w)}{\partial T}, \quad (17)$$

are the uncompensated elasticity and income effect, and the aspiration-induced elasticity, i.e. the elasticity of taxable income with respect to the net-of-tax rate that occurs only

through changes in the aspirational threshold, decomposes as

$$\varepsilon_{z,a}^{1-\tau}(w) \equiv \frac{1-\tau}{z(w)} \frac{\partial z(w)}{\partial a} \frac{da}{d(1-\tau)} = \varepsilon_a^{1-\tau} \cdot \varepsilon_z^a(w), \quad (18)$$

the product of the elasticity of aspirations with respect to the net-of-tax rate ($\varepsilon_a^{1-\tau} \equiv \frac{1-\tau}{a} \frac{da}{d(1-\tau)}$) and the elasticity of taxable income with respect to aspirations ($\varepsilon_z^a(w) \equiv \frac{a}{z(w)} \frac{\partial z(w)}{\partial a}$). The latter captures the behavioral response defined in Section 2 and is the object estimated in the empirical section.

Lemma 1. *The aggregate elasticity of taxable income with respect to the net-of-tax rate e is a mix of substitution, income, and aspiration effects:*

$$e = \frac{\bar{\varepsilon}_{z_u}^{1-\tau} - \bar{\eta} + \bar{\varepsilon}_{z,a}^{1-\tau}}{1 - \frac{\tau}{1-\tau} \bar{\eta}} = e_0 + \frac{\bar{\varepsilon}_{z,a}^{1-\tau}}{1 - \frac{\tau}{1-\tau} \bar{\eta}} \quad (19)$$

where $\bar{\eta} \equiv \int \eta(w) dF$ is the average unweighted income effect, $\bar{\varepsilon}_{z_u}^{1-\tau} \equiv \int \frac{z(w)}{\bar{z}} \varepsilon_{z_u}^{1-\tau}(w) dF$ and $\bar{\varepsilon}_{z,a}^{1-\tau} \equiv \int \frac{z(w)}{\bar{z}} \varepsilon_{z,a}^{1-\tau}(w) dF$ are income-weighted averages of the individual elasticities, and $e_0 \equiv (\bar{\varepsilon}_{z_u}^{1-\tau} - \bar{\eta}) / (1 - \frac{\tau}{1-\tau} \bar{\eta})$ is the standard aggregate elasticity absent the aspiration channel.

A key consideration is whether existing empirical estimates of the elasticity of taxable income (ETI) already incorporate the aspiration-driven response $\bar{\varepsilon}_{z,a}^{1-\tau}$. I argue that this is unlikely to be the case. One potential reason is *timing*. As discussed in [Saez et al. \(2012\)](#), most of the empirical literature has focused on short-term responses. We typically expect the ETI to be smaller in the short run, as individuals face optimization frictions and adjustment costs ([Chetty et al., 2011](#); [Chetty, 2012](#)). These frictions are likely present for the aspiration response as well: the behavioral response via the aspiration channel is a medium- to long-term phenomenon, as changes in the income distribution and the affluence of peers become more salient over time. This aspiration channel provides an additional explanation for why long-run ETI estimates tend to exceed short-run ones. Another potential reason is *identification*. Many studies estimating the ETI rely on responses from *differential* variation in net-of-tax rates between treated and control groups, absorbing aggregate shocks through time effects. But the aspiration channel operates through an economy-wide equilibrium object (for the cases where a is shared society-wide). A reform that shifts the income distribution moves the reference point a for treated and control units alike, so its effect is differenced out along with other macro shocks. In the terminology of micro versus macro elasticities, $\bar{\varepsilon}_{z_u}^{1-\tau}$ is a micro elasticity while e is the macro (policy) elasticity incorporating the equilibrium aspiration feedback. Nonetheless, this

should be treated as a case-by-case empirical question with the specific context of each study determining whether the measured ETI incorporates the aspiration channel.

3.3 Optimal Linear Tax Rate

Proposition 1 (Optimal Linear Tax Rate). *The optimal linear tax rate satisfies*

$$\tau = \frac{1 - \bar{g} + \bar{A}}{1 - \bar{g} + \bar{A} + e} \quad (20)$$

where $g(w) \equiv \gamma(w) u_c(w) / \int \gamma(w) u_c(w) dF$ are the normalized social welfare weights, $\bar{g} \equiv \int g(w) z(w) dF / \bar{z}$ is the income-weighted average welfare weight, and $\bar{A} \equiv \frac{1}{\bar{z}} \int \frac{g(w)}{u_c(w)} \frac{da(w)}{d\tau} \phi_a(w) dF$ is the aggregate aspiration externality.

This augments the standard optimal linear tax formula (Piketty and Saez, 2013) with the direct externality $\bar{A}$. The object $da(w)/d\tau$ links the aspiration formation function to optimal policy by determining how a tax reform reshapes aspirations across the distribution. The formula does not restrict the sign of $\bar{A}$. In the leading empirical case suggested by the literature, $\phi_a(w) < 0$ (higher aspirations reduce utility, i.e., envy) and $da/d\tau < 0$ (higher taxes compress the income distribution, reducing aspirations, e.g., when substitution effects dominate), so that $\bar{A} > 0$: a corrective motive for higher taxes. But $\bar{A} < 0$ obtains, for instance, under altruistic comparisons ($\phi_a > 0$) or when $da/d\tau > 0$. Setting $\bar{A} = 0$ recovers the standard formula, but the distortionary cost e still differs because it incorporates aspiration-driven behavioral responses.

Corollary 1 (Decomposed Formula). *Substituting the decomposition of e from Lemma 1:*

$$\tau = \frac{1 - \bar{g} + \bar{A}}{1 - \bar{g} + \bar{A} + \bar{\varepsilon}_{z,u}^{1-\tau} + \bar{\varepsilon}_{z,a}^{1-\tau} - \bar{\eta} \cdot (\bar{g} - \bar{A})} \quad (21)$$

The sign of $\bar{\varepsilon}_{z,a}^{1-\tau}$ determines whether the aspiration channel amplifies or dampens the distortionary cost of taxation. In the leading case $\bar{\varepsilon}_a^{1-\tau} > 0$ (a higher net-of-tax rate raises aspirations when e.g., substitution effects dominate), when the income-weighted average agent is predominantly *motivated* ($\bar{\varepsilon}_z^a > 0$), a tax increase reduces aspirations, further discouraging effort and calling for a lower optimal rate. When predominantly *frustrated* ($\bar{\varepsilon}_z^a < 0$), lower aspirations relieve frustration, partially offsetting the standard distortion and calling for a higher rate. If instead $\bar{\varepsilon}_a^{1-\tau} < 0$, these conclusions reverse.

Two limiting cases, presented here assuming away income effects $\bar{\eta} = 0$ for clarity, illustrate the distinct roles of aspirations. First, a planner that does not value redistribution ($\bar{g} = 1$) still sets a positive tax rate $\tau = \bar{A}/(\bar{A} + \bar{\varepsilon}_{z_u}^{1-\tau} + \bar{\varepsilon}_{z,a}^{1-\tau})$, highlighting the purely corrective motive from relative income concerns. Second, a planner that does not wish to internalize the externality ($\bar{A} = 0$) faces $\tau = (1 - \bar{g})/(1 - \bar{g} + \bar{\varepsilon}_{z_u}^{1-\tau} + \bar{\varepsilon}_{z,a}^{1-\tau})$: aspirations still matter for the optimal tax rate through behavioral responses in the denominator.

It is useful to rewrite the formula by grouping the aspiration channel into a direct welfare externality $\bar{A}$ and an induced fiscal externality $\bar{B}$. This decomposition bridges the linear and nonlinear tax results.

Corollary 2 (Alternative Expression with Aggregate Fiscal Externality). *The optimal linear tax rate can be rewritten as*

$$\tau = \frac{1 - \bar{g} + \bar{A} + \bar{B}}{1 - \bar{g} + \bar{A} + \bar{B} + e_0}, \quad (22)$$

where $\bar{B} \equiv \frac{1}{z} \frac{\tau}{1 - \frac{\tau}{1 - \tau} \bar{\eta}} \int \frac{\partial z(w)}{\partial a} \frac{da}{d\tau} dF$ is the aggregate fiscal externality from aspiration-driven behavioral responses.

Redistribution is captured by $(1 - \bar{g})$, (standard) distortionary costs by e_0 , while aspirations contribute a total correction wedge $\bar{\Omega} \equiv \bar{A} + \bar{B}$ combining the direct utility impacts and the fiscal externalities (from income effects driven by the changes in aspirations). This object $\bar{\Omega}$ is the linear-tax analogue of the aspiration wedge Ω derived for the nonlinear schedule in Section 4.

3.4 Simple Aspiration Formation Functions & Aspiration Multiplier

The planner's first-order condition and Proposition 1 hold for any aspiration formation function in the weighted average class (3), including type-specific thresholds (with $da(w)/d\tau$ inside the integral defining $\bar{A}$). However, characterizing the equilibrium response $da(w)/d\tau$ for each type requires solving a functional fixed point with a continuum of type specific thresholds, namely an operator equation. I therefore develop the multiplier representation for shared thresholds here, and for finitely many group-specific thresholds in Section 3.5, leaving the derivations for the general case to a future version of this paper. I now focus on the two simple cases from Section 2 and show how each determines the structure of the aspiration multiplier.

Atmospheric aspirations ($a = \bar{z}$). With $\omega(w) = 1$, i.e. equal weights across types, we have $da/d\tau = d\bar{z}/d\tau$, so the aspiration externality becomes

$$\bar{A} = -\frac{e}{1-\tau} \int \frac{g(w)}{u_c(w)} \phi_a(w) dF = \frac{e}{1-\tau} \cdot \tilde{A},$$

where $\tilde{A} \equiv -\int \frac{g(w)}{u_c(w)} \phi_a(w) dF > 0$ when $\phi_a < 0$ (envious relative income concerns). The optimal tax rate simplifies to

$$\tau = \frac{1 - \bar{g} + e \cdot \tilde{A}}{1 - \bar{g} + e}. \quad (23)$$

The aggregate elasticity e scales both the externality correction (numerator) because the aspiration response is larger, and the distortionary cost (denominator).

Because $\varepsilon_a^{1-\tau} = e$ when $a = \bar{z}$, the aspiration-induced elasticity becomes $\varepsilon_{z,a}^{1-\tau}(w) = e \cdot \varepsilon_z^a(w)$, making the aggregate elasticity in Lemma 1 endogenous. Rearranging and assuming away income effects ($\bar{\eta} = 0$) reveals the *aspiration multiplier* interpretation of the aggregate elasticity:

$$e = \frac{\bar{\varepsilon}_{zu}^{1-\tau}}{1 - \bar{\varepsilon}_z^a}, \quad (24)$$

where $\bar{\varepsilon}_z^a \equiv \int \frac{z(w)}{\bar{z}} \varepsilon_z^a(w) dF$ is the income-weighted average of the individual aspiration elasticities. The short-run (or partial equilibrium) aggregate elasticity $\bar{\varepsilon}_{zu}^{1-\tau}$ (before aspiration adjustments, i.e. holding a fixed) is amplified when agents are predominantly motivated ($\bar{\varepsilon}_z^a > 0$), or dampened when predominantly frustrated ($\bar{\varepsilon}_z^a < 0$), into a long-run (or full equilibrium) elasticity e incorporating the full feedback loop with the sequence of adjustments from changes in aspirations. This logic parallels the earnings capacity externalities from top earners studied in Kleven (2025). Note that the model is static and only mirrors a dynamic adjustment process via the equilibrium fixed point that jointly determines the schedule of taxable incomes $\{z(w)\}_w$ and a . Convergence of the iterative adjustment process toward the fixed point requires $|\bar{\varepsilon}_z^a| < 1$, which I assume throughout.

Top-earners aspirations ($a = \bar{z}^+$). With $\omega(w) = \frac{1}{p} \mathbf{1}(w \geq \tilde{w})$, only top earners' income responses feed back into aspirations. Using (15), the response of aspirations to a change in the tax rate can be written as

$$\frac{da}{d\tau} = \frac{\frac{1}{p} \int_{w \geq \tilde{w}} \left. \frac{dz(w)}{d\tau} \right|_{da=0} dF(w)}{1 - \frac{1}{p} \int_{w \geq \tilde{w}} \frac{\partial z(w)}{\partial a} dF(w)}. \quad (25)$$

The numerator averages the standard (aspiration-free) income responses of top earners. The denominator is the top-group aspiration multiplier. Assuming away income effects and using the elasticity notation from Section 3, this becomes

$$\varepsilon_a^{1-\tau} \equiv \frac{1-\tau}{a} \frac{da}{d(1-\tau)} = \frac{\bar{\varepsilon}_{z_u}^{+,1-\tau}}{1 - \frac{1}{p} \int_{w \geq \tilde{w}} \frac{\partial z(w)}{\partial a} dF(w)}, \quad (26)$$

where the average aspiration-free elasticity among the top-earners benchmark group is $\bar{\varepsilon}_{z_u}^{+,1-\tau} \equiv \frac{1}{p\bar{z}^+} \int_{w \geq \tilde{w}} z(w) \varepsilon_{z_u}^{1-\tau}(w) dF(w)$. Equation (26) shows that the society-wide elasticity of aspirations with respect to the net-of-tax rate depends on two objects: the direct earnings response of top earners absent the aspiration channel, and a feedback term capturing how changes in aspirations further affect top earners' labor supply. When $\partial z(w)/\partial a > 0$ on average among top earners, i.e. when top earners are motivated by higher aspirations, the denominator is below one and the response of aspirations is amplified by a multiplier effect. Then the direct aggregate aspiration externality becomes

$$\bar{A} = \frac{\bar{z}^+}{\bar{z}} \frac{\varepsilon_a^{1-\tau}}{1-\tau} \cdot \tilde{A}.$$

Next, assuming away income effects, the optimal tax rate simplifies to

$$\tau = \frac{1 - \bar{g} + \bar{A}}{1 - \bar{g} + \bar{A} + \bar{\varepsilon}_{z_u}^{1-\tau} + \varepsilon_a^{1-\tau} \cdot \bar{\varepsilon}_z^a}. \quad (27)$$

Top earners determine the evolution of the aspiration benchmark itself through $\varepsilon_a^{1-\tau}$ which affects both aggregate welfare via $\bar{A}$ and aggregate earnings through the society-wide behavioral responses to changes in aspirations $\bar{\varepsilon}_z^a$.

3.5 Group-specific aspirational thresholds

As briefly discussed above, it might be more natural to consider cases in which individuals compare themselves and their outcomes with those of a similar subgroup rather than the entire income distribution. For example, individuals with social preferences may only care about the incomes of those with the same occupation as themselves, the same level of education, the same gender, the same age cohort, or any combination of such characteristics.

We extend the model to the case of multidimensional heterogeneity, where each agent's

type is now a two-dimensional vector (w, θ) , with $w \in \mathbb{R}_+$ and $\theta \in \{1, \dots, N\}$. Consider the simple case with two groups, but the model readily extends to any number N of mutually exclusive discrete groups. For example, θ can capture *Young* vs. *Old*, *Low-skill* vs. *High-skill*, or *Male* vs. *Female*. Let F_θ denote the distribution of w conditional on θ , with density f_θ . Let $\pi_\theta = \Pr(\theta)$ denote the population share of group θ .⁴

Next, we assume that aspirational thresholds are now group-specific:

$$a_\theta = \bar{z}_\theta = \int z(w, \theta) dF_\theta(w) \quad (28)$$

Note that aspirations are formed exclusively within groups, ruling out cross-group comparisons. Each agent (w, θ) now solves:

$$v(w, \theta) = \max_z \{u((1 - \tau)z + T, z; w, \theta) + \phi(z, a_\theta)\}, \quad (29)$$

where a_θ is taken as given. The planner maximizes

$$W(\tau) = \sum_\theta \pi_\theta \int G(v(w, \theta)) dF_\theta(w), \quad (30)$$

subject to (i) $T = \tau \bar{z}$ (with $\bar{z} = \sum_\theta \pi_\theta \bar{z}_\theta$), (ii) individual maximization, and (iii) $a_\theta = \bar{z}_\theta$ for all θ . Solving for the planner's first-order condition and rearranging terms yields the following optimal tax rate:

$$\tau = \frac{1 - \bar{g} + \sum_\theta s_\theta \cdot e_\theta \cdot \tilde{A}_\theta}{1 - \bar{g} + \sum_\theta s_\theta \cdot e_\theta}, \quad (31)$$

where $s_\theta = \pi_\theta \bar{z}_\theta / \bar{z}$ is group θ 's income share, $e_\theta = \frac{1-\tau}{\bar{z}_\theta} \frac{d\bar{z}_\theta}{d(1-\tau)}$ is group θ 's aggregate elasticity of taxable income, and $\tilde{A}_\theta = - \int \frac{g(w, \theta)}{u_c(w, \theta)} \phi_a(w, \theta) dF_\theta$ is group θ 's direct aggregate aspiration externality. Since $a_\theta = \bar{z}_\theta$, each group-level elasticity e_θ incorporates the within-group aspiration feedback loop. Abstracting from income effects, e_θ also admits a multiplier representation:

$$e_\theta = \frac{\bar{\varepsilon}_{z_u, \theta}^{1-\tau}}{1 - \bar{\varepsilon}_{z, \theta}^a}, \quad (32)$$

where $\bar{\varepsilon}_{z_u, \theta}^{1-\tau}$ is the income-weighted average uncompensated elasticity within group θ and $\bar{\varepsilon}_{z, \theta}^a$ is the within-group aspiration elasticity. Groups in which aspirations are more motivating (higher $\bar{\varepsilon}_{z, \theta}^a$) have a larger multiplier and hence a more elastic tax base.

⁴Importantly, we assume that the government does not observe θ , or at the very least chooses not to use it to implement redistribution.

The optimal tax formula closely parallels the one-dimensional expression in equation (23), with the aggregate elasticity $e = \sum_{\theta} s_{\theta} \cdot e_{\theta}$ and aggregate externality

$$\tilde{A} = \sum_{\theta} \frac{s_{\theta} e_{\theta}}{e} \tilde{A}_{\theta}$$

now with weighted averages of group-level quantities. The key policy weights are the products $s_{\theta} e_{\theta}$. A group matters for optimal tax design when it both accounts for a large share of aggregate income and has a group mean income that responds strongly to the tax rate. This also implies that a large direct aspiration externality $\tilde{A}_{\theta}$ has limited force if the group's reference income is inelastic, since taxation then does little to move a_{θ} .

This decomposition also yields a simple covariance insight. The optimal tax rate is higher when groups with large weights $s_{\theta} e_{\theta}$ also have large externalities $\tilde{A}_{\theta}$, because the tax system then disproportionately compresses the reference incomes that generate the largest welfare losses. Conversely, if the groups whose aspirations respond most to taxation have small direct externalities, the corrective motive is weaker.

4 Optimal Nonlinear Income Tax

4.1 Setup and Planner's Problem

4.1.1 Taxes and Government Revenue

Let us consider the perturbation approach introduced by [Saez \(2001\)](#) and formalized by [Goloso et al. \(2014\)](#), [Jacquet and Lehmann \(2021\)](#), and [Gerritsen \(2024\)](#). More particularly, following [Gerritsen \(2024\)](#), we introduce κ the reform parameter, and $\rho(z)$ the reform function, to analyze infinitesimal tax reforms in the direction of $\rho(z)$. The nonlinear income tax can then be written as:

$$T(z, \kappa) = \mathcal{T}(z) + \kappa \rho(z) \tag{33}$$

Taking the total derivative of equation (33) with respect to κ yields the impact of a tax reform on the tax burden of individuals choosing taxable income z :

$$\frac{dT}{d\kappa} = \rho(z) + T_z \cdot \frac{dz}{d\kappa}, \tag{34}$$

where $T_z = \mathcal{T}_z + \kappa \rho_z$.

Government revenue is given by:

$$\mathcal{R} \equiv \int T(z, \kappa) dF(w), \quad (35)$$

and the impact of a tax reform on government revenue is:

$$\frac{d\mathcal{R}}{d\kappa} = \int \left[\rho(z) + T_z \cdot \frac{dz}{d\kappa} \right] dF(w). \quad (36)$$

4.1.2 Individual Utility

As in the previous section, each agent chooses some amount of taxable income z and consumption c to maximize utility subject to a budget constraint.

$$v(w) = \max_{c,z} \{u(c, z; w) + \phi(z, a; w) : c = z - T(z, \kappa)\}$$

where a represents an aspirational threshold, and $T(z, \kappa)$ is the tax liability. A type- w agent takes the aspirational threshold a as given and chooses taxable income $z(w)$ which satisfies the following first-order condition:

$$-\frac{u_z + \phi_z}{u_c} = 1 - T_z(z(w), \kappa). \quad (37)$$

Using the envelope theorem, the effect of a reform on the indirect utility of an agent of type w simplifies to:

$$\frac{dv(w)}{d\kappa} = u_c \cdot [-\rho(z(w))] + \phi_a \cdot \frac{da}{d\kappa}, \quad (38)$$

where u_c is the marginal utility of consumption. This simplification leverages the budget constraint $c = z - T(z, \kappa)$ and the behavioral optimality condition $-\frac{u_z + \phi_z}{u_c} = 1 - T_z(z, \kappa)$, ensuring that utility is evaluated at the optimal choice of $z(w)$.

4.1.3 Social Welfare

As in the linear case, define social welfare as $\mathcal{W} \equiv \int G(v(w)) dF(w)$, with $\gamma(w) \equiv G'(v(w))$. The impact of a reform on social welfare is:

$$\frac{d\mathcal{W}}{d\kappa} = - \int \gamma(w) \left[u_c \cdot \rho(z(w)) - \phi_a \cdot \frac{da}{d\kappa} \right] dF(w). \quad (39)$$

The key novelty is the second term: even though each individual treats a as given in their own optimization, a reform that changes many individuals' incomes shifts the equilibrium reference point a .

Next, let λ denote the Lagrange multiplier on the social planner's budget constraint (the social planner maximizes social welfare subject to the revenue constraint $\mathcal{R} \geq E$, where E is an exogenous revenue requirement). It corresponds to the social marginal value of public resources. The net social welfare effect of a tax reform is given by:

$$\begin{aligned} \frac{1}{\lambda} \frac{d\mathcal{W}}{d\kappa} + \frac{d\mathcal{R}}{d\kappa} &= \int \left[-\frac{\gamma(w)}{\lambda} u_c \cdot \rho(z(w)) + \frac{\gamma(w)}{\lambda} \phi_a \cdot \frac{da}{d\kappa} + \rho(z(w)) + T_z \cdot \frac{dz(w)}{d\kappa} \right] dF(w) \quad (40) \\ &= \underbrace{\int (1 - g(w)) \cdot \rho(z(w)) dF(w)}_{\text{Net Redistributive Gain}} + \underbrace{\int \frac{\gamma(w)}{\lambda} \phi_a \cdot \frac{da}{d\kappa} dF(w)}_{\text{Externality Effect}} + \underbrace{\int T_z \cdot \frac{dz(w)}{d\kappa} dF(w)}_{\text{Behavioral Effects}}, \end{aligned} \quad (41)$$

where $g(w) \equiv \frac{\gamma(w)}{\lambda} u_c$ is the social welfare weight of a type- w agent, with λ the marginal value of public funds.

4.2 Behavioral Responses to Tax Reform

Once again, let us decompose the impact of a tax reform on taxable income into familiar elasticity concepts. First, notice that:

$$\begin{aligned} \frac{dz(w)}{d\kappa} &= \left. \frac{dz(w)}{d\kappa} \right|_{\rho(z(w))=da=0} + \left. \frac{dz(w)}{d\kappa} \right|_{\rho(z(w))=da=0} + \left. \frac{dz(w)}{d\kappa} \right|_{\rho(z(w))=\rho_z(z(w))=0} \\ &= -\frac{\rho_z(z(w)) \cdot z(w)}{1 - T_z} \varepsilon_z^c(w) - \frac{\rho(z(w))}{1 - T_z} \eta_z(w) + \frac{da}{d\kappa} \frac{dz}{da} \Big|_{\rho(z(w))=\rho_z(z(w))=0} \quad (42) \\ &= -\frac{\rho_z(z(w)) \cdot z(w)}{1 - T_z} \varepsilon_z^c(w) - \frac{\rho(z(w))}{1 - T_z} \eta_z(w) + \frac{da}{d\kappa} \frac{\partial z(w)}{\partial a}, \end{aligned}$$

where $\varepsilon_z^c(w)$ is the compensated elasticity of taxable income to an increase in the marginal net-tax-rate (i.e. a decrease in the marginal tax rate) of a type- w agent, holding both the tax burden and the aspirational threshold unchanged ($\varepsilon_z^c(w) > 0$ if we assume leisure is a normal good):

$$\varepsilon_z^c(w) \equiv -\frac{1 - T_z}{\rho_z(z(w)) \cdot z(w)} \left. \frac{dz(w)}{d\kappa} \right|_{\rho(z(w))=da=0}, \quad (43)$$

$\eta_z(w)$ is the income effect due to a reform that lowers the tax burden by one unit,⁵ while leaving both the marginal taxes and the aspirational threshold unchanged:

$$\eta_z(w) \equiv -\frac{1 - T_z}{\rho(z(w))} \frac{dz(w)}{d\kappa} \Big|_{\rho_z(z(w))=da=0}, \quad (44)$$

and $\frac{\partial z(w)}{\partial a}$ is the causal impact of a change in the aspirational threshold on taxable income.

Using the decomposition of the behavioral response in taxable income, equation (41) rewrites as

$$\begin{aligned} \frac{1}{\lambda} \frac{dW}{d\kappa} + \frac{d\mathcal{R}}{d\kappa} = & \int \left[1 - \frac{\gamma(w)}{\lambda} u_c - \frac{T_z}{1 - T_z} \eta_z(w) \right] \cdot \rho(z(w)) dF(w) \\ & - \int \frac{T_z}{1 - T_z} \rho_z(z(w)) \cdot z(w) \varepsilon_z^c(w) dF(w) \\ & + \underbrace{\left[\int \frac{\gamma(w)}{\lambda} \frac{da}{d\kappa} \phi_a dF(w) \right]}_{\text{Agg. Aspiration-Driven Direct Externality}} + \underbrace{\left[\int T_z \frac{da}{d\kappa} \frac{\partial z(w)}{\partial a} dF(w) \right]}_{\text{Agg. Aspiration-Driven Fiscal Externality}} \end{aligned} \quad (45)$$

4.3 Optimal Marginal Tax Schedule

Let us first introduce a standard notation for the social marginal value of a type w 's private resources in terms of public resources

$$\alpha(w) \equiv \frac{\gamma(w)}{\lambda} u_c + \frac{T_z}{1 - T_z} \eta_z(w). \quad (46)$$

$\alpha(w)$ captures the idea that, denoted in terms of public resources, a marginal increase in agent w 's disposable income yields additional social utility of consumption equal to $\frac{\gamma(w)}{\lambda} u_c$ and a classical revenue effect $\frac{T_z}{1 - T_z} \eta_z(w)$ from the income effect in taxable income. Because this thought experiment reduces the tax liability only for a measure-zero mass of type- w agents, it does not shift individuals' aspirational reference point, so $da/d\kappa = 0$. As a result, $\alpha(w)$ does not include (i) the direct aspiration externality $-\frac{\gamma(w)}{\lambda} \frac{da}{d\kappa} \phi_a$ nor (ii) the aspiration-driven fiscal externality $-T_z \frac{da}{d\kappa} \frac{\partial z}{\partial a}$ generated from the aspiration-driven income effect. These aggregate components enter the planner's condition only when considering reforms that shift many individuals' incomes simultaneously.

⁵A lower tax burden leads to more disposable income. If we assume that leisure is a normal good, then a lower tax burden $\rho(z(w)) < 0$ induces agents to work less $\frac{dz(w)}{d\kappa} \Big|_{\rho_z(z(w))=da=0} < 0$, and thus income effects are negative $\eta_z < 0$.

Lemma 2 (Average Social Marginal Value of Private Resources). *In the tax optimum, the average social marginal value of private resources differs from 1 by the aggregate aspiration-driven welfare and revenue effects induced by a reform which increases the tax liability by 1 for all individuals while leaving marginal tax rates unchanged:*

$$\int \alpha(w) dF(w) = 1 + \int \frac{da}{d\kappa} \left[\frac{\gamma(w)}{\lambda} \phi_a + T_z \frac{\partial z(w)}{\partial a} \right] dF(w). \quad (47)$$

where $da/d\kappa$ captures the shift in aspirational threshold(s) induced by that reform.

In the standard (no-aspirations) model, we have $\int \alpha(w) dF(w) = 1$. Here, aspirations introduce an aggregate externality term and behavioral responses (the right-hand-side integral) creating a fiscal externality. If that term vanishes (e.g. if $da/d\kappa = 0$), we recover the usual condition that the average social marginal value of private resources equals the social marginal value of public funds. Otherwise, the planner must account for how aspirations alter individual choices and overall welfare.

Proposition 2 (Optimal Nonlinear Tax Rate). *In the tax optimum, the marginal tax rate at income level z^* , denoted by $T_z^* \equiv T_z(z^*, \kappa)$ must satisfy the following condition:*

$$\begin{aligned} \frac{T_z^*}{1 - T_z^*} &= \frac{1}{\bar{\varepsilon}_{z^*}^c} \cdot \frac{1}{z^* h(z^*)} \cdot \left[(1 - H(z^*)) \cdot (1 - \bar{\alpha}_{z(w) > z^*}) + \int \frac{da}{d\kappa} \left[\frac{\gamma(w)}{\lambda} \phi_a + T_z \frac{\partial z(w)}{\partial a} \right] dF(w) \right] \\ &= \frac{1}{\bar{\varepsilon}_{z^*}^c} \cdot \frac{1}{z^* h(z^*)} \cdot [(1 - H(z^*)) \cdot (1 - \bar{\alpha}_{z(w) > z^*}) + \bar{A} + \bar{B}] \end{aligned} \quad (48)$$

where $\bar{\varepsilon}_{z^*}^c$ is the local average compensated elasticity of taxable income at income level z^* , $\bar{\alpha}_{z(w) > z^*}$ is the average social marginal value of private resources (keeping the aspiration channel muted) of individuals who earn more than z^* , $\bar{A} \equiv \int \frac{da}{d\kappa} \frac{\gamma}{\lambda} \phi_a dF(w)$ captures the aggregate externality from relative income concerns, and $\bar{B} \equiv \int \frac{da}{d\kappa} T_z \frac{\partial z(w)}{\partial a} dF(w)$ captures the aggregate fiscal externality from aspiration-induced behavioral responses. All quantities involving $da/d\kappa$ are evaluated under the local perturbation that raises tax liability above z^* .

The optimal marginal tax rate inherits the standard Mirrleesian structure (rearranged to resemble the familiar [Diamond \(1998\)](#) “ABC” formula) with an equity term scaled by behavioral elasticities, but is shifted by an additional “aspiration wedge” that aggregates:

- $\bar{A} \equiv \int \frac{da}{d\kappa} \cdot \frac{\gamma}{\lambda} \phi_a dF(w)$: the aggregate externality term i.e., average direct welfare effect of the updated aspiration threshold resulting from the policy change. With envy

($\phi_a < 0$), this term is positive (a corrective motive) when the reform lowers aspirations ($da/d\kappa < 0$) and negative when it raises them. Under altruistic comparisons ($\phi_a > 0$), the logic flips.

- $\bar{B} \equiv \int \frac{da}{d\kappa} \cdot T_z \frac{\partial z(w)}{\partial a} dF(w)$: the aggregate fiscal externality from aspiration-induced behavioral responses (the intuition for the expected sign of these behavioral responses was first derived in [Genicot and Ray \(2017\)](#))
 - For individuals located in the “frustrated” region relative to their aspiration threshold e.g., in the simple example in Figure 1, $z(w) < a$: $\frac{\partial z(w)}{\partial a}$ is likely negative as people reduce effort when falling short
 - For individuals located in the “motivating” region relative to their aspiration threshold e.g., in the simple example in Figure 1, $z(w) > a$: $\frac{\partial z(w)}{\partial a}$ is likely positive as people work more to maintain their position

If $da/d\kappa < 0$, then the sign of $\bar{B}$ will depend on whether the decrease in aspirations will, on average, and weighted by marginal tax rates, decrease or increase labor supply. Optimal marginal tax rates should be adjusted downward (upward) when aspiration effects predominantly encourage (discourage) labor supply (i.e. $\bar{B} < 0$), after accounting for the direct welfare (externality) impact.

It is important to note that the above discussion is mostly for illustrative purposes because it fails to fully take into account how endogenous $da/d\kappa$ is to the particular policy reform of interest. I now focus on the two canonical aspiration formation functions from Section 2, in the same way as in Section 3.4 for the linear case.

4.4 Simple Aspiration Formation Functions

Assumption 2 (Regular earnings distributions and reforms). *At the tax schedules considered, I assume that (i) earnings $z(w)$ are interior and strictly increasing in w , (ii) $1 - T_z > 0$, (iii) the induced earnings distribution admits a positive, continuous density near each reform point (i.e. no atoms or bunching), and (iv) all integrands are locally bounded, so that differentiation under the integral sign and the interchange of limits and integrals below are valid.*

Atmospheric aspirations ($a = \bar{z}$). Assume that the aspirational threshold corresponds to the average level of income in society,

$$a = \bar{z} = \int z(w) dF(w). \quad (49)$$

This allows us to make progress in understanding how a small reform of the nonlinear tax schedule impacts the aspirational threshold.

Next, taking the integral (i.e. summing across types) on each side of equation (42), which characterizes the behavioral response of each type- w agent to the tax reform, we can solve for the *shared* shift in the aspirational threshold $da/d\kappa$:

$$\begin{aligned} \frac{da}{d\kappa} &= \int \frac{dz(w)}{d\kappa} dF(w) \\ &= \int \left[-\frac{\rho_z(z(w)) \cdot z(w)}{1 - T_z} \varepsilon_z^c(w) - \frac{\rho(z(w))}{1 - T_z} \eta_z(w) \right] dF(w) + \frac{da}{d\kappa} \int \frac{\partial z(w)}{\partial a} dF(w), \end{aligned} \quad (50)$$

which simplifies to:

$$\frac{da}{d\kappa} = - \frac{\int \left[\frac{\rho_z(z(w)) \cdot z(w)}{1 - T_z} \varepsilon_z^c(w) + \frac{\rho(z(w))}{1 - T_z} \eta_z(w) \right] dF(w)}{1 - \int \frac{\partial z(w)}{\partial a} dF(w)}. \quad (51)$$

This corresponds to the aggregate (or average) of the standard substitution effects and income effects, scaled up (or down) by an aspiration-driven multiplier. If agents are majoritarily motivated by an increase in their aspiration threshold (i.e., if higher aspirations inspire), then the multiplier scales up the magnitude of the average behavioral response. On the other hand, if agents are predominantly discouraged by an increase in their aspiration threshold (i.e., if higher aspirations frustrate), then the multiplier scales down the magnitude of the average behavioral response. As in the linear case, the multiplier captures the full sequence of adjustments toward the static equilibrium fixed point. Convergence of the fixed-point iteration requires $\left| \int \frac{\partial z(w)}{\partial a} dF(w) \right| < 1$.

Different tax reforms will mechanically have different impacts on the aspirational threshold. Let us re-examine $da/d\kappa$ under one commonly used reform to derive the optimal marginal tax rate schedule.

Consider the small reform which only increases the tax liability for those above a certain income level. This will mechanically change the marginal income tax for individuals within a small income band:

- $\rho(z(w)) = 0$ for individuals with $z(w) < z^*$;
- $\rho(z(w)) = 1 > 0$ (a fixed increment) for $z(w) > z^* + \delta z$;
- $\rho(z(w)) = \frac{z(w) - z^*}{\delta z}$ for those with $z^* \leq z(w) \leq z^* + \delta z$, so that $\rho_z(z(w)) = \frac{1}{\delta z} > 0$ within this small income band.

It will induce substitution effects for those within the small income band around z^* and income effects for those earning more than z^* . Evaluating $da/d\kappa$ from equation (51) using these reform parameters yields:⁶

$$\frac{da}{d\kappa} = \frac{\underbrace{\int_{z^*}^{z^* + \delta z} -\frac{\rho_z(z(w)) \cdot z(w)}{1 - T_z} \varepsilon_z^c(w) dF(w)}_{<0} + \underbrace{\int_{z(w) \geq z^* + \delta z} -\frac{1}{1 - T_z} \eta_z(w) dF(w)}_{\geq 0}}{1 - \int \frac{\partial z(w)}{\partial a} dF(w)}. \quad (52)$$

Importantly note that at some income levels z^* , it may be the case that the sum of income effects above z^* (positive, corresponding to the right-hand side term inside the square brackets above) will dominate the substitution effect at z^* (negative, corresponding to the left-hand side term inside the square brackets above). If so, this small reform which increases the marginal tax rate in an income band around z^* will *increase* the aggregate aspirational threshold a ($da/d\kappa > 0$).

Plugging this expression for $da/d\kappa$ into the planner's first-order condition (equation 45) evaluated at this specific reform, and using that all terms on the small band weighted by $\rho(z(w))$ vanish as $\delta z \rightarrow 0$, gives

$$0 = \int_{z(w) > z^*} \left[1 - \frac{\gamma(w)}{\lambda} u_c - \frac{T_z - \Omega}{1 - T_z} \eta_z(w) \right] dF(w) - \lim_{\delta z \rightarrow 0} \int_{z^* \leq z(w) \leq z^* + \delta z} \frac{T_z - \Omega}{1 - T_z} \rho_z(z(w)) \cdot z(w) \varepsilon_z^c(w) dF(w), \quad (53)$$

where

$$\Omega \equiv - \frac{\int \left[\frac{\gamma(w)}{\lambda} \phi_a + T_z \frac{\partial z(w)}{\partial a} \right] dF(w)}{1 - \int \frac{\partial z(w)}{\partial a} dF(w)} \quad (54)$$

represents the total social shadow price of a marginal increase in the aspiration level, accounting for both fiscal and welfare externalities, scaled up by an aspiration multiplier.

⁶Note that in the expression below, I am omitting the term capturing the income effects within the small income band which converges to zero as δz goes to zero.

Note that it depends on the entire tax schedule across all income levels. Rearranging terms, and evaluating it at z^* yields the following result.

Corollary 3 (Optimal Nonlinear Tax Rate). *In the tax optimum with $a = \bar{z}$, the marginal tax rate at income level z^* , denoted by $T_z^* \equiv T_z(z^*, \kappa)$ must satisfy the following condition:*

$$\frac{T_z^* - \Omega}{1 - T_z^*} = \frac{1}{\bar{\varepsilon}_{z^*}^c} \cdot \frac{1}{z^* h(z^*)} \cdot \int_{z^*}^{+\infty} \left[1 - g(z) - \eta_z(z) \frac{T_z(z) - \Omega}{1 - T_z(z)} \right] h(z) dz, \quad (55)$$

where $g(z) \equiv \gamma \cdot u_c / \lambda$.

This formula shows that, when assuming a shared aspirational threshold $a = \bar{z}$, the planner's condition coincides with the standard Mirrlees recursion augmented with the aggregate externality Ω which combines the direct relative income externality $\int \frac{\gamma(w)}{\lambda} \phi_a dF(w)$ together with the aggregate fiscal externality from aspiration-driven behavioral responses $\int T_z \frac{\partial z(w)}{\partial a} dF(w)$, scaled up by the aspiration multiplier.

Top-earners aspirations ($a = \bar{z}^+$). Consider now the top-earners specification $a = \bar{z}^+ = \frac{1}{p} \int_{w \geq \tilde{w}} z(w) dF(w)$ from Section 2, with $p \equiv 1 - F(\tilde{w})$. Only income responses within the reference group feed back into a . Integrating (42) over $\{w \geq \tilde{w}\}$ and solving for $da/d\kappa$:

$$\frac{da}{d\kappa} = - \frac{\frac{1}{p} \int_{w \geq \tilde{w}} \left[\frac{\rho_z(z(w)) z(w)}{1 - T_z} \varepsilon_z^c(w) + \frac{\rho(z(w))}{1 - T_z} \eta_z(w) \right] dF(w)}{1 - \frac{1}{p} \int_{w \geq \tilde{w}} \frac{\partial z(w)}{\partial a} dF(w)}, \quad (56)$$

with stability requiring $|\frac{1}{p} \int_{w \geq \tilde{w}} \frac{\partial z(w)}{\partial a} dF(w)| < 1$. A key difference from the atmospheric case: the standard perturbation that raises tax liability above z^* creates substitution effects only in $[z^*, z^* + \delta z]$, which lies inside the reference group only if $z^* \geq z(\tilde{w})$. Absent income effects ($\eta_z = 0$), if $z^* < z(\tilde{w})$ then, for sufficiently small δz , $da/d\kappa = 0$ and the formula reduces to the standard ABC formula. With income effects, reforms below $z(\tilde{w})$ still shift a through income effects on reference-group members.

I therefore present the wedge result for $z^* \geq z(\tilde{w})$ assuming away income effects. Define the aspiration total externality as:

$$\Omega^+ \equiv - \frac{\int \left[\frac{\gamma(w)}{\lambda} \phi_a(w) + T_z(z(w)) \frac{\partial z(w)}{\partial a} \right] dF(w)}{p \left(1 - \frac{1}{p} \int_{w \geq \tilde{w}} \frac{\partial z(w)}{\partial a} dF(w) \right)}. \quad (57)$$

The numerator integrates over the entire population (everyone bears the externality cost). The denominator differs from the atmospheric case: $1/p$ reflects that each dollar of reference-group income raises a by $1/p$, and the multiplier involves only the reference group's aspiration responses.

Corollary 4 (Optimal Nonlinear Tax Rate with Top-earners Aspirations). *In the tax optimum with $a = \bar{z}^+$ and assuming $\eta_z = 0$, the marginal tax rate at income level $z^* \geq z(\tilde{w})$ satisfies*

$$\frac{T_z^*(z^*) - \Omega^+}{1 - T_z^*(z^*)} = \frac{1}{\bar{\varepsilon}_{z^*}^c} \cdot \frac{1}{z^* h(z^*)} \cdot \int_{z^*}^{+\infty} [1 - g(z)] h(z) dz, \quad (58)$$

where Ω^+ is defined in (57).

This is the same corrected Mirrlees condition as Corollary 3 (with $\eta_z = 0$), restricted to income levels at or above the reference-group cutoff. Two features distinguish it from the atmospheric case. First, the aspiration wedge is active only above $z(\tilde{w})$: below the cutoff, reforms do not create substitution effects on reference-group members, and with $\eta_z = 0$ the formula is standard. Second, the factor $1/p$ in the denominator of Ω^+ amplifies the wedge for smaller reference groups, holding the numerator and the within-group aspiration feedback fixed. Whether a more exclusive group (higher $\tilde{w}$, smaller p) ultimately produces a larger Ω^+ depends on how the within-group aspiration feedback $\frac{1}{p} \int_{w \geq \tilde{w}} \frac{\partial z}{\partial a} dF$ changes with the cutoff. In contrast to the atmospheric case, where Ω shifts all marginal rates uniformly, the top-earners specification concentrates the aspiration adjustment at the top of the income distribution. Marginal rates above $z(\tilde{w})$ are adjusted upward when $\Omega^+ > 0$ (the corrective case under envy with motivated top earners) and downward when $\Omega^+ < 0$.

4.5 Group-specific aspirations ($a_\theta = \bar{z}_\theta$).

In this section, I assume the government is constrained to use a common nonlinear tax schedule $T(z, \kappa) = \mathcal{T}(z) + \kappa \rho(z)$ that does not condition on θ . Let the group-specific aspirational threshold be

$$a_\theta = \bar{z}_\theta \equiv \int z(w, \theta) dF_\theta(w), \quad \theta \in \{1, \dots, N\},$$

and assume no cross-group aspiration spillovers, such that

$$\frac{\partial z(w, \theta)}{\partial a_{\theta'}} = 0 \quad \text{for all } \theta' \neq \theta.$$

Write $g(w, \theta) \equiv \gamma(w, \theta)u_c(w, \theta)/\lambda$. Then the behavioral response of type (w, θ) to a small reform is

$$\frac{dz(w, \theta)}{d\kappa} = -\frac{\rho_z(z(w, \theta)) z(w, \theta)}{1 - T_z} \varepsilon_z^c(w, \theta) - \frac{\rho(z(w, \theta))}{1 - T_z} \eta_z(w, \theta) + \frac{da_\theta}{d\kappa} \frac{\partial z(w, \theta)}{\partial a_\theta}. \quad (59)$$

Integrating (59) within each group and using $a_\theta = \bar{z}_\theta$ yields

$$\frac{da_\theta}{d\kappa} = -\frac{\int \left[\frac{\rho_z(z(w, \theta)) z(w, \theta)}{1 - T_z} \varepsilon_z^c(w, \theta) + \frac{\rho(z(w, \theta))}{1 - T_z} \eta_z(w, \theta) \right] dF_\theta(w)}{1 - \int \frac{\partial z(w, \theta)}{\partial a_\theta} dF_\theta(w)}. \quad (60)$$

The denominator is the within-group aspiration multiplier. The derivative is well-defined when the denominator is nonzero, with the local stability condition $|\int \partial z(w, \theta)/\partial a_\theta dF_\theta(w)| < 1$ for each θ .

Define the group-specific aspiration wedge

$$\Omega_\theta \equiv -\frac{\int \left[\frac{\gamma(w, \theta)}{\lambda} \phi_a(w, \theta) + T_z(z(w, \theta)) \frac{\partial z(w, \theta)}{\partial a_\theta} \right] dF_\theta(w)}{1 - \int \frac{\partial z(w, \theta)}{\partial a_\theta} dF_\theta(w)}. \quad (61)$$

This is the social shadow value of a marginal increase in group θ 's reference income, combining the direct welfare externality and the induced fiscal externality, scaled by the within-group aspiration multiplier.

Let $H_\theta(z)$ denote the earnings distribution in group θ induced by the common tax schedule, with density $h_\theta(z)$. For each income level z , let $g_\theta(z)$, $\eta_{z,\theta}(z)$, and $\bar{\varepsilon}_{z,\theta}^c$ denote the conditional averages of $g(w, \theta)$, $\eta_z(w, \theta)$, and $\varepsilon_z^c(w, \theta)$ among group- θ individuals earning z .

Corollary 5 (Optimal Nonlinear Tax Rate with Group-Specific Aspirations). *At an interior optimum, consider the standard perturbation that raises tax liability above income z^* . Then*

$$\frac{T_z^* - \Omega(z^*)}{1 - T_z^*} = \frac{1}{z^* h(z^*) \bar{\varepsilon}_{z^*}^c} \sum_{\theta=1}^N \pi_\theta \int_{z^*}^{\infty} \left[1 - g_\theta(z) - \eta_{z,\theta}(z) \frac{T_z(z) - \Omega_\theta}{1 - T_z(z)} \right] h_\theta(z) dz, \quad (62)$$

where

$$h(z) = \sum_{\theta=1}^N \pi_\theta h_\theta(z), \quad \bar{\varepsilon}_z^c = \frac{\sum_{\theta=1}^N \pi_\theta h_\theta(z) \bar{\varepsilon}_{z,\theta}^c}{h(z)},$$

and

$$\Omega(z) = \frac{\sum_{\theta=1}^N \pi_{\theta} h_{\theta}(z) \bar{\varepsilon}_{z,\theta}^c \Omega_{\theta}}{\sum_{\theta=1}^N \pi_{\theta} h_{\theta}(z) \bar{\varepsilon}_{z,\theta}^c}. \quad (63)$$

The formula has the same Mirrleesian structure as in the one-dimensional case, but the aspiration correction is no longer a single uniform wedge across income levels (as it is the case with $a = \bar{z}$).

Each group θ generates its own aspiration wedge Ω_{θ} , reflecting the direct welfare cost of higher reference income within that group together with the induced fiscal externality from aspiration-driven behavioral responses, both scaled by a within-group aspiration multiplier. The relevant correction $\Omega(z^*)$ is an elasticity-weighted average of the Ω_{θ} 's among the groups represented at that income level. This creates a new composition channel in optimal tax design. Marginal tax rates should be adjusted more strongly at income levels where the tax base is disproportionately composed of groups for which aspirations generate large welfare losses or large fiscal externalities.

In the special case without income effects ($\eta_z(w, \theta) = 0$ for all (w, θ)), (62) simplifies to

$$\frac{T_z^* - \Omega(z^*)}{1 - T_z^*} = \frac{1}{z^* h(z^*) \bar{\varepsilon}_{z^*}^c} \int_{z^*}^{\infty} [1 - g(z)] h(z) dz, \quad (64)$$

where

$$g(z) = \frac{\sum_{\theta=1}^N \pi_{\theta} h_{\theta}(z) g_{\theta}(z)}{h(z)}.$$

Thus, absent income effects, group-specific aspirations modify the standard “ABC” formula only through the local wedge $\Omega(z^*)$. When $N = 1$, the formula collapses to the atmospheric-aspirations case.

5 Empirical Application

While the theoretical framework demonstrates that aspirations can significantly alter the structure of optimal tax schedules, translating these insights into policy recommendations requires empirical evidence on the magnitude and nature of aspiration-driven behavior and preferences.

Most of the empirical literature has focused on the externality effect on well-being. In contrast, I focus my attention on the behavioral response in taxable income to changes in aspirations, i.e. on the elicitation of ε_z^a . As can be seen in the expressions for the optimal marginal tax rates in equations 21 and 48, what matters is the weighted average

response across the income distribution. This requires an empirical approach that yields estimates of ε_z^a (or $\partial z/\partial a$) for individuals across the income distribution. Importantly, and to make progress in the empirical application, I assume that the aspirational threshold corresponds to the average before-tax income $a = \bar{z}$. I plan to relax this assumption in future waves of the survey experiment.

A second measurement caveat concerns the mapping from survey objects to model sufficient statistics and primitives. The model’s reference point a is a realized equilibrium summary of the income distribution, while the experiment and hypothetical scenarios manipulate *perceived* average income and elicits *intended* income over the next 12 months. The estimated response is therefore an elasticity of intended income with respect to perceived average income. Interpreting it as the structural ε_z^a entering the optimal tax formulas requires two assumptions: (i) full pass-through from the equilibrium reference point to perceptions, (ii) translation of intentions into realized taxable income.

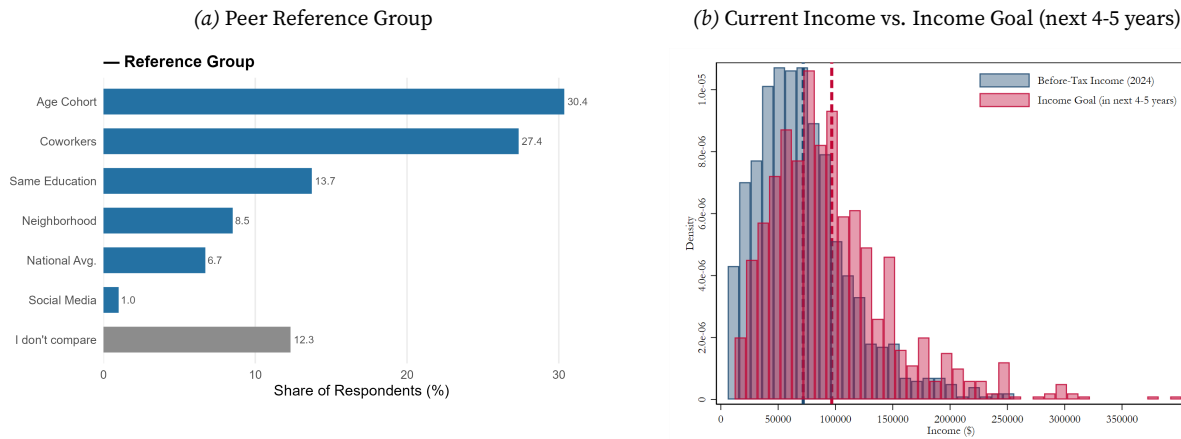


Figure 3. Evidence on the Aspiration Formation Function

Note: The figure in the left panel shows the distribution of survey responses to the question “When you think of your economic and financial goals, and more specifically your desirable income goal, whose situation do you most compare yourself to?”. The figure in the right panel shows the distribution of current before-tax income in 2024 vs. respondents’ income goal in the next 4 to 5 years. The mean 2024 before-tax income in the sample of survey respondents is \$71,868, while the mean income goal (in the next 4-5 years) is \$96,764, corresponding to a 34.6% increase, relative to current income.

I conduct a pre-registered online survey experiment with 1,028 respondents recruited through Prolific Academic to be representative of the US population aged 25-54 on the basis of age, gender, and ethnicity.⁷ The survey design combines two key components. First, an information provision experiment randomly assigns respondents to a treatment

⁷The quotas based on age, gender, and race (ethnicity simplified) were chosen to mirror the distribution of these characteristics in the 2024 annual estimates from the US Census Bureau available here <https://www.census.gov/data/tables/time-series/demo/popest/2020s-national-detail.html>.

group that receives information about the average personal before-tax income among US workers aged 18-65, computed from the Current Population Survey (CPS) 2025 Annual Social and Economic Supplement (ASEC). Second, hypothetical choice scenarios elicit behavioral responses by asking respondents in both control and treatment groups how their intended before-tax income (in the next 12 months) would change if the average income among US workers aged 18-65 were 5, 10, or 20% (randomly assigned) higher than they previously expected. Following best practices for survey design and information provision experiments (Haaland et al., 2023; Stantcheva, 2023), this approach allows me to estimate the elasticity of taxable income with respect to aspirations, both locally with exogenous variation, and more descriptively across the income distribution.

I took several steps to ensure response quality, including screening out respondents based on (i) past studies’ rejection rates, and (ii) the number of hours spent on the platform. As stated in the pre-registration, I also filter out respondents flagged as bots, speedsters, and those failing attention checks. I also exclude respondents providing inconsistent or nonsensical information on income measures or beliefs about average US income. After applying these criteria, the final analysis sample consists of 998 respondents.

I also collected data to inform the shape of the aspiration formation function a , by asking respondents whose reference group do they compare themselves the most when thinking of their economic and financial goals, as well as by asking them for their “desirable income goal”, defined as the income level they would like to achieve in the next 4 to 5 years, and that represents a realistic and meaningful goal for themselves (see Figure 3).

5.1 Information Provision Experiment

Respondents are randomly assigned with equal probability to either a control or treatment condition. Control group participants report their beliefs about average US income but receive no information about the true value. Treatment group participants report their prior beliefs, then receive accurate information from the US Census Bureau that the average personal income for working adults aged 18-65 was \$80,400 in 2024 (see Figure A.1 for the information vignette screen), and subsequently report their posterior beliefs. After that, respondents are asked about their intended personal before-tax income (in the next 12 months). I plot and compare the distribution of respondents’ prior and posterior beliefs in Figure 4.

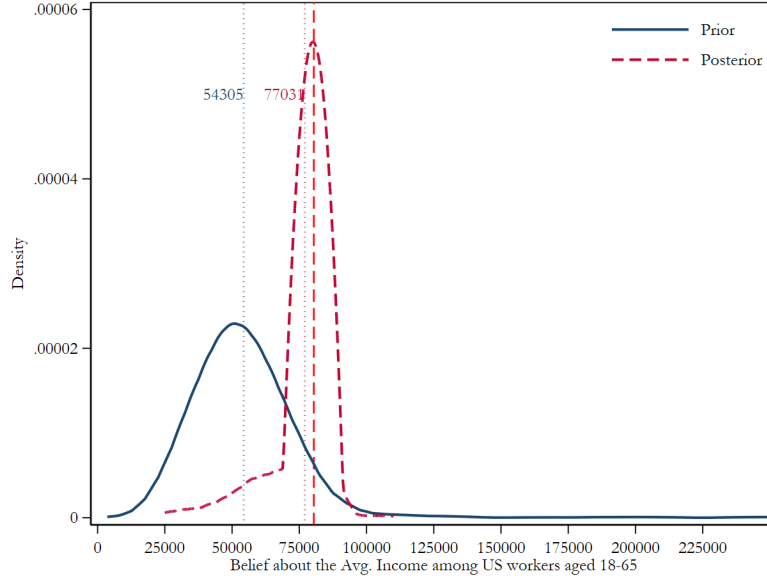


Figure 4. Distribution of Beliefs about the Average Income among US workers (18-65)

Note: This figure compares the distribution of respondents' prior and posterior beliefs about the average (total) personal income among US workers aged 18-65. Prior beliefs (navy) represent initial assessments before any information treatment (i.e., it combines the stated belief for the control group, and the prior belief for the treated group), while posterior beliefs (in dark red) reflect updated beliefs after information provision for the treated group only. The vertical dashed bright red line marks the true average income of US workers aged 18-65 (\$80,400). Dotted vertical lines indicate the mean of each distribution, with values labeled in dollars. Distributions are estimated using kernel density estimation with Epanechnikov kernels and bandwidths of 10,000 (prior) and 5,000 (posterior).

Interestingly, most respondents underestimate the level of the average personal income among US workers aged 18-65. This misperception might be due to a combination of factors including (i) a “center bias” from lower-income earners, where people think they are closer to the center than they actually are (Hvidberg et al., 2023), (ii) systematic underestimation of high incomes, and (iii) a failure to appreciate that the average (mean) income is going to be more influenced by outliers and thus rightly skewed toward higher incomes relative to the median. I use the mean rather than the median because it is more relevant and amenable for optimal tax analysis. This choice also strengthens the first stage of my instrumental variables strategy: by creating larger discrepancies between prior beliefs and true values, the information treatment induces more substantial belief updating. Figure 4 confirms this mechanism, most treatment group respondents revised their beliefs substantially toward the true value of \$80,400.

To identify the causal effect of aspirations on taxable income, I exploit the information provision experiment using an instrumental variables (IV) approach. The second-stage equation relates respondent i 's intended income to their beliefs about average US income:

$$\log(Y_i) = \beta_0 + \beta_1 \widehat{\log(\text{Belief}_i)} + \beta_2 \text{Treat}_i + \beta_3 G_i + \gamma' X_i + \varepsilon_i \quad (65)$$

where Y_i denotes intended before-tax income in the next 12 months, Belief_i represents the respondent's belief about average personal before-tax income among US workers aged 18-65 (which is endogenous) in force when outcomes are reported, $G_i = \log(\text{Prior}_i) - \log(80,400)$ captures the size of the information shock, and X_i includes individual-level controls for education, age, employment status, and 2024 before-tax income (all asked before receiving any information). The first-stage equation models belief formation as:

$$\log(\text{Belief}_i) = \alpha_0 + \alpha_1 Z_i + \alpha_2 \text{Treat}_i + \alpha_3 G_i + \delta' X_i + u_i \quad (66)$$

The instrument $Z_i = \text{Treat}_i \times G_i$ interact (exogenous) random treatment assignment with the size of the information shock—specifically, the difference between the respondent's prior belief and the true average income of \$80,400, which captures the magnitude of the baseline misperception. Identification relies on the fact that random treatment assignment shifts beliefs exogenously without directly affecting intended income, conditional on controls. The estimated coefficient β_1 captures the elasticity of intended income with respect to perceived average income. As a robustness check to minimize experimenter demand bias, I also present specifications that exclude respondents whose income would respond to an unexpected 10% increase in Denmark's average income (a Placebo question).

It is important to note that this estimate represents a local average treatment effect for compliers, i.e., respondents whose beliefs are shifted by the information treatment.

Table 1. IV Estimates: Elasticity of taxable income with respect to the average US income

	Full Sample				Placebo = 0 Sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Log belief avg. US income	-0.036 (0.126)	-0.208 (0.176)	-0.003 (0.031)	0.004 (0.050)	0.003 (0.141)	0.020 (0.223)	0.014 (0.028)	0.048 (0.046)
Additional controls	N	N	Y	Y	N	N	Y	Y
Observations	998	998	998	998	721	721	721	721
First-stage F-stat		.		227.93		.		124.05

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

This table shows estimates from log-log regressions of respondents' intended taxable income over the next 12 months on their belief about average income among US workers aged 18–65 (in effect when outcomes are reported). Columns labeled OLS estimate this relationship directly, while columns labeled IV instrument respondents' beliefs with randomly assigned treatment status interacted with the information shock, defined as log prior belief minus log true average income. All specifications include the main effects of treatment status and the information shock. Specifications with additional controls include log 2024 before-tax income, age, age squared, education level, employment status, and urban versus rural residence. The “Placebo = 0 Sample” consists of respondents who indicated that their income would not respond to an unexpected change in average income among workers in Denmark. Robust standard errors are reported in parentheses.

Table 1 reports the IV coefficient estimates from equation (65). Focusing on columns (6), and (8), I find a positive elasticity of intended taxable income with respect to perceived average US income ranging from 0.02 to 0.048, though none of the estimates are statistically distinguishable from zero. Including individual-level controls in column (8) increases statistical precision, narrowing the standard errors substantially, but the positive point estimates remain small and not statistically significant. These coefficient estimates might suggest that the average income in society is not a great proxy for one's aspirations, at least not a universal one (Figure 3 shows most compare to narrower groups), and motivates the tailored approach I plan to use in future waves of the online survey experiment.

5.2 Hypothetical Choice Survey

After eliciting respondents' beliefs about the average income among US workers aged 18–65, as well as their intended personal before-tax income in the next 12 months, I present respondents with hypothetical scenarios and ask them how they might respond in terms of their own total income if they learn today that the average income in the U.S. for working adults aged 18–65 is some % higher than they expected, using a slider anchored at their intended income (provided in a previous response) with the default option being “Stay the same” (see Figure A.2). The percentage increase is randomly assigned across

respondents to be 5%, 10% or 20%. Importantly, I tell respondents to assume prices and hourly pay stay the same, and that nothing changes for them unless they decide to change it. I also tell respondents twice, first in the setup screen, and at the end of the question (see Figure A.2) that in order to change their actual income, respondents need to adjust their working hours, income sources, or switch jobs or positions.

The slider is initially centered at 0% and lets respondents choose a % response (either positive or negative) for their updated intended income in the next 12 months. This allows me to directly compute an individual-level elasticity of taxable income with respect to changes in the average US income (as the ratio of percentage changes).

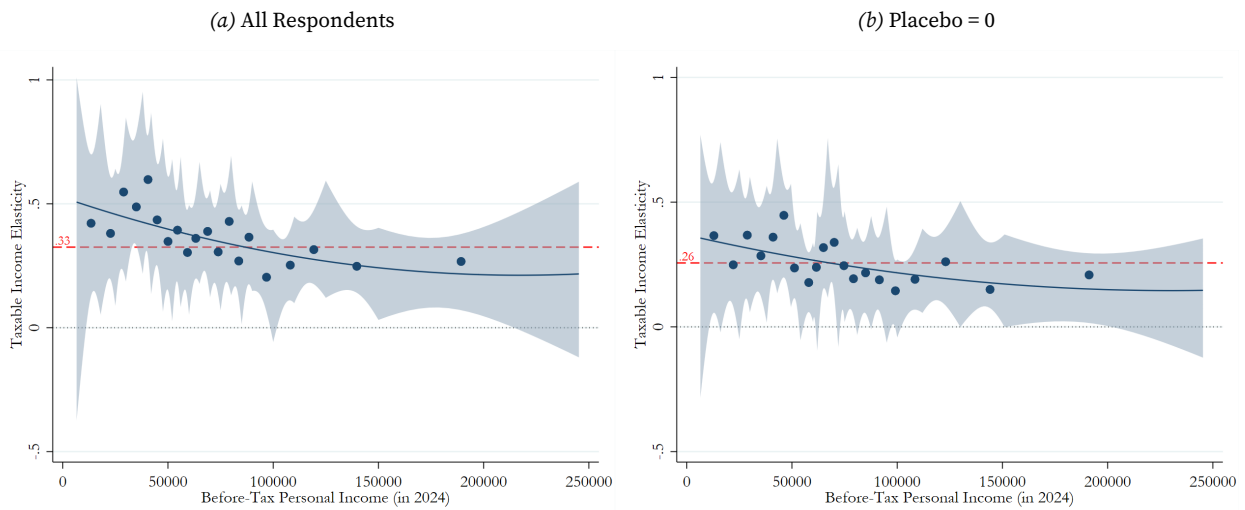


Figure 5. Elasticity of taxable income with respect to the average US income ε_z^a across the income distribution

Note: This figure displays the relationship between taxable income elasticity and 2024 before-tax personal income using binned scatterplots with quadratic polynomial fits. The elasticity is calculated from hypothetical choice scenarios as the percentage change in intended 12-month income divided by the percentage change in average US income (randomized across 5, 10, and 20%). See Figure A.2 for more details. Each panel presents estimates from 20 equal-sized bins with 95% confidence bands. The horizontal dashed red line indicates the sample mean elasticity, weighted by before-tax income. Panel (a) includes all respondents in the analysis sample. Panel (b) exclude respondents whose income would respond to an unexpected 10% increase in Denmark’s average income (a Placebo question). The binscatter estimation follows the methodology of Cattaneo et al. (2024).

Figure 5 shows the distribution of these respondent-level elasticities across the distribution of before-tax personal income (in 2024), using binscatter plots with 20 bins, a quadratic polynomial fit, together with confidence bands (Cattaneo et al., 2024). Figure 5a shows this for all respondents, while Figure 5b restricts the sample to respondents (72% of respondents) whose income would not respond to an unexpected 10% increase in Denmark’s average income. This is my preferred sample because it is less likely to feature experimenter demand bias.

The first striking finding is that the estimated elasticity of taxable income with respect to the average US income is positive throughout the income distribution, with an income-weighted average of 0.26 in the preferred sample. This stands in contrast to theoretical predictions that some lower-income individuals may be in a frustrated region (Genicot and Ray, 2017), where they would either be unaffected by an increase in their socially-determined aspirations (a zero response) or become discouraged (a negative response).

Second, these figures reveal a pronounced negative gradient in ε_z^a across the income distribution, with low-income respondents exhibiting substantially higher responsiveness to changes in average US income (elasticities around 0.35) compared to high-income respondents (elasticities declining toward 0.2). This pattern is consistent with an increasing and concave aspirational utility component, as depicted in Figure 2, but on its own, does not identify the shape of ϕ nor rule out the S-shaped specification in Figure 1 whose observed agents lie on the motivating side. Put differently, I find that US respondents are predominantly motivated by increased aspirations, rather than frustrated, and this holds true across the income distribution.

6 Policy Simulations

6.1 Optimal Linear Tax

To assess the quantitative implications of aspiration-driven behavior for optimal tax policy, I simulate optimal linear tax rates under alternative calibrations of the key sufficient statistics. I focus on the simple society-wide aspirational threshold $a = \bar{z}$. As discussed in Section 3.4, this simplifying assumption means $\varepsilon_a^{1-\tau} = e$. And thus, using Lemma 1, we have

$$e = \frac{\bar{\varepsilon}_{zu}^{1-\tau} - \bar{\eta}}{1 - \frac{\tau}{1-\tau}\bar{\eta} - \bar{\varepsilon}_z^a} \quad (67)$$

where $\bar{\varepsilon}_z^a$ is the object I measure in my survey. Following the formula derived in Section 3.4, the optimal linear tax rate is given by:

$$\tau = \frac{1 - \bar{g} + e \cdot \tilde{A}}{1 - \bar{g} + e}.$$

I calibrate the baseline parameters using estimates from the literature, as summarized in Table 2. For the average welfare weight, I use $\bar{g} = 0.85$ following Hendren (2020) and Piketty and Saez (2013). I first introduce the notation $\bar{\varepsilon}_{zc}^{1-\tau}$ for the aggregate compensated

ETI, and use the aggregate Slutsky approximation $\bar{\varepsilon}_{z_c}^{1-\tau} = \bar{\varepsilon}_{z_u}^{1-\tau} - \bar{\eta}$ which holds exactly when $\text{Cov}(z, \eta) = 0$. I consider two scenarios for the uncompensated elasticity of taxable income and income effects: a low (compensated) ETI scenario with $\bar{\varepsilon}_{z_u}^{1-\tau} = 0.2$ and $\bar{\eta} = 0$ consistent with Saez et al. (2012), and a high (compensated) ETI scenario with $\bar{\varepsilon}_{z_u}^{1-\tau} = 0.3$ and $\bar{\eta} = -0.1$ based on Gruber and Saez (2002) and related studies on income effects (Vivalt et al., 2024; Imbens et al., 2001).

Table 2. Key Parameters for Optimal Linear Tax Simulations

Parameter	Paper	Estimate	Range
<i>Compensated ETI:</i> $\bar{\varepsilon}_{z_c}^{1-\tau}$	Chetty (2012)	0.33	[0.23, 0.61]
	Saez et al. (2012)	0.25	[0.12, 0.40]
	Gruber and Saez (2002)	0.40	[0.17, 0.63]
<i>Uncompensated ETI:</i> $\bar{\varepsilon}_{z_u}^{1-\tau}$	Kleven and Schultz (2014)	0.20	[0.05, 0.30]
<i>Avg. Income Effects:</i> $\bar{\eta}$	Saez et al. (2012)	0	
	Gruber and Saez (2002)	-0.13	[-0.347, 0.08]
	Vivalt et al. (2024)	-0.16	
	Imbens et al. (2001)	-0.11	
<i>Avg. Welfare Weights:</i> $\bar{g}$	Hendren (2020)	0.85	
	Piketty and Saez (2013)	0.87	

Figures 6a and 6b show comparative statics to illustrate how the optimal tax rate varies with the aspiration elasticity $\bar{\varepsilon}_z^a$ for different values of the aggregate direct externality parameter $\tilde{A} \in \{0, 0.1, 0.2\}$. As expected, for the plotted calibrations ($0 \leq \tilde{A} < 1$ and $1 - \bar{g} > 0$), the optimal tax rate decreases with the aspiration elasticity, reflecting the additional behavioral response that must be accounted for when setting marginal tax rates. In the low-ETI scenario, and with $\tilde{A} = 0.1$, moving from $\bar{\varepsilon}_z^a = 0$ to $\bar{\varepsilon}_z^a = 0.25$ reduces the optimal tax rate from 49% to 42%, corresponding to a 13% reduction. (see Figure 6a).

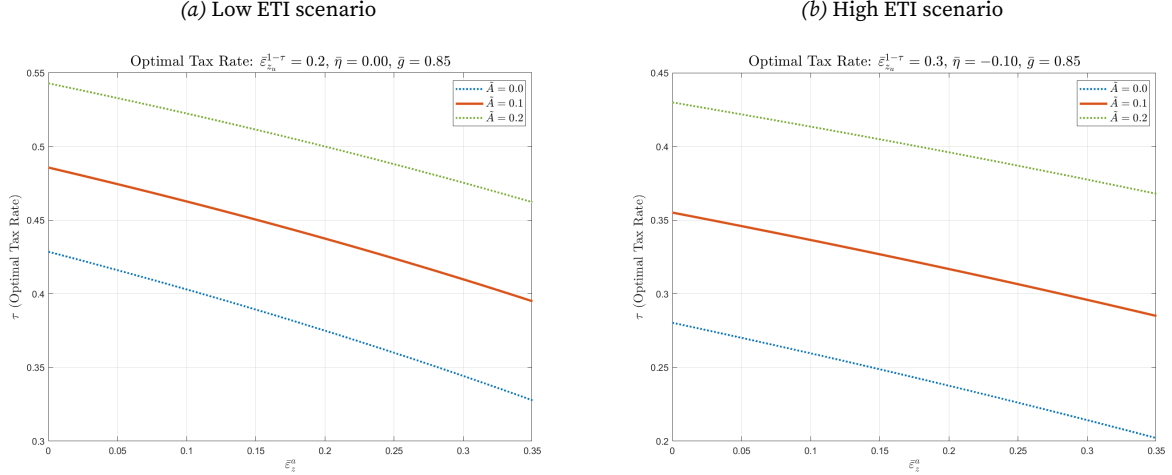


Figure 6. Optimal Linear Tax: Comparative Statics

In the high-ETI scenario, and with $\tilde{A} = 0.1$, moving from $\bar{\varepsilon}_z^a = 0$ to $\bar{\varepsilon}_z^a = 0.25$ reduces the optimal tax rate from 36% to 31%, corresponding to a 14% reduction (see Figure 6b).

7 Conclusion

This paper shows that incorporating endogenous, socially-determined aspirations into optimal tax design fundamentally alters the standard equity-efficiency tradeoff. I derive sufficient statistics formulas for linear and nonlinear income taxation that augment the classic formulas with a new fiscal externality term: the elasticity of taxable income with respect to the aspirational threshold. This elasticity determines whether aspirations motivate or frustrate labor supply, with direct implications for optimal tax rates. Using survey evidence from US respondents and hypothetical choices, I find that aspirations predominantly motivate across the income distribution, with elasticity estimates ranging from 0.35 at low incomes to 0.2 at high incomes. This implies that standard optimal tax formulas may overstate the desirable degree of progressivity.

Two important extensions remain for future versions of this work. First, I plan to conduct numerical simulations for the optimal nonlinear tax schedule. Second, I aim to incorporate upward-looking, and group-specific aspirational thresholds into the empirical analysis since it is likely that the aspiration elasticity will be larger for occupation-specific, age-specific, or education-specific reference incomes. The future survey wave elicits both the reference group, and the sign of the behavioral response $\partial z / \partial a$ conditional on that group.

References

- Aronsson, T. and Johansson-Stenman, O. (2010). Positional concerns in an olg model: optimal labor and capital income taxation. *International Economic Review*, 51(4):1071–1095.
- Aronsson, T. and Johansson-Stenman, O. (2018). Paternalism against veblen: Optimal taxation and non-respected preferences for social comparisons. *American Economic Journal: Economic Policy*, 10(1):39–76.
- Aronsson, T. and Johansson-Stenman, O. (2023). Optimal taxation and other-regarding preferences. Working paper, University of Gothenburg.
- Bernard, T., Dercon, S., Orkin, K., Schinaia, G., and Taffesse, A. S. (2026). The future in mind: Aspirations and long-term outcomes in rural ethiopia. *The Quarterly Journal of Economics*, page qjag002.
- Boskin, M. J. and Sheshinski, E. (1978). Optimal redistributive taxation when individual welfare depends upon relative income. *The Quarterly Journal of Economics*, 92(4):589–601.
- Breza, E., Kaur, S., and Shamdasani, Y. (2018). The morale effects of pay inequality. *The Quarterly Journal of Economics*, 133(2):611–663.
- Card, D., Mas, A., Moretti, E., and Saez, E. (2012). Inequality at work: The effect of peer salaries on job satisfaction. *American Economic Review*, 102(6):2981–3003.
- Cattaneo, M. D., Crump, R. K., Farrell, M. H., and Feng, Y. (2024). On binscatter. *American Economic Review*, 114(5):1488–1514.
- Chetty, R. (2012). Bounds on elasticities with optimization frictions: A synthesis of micro and macro evidence on labor supply. *Econometrica*, 80(3):969–1018.
- Chetty, R., Friedman, J. N., Olsen, T., and Pistaferri, L. (2011). Adjustment costs, firm responses, and micro vs. macro labor supply elasticities: Evidence from danish tax records. *The Quarterly Journal of Economics*, 126(2):749–804.
- Clark, A. E., Frijters, P., and Shields, M. A. (2008). Relative income, happiness, and utility: An explanation for the easterlin paradox and other puzzles. *Journal of Economic Literature*, 46(1):95–144.

- Cullen, Z. and Perez-Truglia, R. (2022). How much does your boss make? the effects of salary comparisons. *Journal of Political Economy*, 130(3):766–822.
- Dalton, P. S., Ghosal, S., and Mani, A. (2016). Poverty and aspirations failure. *The Economic Journal*, 126(590):165–188.
- Diamond, P. A. (1998). Optimal income taxation: an example with a u-shaped pattern of optimal marginal tax rates. *American Economic Review*, pages 83–95.
- Doepke, M. and Zilibotti, F. (2019). Love, money, and parenting: How economics explains the way we raise our kids. In *Love, money, and parenting*. Princeton University Press.
- Dube, A., Giuliano, L., and Leonard, J. (2019). Fairness and frictions: The impact of unequal raises on quit behavior. *American Economic Review*, 109(2):620–663.
- Ferrer-i Carbonell, A. (2005). Income and well-being: an empirical analysis of the comparison income effect. *Journal of Public Economics*, 89(5-6):997–1019.
- Genicot, G. and Ray, D. (2017). Aspirations and inequality. *Econometrica*, 85(2):489–519.
- Genicot, G. and Ray, D. (2020). Aspirations and economic behavior. *Annual Review of Economics*, 12(1):715–746.
- Gerritsen, A. (2024). Optimal nonlinear taxation: a simpler approach. *International Tax and Public Finance*, 31(2):486–510.
- Golosov, M., Hassler, J., Krusell, P., and Tsyvinski, A. (2014). Optimal taxes on fossil fuel in general equilibrium. *Econometrica*, 82(1):41–88.
- Gruber, J. and Saez, E. (2002). The elasticity of taxable income: evidence and implications. *Journal of Public Economics*, 84(1):1–32.
- Haaland, I., Roth, C., and Wohlfart, J. (2023). Designing information provision experiments. *Journal of Economic Literature*, 61(1):3–40.
- Harsanyi, J. C. (1977). Morality and the theory of rational behavior. *Social research*, pages 623–656.
- Hendren, N. (2020). Measuring economic efficiency using inverse-optimum weights. *Journal of Public Economics*, 187:104198.
- Hvidberg, K. B., Kreiner, C. T., and Stantcheva, S. (2023). Social positions and fairness views on inequality. *Review of Economic Studies*, 90(6):3083–3118.

- Imas, A. (2026). What will be scarce? The economics of structural change and the post-commodity future of work. Substack, Ghosts of Electricity. Accessed 23 April 2026.
- Imbens, G. W., Rubin, D. B., and Sacerdote, B. I. (2001). Estimating the effect of unearned income on labor earnings, savings, and consumption: Evidence from a survey of lottery players. *American Economic Review*, 91(4):778–794.
- Jacquet, L. and Lehmann, E. (2021). Optimal income taxation with composition effects. *Journal of the European Economic Association*, 19(2):1299–1341.
- Janzen, S. A., Magnan, N., Sharma, S., and Thompson, W. M. (2017). Aspirations failure and formation in rural nepal. *Journal of Economic Behavior & Organization*, 139:1–25.
- Kanbur, R. and Tuomala, M. (2013). Relativity, inequality, and optimal nonlinear income taxation. *International Economic Review*, 54(4):1199–1217.
- Kaplow, L. (2024). Optimal income taxation. *Journal of Economic Literature*, 62(2):637–738.
- Kaplow, L. and Shavell, S. (2001). Any non-welfarist method of policy assessment violates the pareto principle. *Journal of Political Economy*, 109(2):281–286.
- Kleven, H. (2025). Externalities and the taxation of top earners. *NBER Working Paper n. 33345*.
- Kleven, H. J. and Schultz, E. A. (2014). Estimating taxable income responses using danish tax reforms. *American Economic Journal: Economic Policy*, 6(4):271–301.
- Landersø, R. and Heckman, J. J. (2017). The scandinavian fantasy: The sources of inter-generational mobility in denmark and the us. *The Scandinavian journal of economics*, 119(1):178–230.
- Luttmer, E. F. (2005). Neighbors as negatives: Relative earnings and well-being. *The Quarterly journal of economics*, 120(3):963–1002.
- Lybbert, T. J. and Wydick, B. (2018). Poverty, aspirations, and the economics of hope. *Economic development and cultural change*, 66(4):709–753.
- McKenzie, D., Mohpal, A., and Yang, D. (2022). Aspirations and financial decisions: Experimental evidence from the philippines. *Journal of Development Economics*, 156:102846.
- Orkin, K., Garlick, R., Mahmud, M., Sedlmayr, R., Haushofer, J., and Dercon, S. (2023). Aspiring to a better future: Can a simple psychological intervention reduce poverty? *NBER Working Paper No. 31735*.

- Oswald, A. J. (1983). Altruism, jealousy and the theory of optimal non-linear taxation. *Journal of Public Economics*, 20(1):77–87.
- Perez-Truglia, R. (2020). The effects of income transparency on well-being: Evidence from a natural experiment. *American Economic Review*, 110(4):1019–1054.
- Piketty, T. and Saez, E. (2013). Optimal labor income taxation. In *Handbook of public economics*, volume 5, pages 391–474. Elsevier.
- Ross, P. H. (2019). Occupation aspirations, education investment, and cognitive outcomes: Evidence from indian adolescents. *World development*, 123:104613.
- Saez, E. (2001). Using elasticities to derive optimal income tax rates. *The Review of Economic Studies*, 68(1):205–229.
- Saez, E., Slemrod, J., and Giertz, S. H. (2012). The elasticity of taxable income with respect to marginal tax rates: A critical review. *Journal of Economic Literature*, 50(1):3–50.
- Stantcheva, S. (2023). How to run surveys: A guide to creating your own identifying variation and revealing the invisible. *Annual Review of Economics*, 15(1):205–234.
- Stostad, M. N. and Cowell, F. (2024). Inequality as an externality: consequences for tax design. *Journal of Public Economics*, 235:105139.
- Vivalt, E., Rhodes, E., Bartik, A. W., Broockman, D. E., Krause, P., and Miller, S. (2024). The employment effects of a guaranteed income: Experimental evidence from two us states. Technical report, NBER Working Paper No. 32719.
- Weinzierl, M. (2018). Welfarism’s envy problem extends to popular judgments. In *AEA Papers and Proceedings*, volume 108, pages 28–32. American Economic Association 2014 Broadway, Suite 305, Nashville, TN 37203.

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A Empirical Appendix

A.1 Information Provision Experiment



According to the most recent data from the U.S. Census Bureau and the U.S. Bureau of Labor Statistics, the average **personal income** before taxes for **working adults aged 18-65** in the **United States** in **2024** was:

\$80,400

This includes income from employment (wages, salaries), self-employment, interest and dividends, pension, social security, and other cash income.

Figure A.1. Information Provision Experiment: Vignette on the Average Income among US Workers (18-65)

A.2 Hypothetical Choice



Suppose you learn today that the **average income in the U.S.** for working adults aged 18-65 is **5% higher** than you expected because many workers across the country are putting in more hours.

This corresponds to an **increase of \$4,020**, bringing the national average income to **\$84,420**.

Over the next 12 months, how will you respond in terms of your **own total income**?

Remember that to change your actual income, you need to adjust your working hours, income sources, or switch jobs or positions.

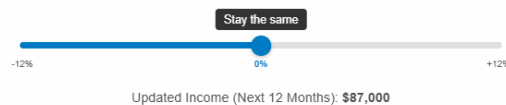


Figure A.2. Online Survey: Screenshot of the Hypothetical Choice Screen

B Proofs of Theoretical Results

B.1 Optimal Linear Income Tax

Proof of Proposition 1. Because we plugged the planner's budget constraint directly into each agent's indirect utility function in equation (11), the planner's maximization problem is a simple unconstrained problem. Taking the total derivative with respect to τ , the planner's first-order condition then writes as:

$$\frac{dW}{d\tau} = \int \gamma(w) \left[\frac{\partial v(w)}{\partial \tau} + \frac{\partial v(w)}{\partial z} \frac{dz(w)}{d\tau} + \frac{\partial v(w)}{\partial \bar{z}} \frac{d\bar{z}}{d\tau} + \frac{\partial v(w)}{\partial a} \frac{da}{d\tau} \right] dF = 0, \quad (68)$$

where $\partial v(w)/\partial z = 0$ for all agents from the individuals' first-order conditions (direct application of the envelope theorem), $\partial v(w)/\partial \tau = (-z(w) + \bar{z}) \cdot u_c(w)$, $\partial v(w)/\partial \bar{z} = \tau u_c(w)$, and $\partial v(w)/\partial a = \phi_a(w)$. Hence, the planner's first-order condition rewrites as:

$$\begin{aligned} \frac{dW}{d\tau} &= \int \gamma(w) \cdot u_c(w) \left[\bar{z} - z(w) - \tau \frac{d\bar{z}}{d(1-\tau)} \right] dF + \int \gamma(w) \frac{da(w)}{d\tau} \phi_a(w) dF \\ &= \underbrace{\int \gamma(w) \cdot u_c(w) (\bar{z} - z(w)) dF}_{\text{Net Redistribution}} + \underbrace{\int -\gamma(w) \cdot u_c(w) \frac{\tau}{1-\tau} \bar{z} e dF}_{\text{Behavioral Response}} + \underbrace{\int \gamma(w) \frac{da(w)}{d\tau} \phi_a(w) dF}_{\text{Aspiration Externality}} = 0, \end{aligned} \quad (69)$$

where $e = \frac{1-\tau}{\bar{z}} \frac{d\bar{z}}{d(1-\tau)}$ is the aggregate elasticity of taxable income with respect to the net-of-tax rate. Next, denoting by $g(w) \equiv \gamma(w)u_c(w) / \int \gamma(w)u_c(w)dF$ the normalized social welfare weight for an agent of type w , rearranging terms yields:

$$\frac{\tau}{1-\tau} \bar{z} e = \bar{z} - \int g(w) z(w) dF + \int \frac{g(w)}{u_c(w)} \frac{da(w)}{d\tau} \phi_a(w) dF, \quad (71)$$

which further simplifies to:

$$\frac{\tau}{1-\tau} = \frac{1}{e} (1 - \bar{g} + \bar{A}), \quad (72)$$

where $\bar{g} \equiv \int g(w) z(w) dF / \bar{z}$, and $\bar{A} = \frac{1}{\bar{z}} \int \frac{g(w)}{u_c(w)} \frac{da(w)}{d\tau} \phi_a(w) dF$. $\square$

Proof of Lemma 1. Integrating the individual response $dz(w)/d(1-\tau)$ over F :

$$\frac{d\bar{z}}{d(1-\tau)} = \int \left[\frac{z(w)}{1-\tau} \varepsilon_{z_u}^{1-\tau}(w) - \frac{\bar{z}}{1-\tau} \eta(w) + \frac{\tau}{1-\tau} \eta(w) \frac{d\bar{z}}{d(1-\tau)} + \frac{z(w)}{1-\tau} \varepsilon_{z,a}^{1-\tau}(w) \right] dF. \quad (73)$$

Collecting the $d\bar{z}/d(1-\tau)$ terms on the left:

$$\frac{d\bar{z}}{d(1-\tau)} \left(1 - \frac{\tau}{1-\tau} \bar{\eta}\right) = \frac{\bar{z}}{1-\tau} [\bar{\varepsilon}_{z,u}^{1-\tau} - \bar{\eta} + \bar{\varepsilon}_{z,a}^{1-\tau}], \quad (74)$$

where $\bar{\varepsilon}_{z,u}^{1-\tau} \equiv \int \frac{z(w)}{\bar{z}} \varepsilon_{z,u}^{1-\tau}(w) dF$, $\bar{\eta} \equiv \int \eta(w) dF$, and $\bar{\varepsilon}_{z,a}^{1-\tau} \equiv \int \frac{z(w)}{\bar{z}} \varepsilon_{z,a}^{1-\tau}(w) dF$. Multiplying both sides by $(1-\tau)/\bar{z}$ and using $e \equiv \frac{1-\tau}{\bar{z}} \frac{d\bar{z}}{d(1-\tau)}$:

$$e = \frac{\bar{\varepsilon}_{z,u}^{1-\tau} - \bar{\eta} + \bar{\varepsilon}_{z,a}^{1-\tau}}{1 - \frac{\tau}{1-\tau} \bar{\eta}}. \quad (75)$$

□

Proof of Corollary 1. Combining the optimal linear tax rate formula from Proposition 1 together with the decomposition of the aggregate elasticity of taxable income from Lemma 1, and rearranging terms yields the desired formula. □

Proof of Corollary 2. From the planner's FOC (14), decompose the behavioral response using $e = e_0 + \bar{\varepsilon}_{z,a}^{1-\tau}/(1 - \frac{\tau}{1-\tau} \bar{\eta})$ from Lemma 1. The aspiration-induced component in the planner's FOC in (71), can be written as

$$\frac{\tau}{1-\tau} \bar{z} \cdot \frac{\bar{\varepsilon}_{z,a}^{1-\tau}}{1 - \frac{\tau}{1-\tau} \bar{\eta}} = \frac{\tau}{1 - \frac{\tau}{1-\tau} \bar{\eta}} \int \frac{\partial z(w)}{\partial a} \frac{da}{d(1-\tau)} dF = -\frac{\tau}{1 - \frac{\tau}{1-\tau} \bar{\eta}} \int \frac{\partial z(w)}{\partial a} \frac{da}{d\tau} dF. \quad (76)$$

Substituting back into the FOC in (71), collecting the standard terms under e_0 , and defining $\bar{B} \equiv \frac{1}{\bar{z}} \frac{\tau}{1 - \frac{\tau}{1-\tau} \bar{\eta}} \int \frac{\partial z(w)}{\partial a} \frac{da}{d\tau} dF$, dividing through by $\bar{z}$, and rearranging gives $\frac{\tau}{1-\tau} = (1 - \bar{g} + \bar{A} + \bar{B})/e_0$. Isolating τ yields the final expression. □

Derivation for top-earners aspirations. Suppose aspirations are given by the average income of the top p fraction:

$$a = \bar{z}^+ \equiv \frac{1}{p} \int_{w \geq \tilde{w}} z(w) dF(w), \quad (77)$$

where $\Pr(w \geq \tilde{w}) = p$. Differentiating (77) with respect to τ gives

$$\frac{da}{d\tau} = \frac{1}{p} \int_{w \geq \tilde{w}} \frac{dz(w)}{d\tau} dF(w). \quad (78)$$

Using (15) and (78) and collecting the $\frac{da}{d\tau}$ terms gives

$$\frac{da}{d\tau} \left[1 - \frac{1}{p} \int_{w \geq \tilde{w}} \frac{\partial z(w)}{\partial a} dF(w)\right] = \frac{1}{p} \int_{w \geq \tilde{w}} \frac{dz(w)}{d\tau} \bigg|_{da=0} dF(w), \quad (79)$$

and therefore

$$\frac{da}{d\tau} = \frac{\frac{1}{p} \int_{w \geq \tilde{w}} \frac{dz(w)}{d\tau} \Big|_{da=0} dF(w)}{1 - \frac{1}{p} \int_{w \geq \tilde{w}} \frac{\partial z(w)}{\partial a} dF(w)}. \quad (80)$$

Assume now that income effects are zero, $\eta(w) = 0$. Then the direct response of earnings to the tax rate, holding aspirations fixed, is

$$\frac{dz(w)}{d\tau} \Big|_{da=0} = -\frac{z(w)}{1-\tau} \varepsilon_{z_u}^{1-\tau}(w). \quad (81)$$

Substituting (81) into (80) gives

$$\frac{da}{d\tau} = -\frac{\frac{1}{p} \int_{w \geq \tilde{w}} \frac{z(w)}{1-\tau} \varepsilon_{z_u}^{1-\tau}(w) dF(w)}{1 - \frac{1}{p} \int_{w \geq \tilde{w}} \frac{\partial z(w)}{\partial a} dF(w)}. \quad (82)$$

Now define

$$\bar{\varepsilon}_{z_u}^{+, 1-\tau} \equiv \frac{1}{p\bar{z}^+} \int_{w \geq \tilde{w}} z(w) \varepsilon_{z_u}^{1-\tau}(w) dF(w). \quad (83)$$

Using $a = \bar{z}^+$ and the definition $\varepsilon_a^{1-\tau} \equiv \frac{1-\tau}{a} \frac{da}{d(1-\tau)} = -\frac{1-\tau}{a} \frac{da}{d\tau}$, equation (82) implies

$$\varepsilon_a^{1-\tau} = \frac{\bar{\varepsilon}_{z_u}^{+, 1-\tau}}{1 - \frac{1}{p} \int_{w \geq \tilde{w}} \frac{\partial z(w)}{\partial a} dF(w)}. \quad (84)$$

Next, using the definition of $\bar{A}$ from Proposition 1, $\bar{A} = \frac{1}{\bar{z}} \int \frac{g(w)}{u_c(w)} \frac{da}{d\tau} \phi_a(w) dF(w)$. If $\tilde{A} \equiv -\int \frac{g(w)}{u_c(w)} \phi_a(w) dF(w)$, then substituting $\frac{da}{d\tau} = -\frac{a}{1-\tau} \varepsilon_a^{1-\tau}$ and $a = \bar{z}^+$ yields

$$\bar{A} = \frac{\bar{z}^+}{\bar{z}} \frac{\varepsilon_a^{1-\tau}}{1-\tau} \tilde{A}. \quad (85)$$

Using $\varepsilon_{z,a}^{1-\tau}(w) = \varepsilon_a^{1-\tau} \varepsilon_z^a(w)$,

$$\bar{\varepsilon}_{z,a}^{1-\tau} = \int \frac{z(w)}{\bar{z}} \varepsilon_{z,a}^{1-\tau}(w) dF(w) = \varepsilon_a^{1-\tau} \int \frac{z(w)}{\bar{z}} \varepsilon_z^a(w) dF(w) \equiv \varepsilon_a^{1-\tau} \bar{\varepsilon}_z^a. \quad (86)$$

Finally, with no income effects, Corollary 1 implies

$$\tau = \frac{1 - \bar{g} + \bar{A}}{1 - \bar{g} + \bar{A} + \bar{\varepsilon}_{z_u}^{1-\tau} + \varepsilon_a^{1-\tau} \bar{\varepsilon}_z^a}, \quad (87)$$

which is exactly (27). $\square$

Proof of Optimal Linear Tax Rate Formula with Group-Specific Aspirations. By the envelope theorem, the derivative of indirect utility for agent (w, θ) with respect to τ is:

$$\frac{dv(w, \theta)}{d\tau} = u_c(w, \theta) \left[\bar{z} - z(w, \theta) + \tau \frac{d\bar{z}}{d\tau} \right] + \phi_a(w, \theta) \frac{d\bar{z}_\theta}{d\tau},$$

where we used $dT/d\tau = \bar{z} + \tau \frac{d\bar{z}}{d\tau}$ from budget balance.

With $\gamma(w, \theta) \equiv G'(v(w, \theta))$, the derivative of social welfare is:

$$\frac{dW}{d\tau} = \sum_{\theta} \pi_{\theta} \int \gamma(w, \theta) \frac{dv(w, \theta)}{d\tau} dF_{\theta}(w).$$

Define $\Lambda \equiv \sum_{\theta} \pi_{\theta} \int \gamma(w, \theta) u_c(w, \theta) dF_{\theta}$, normalized welfare weights $g(w, \theta) \equiv \gamma(w, \theta) u_c(w, \theta) / \Lambda$, and $\bar{g} \equiv \frac{1}{\bar{z}} \sum_{\theta} \pi_{\theta} \int g(w, \theta) z(w, \theta) dF_{\theta}$.

Substituting and collecting terms:

$$\frac{dW}{d\tau} = \Lambda \bar{z} (1 - \bar{g}) + \Lambda \tau \frac{d\bar{z}}{d\tau} + \sum_{\theta} \pi_{\theta} \frac{d\bar{z}_{\theta}}{d\tau} \int \gamma(w, \theta) \phi_a(w, \theta) dF_{\theta}.$$

For the externality term, note that $\gamma(w, \theta) = \Lambda g(w, \theta) / u_c(w, \theta)$, so:

$$\int \gamma(w, \theta) \phi_a(w, \theta) dF_{\theta} = \Lambda \int \frac{g(w, \theta)}{u_c(w, \theta)} \phi_a(w, \theta) dF_{\theta} = -\Lambda \tilde{A}_{\theta},$$

where $\tilde{A}_{\theta} \equiv - \int \frac{g(w, \theta)}{u_c(w, \theta)} \phi_a(w, \theta) dF_{\theta}$.

Define group-specific aggregate elasticities $e_{\theta} \equiv \frac{1-\tau}{\bar{z}_{\theta}} \frac{d\bar{z}_{\theta}}{d(1-\tau)}$, so that $\frac{d\bar{z}_{\theta}}{d\tau} = -\frac{e_{\theta} \bar{z}_{\theta}}{1-\tau}$. Similarly, $\frac{d\bar{z}}{d\tau} = -\frac{e \bar{z}}{1-\tau}$ where $e = \sum_{\theta} s_{\theta} e_{\theta}$ and $s_{\theta} \equiv \pi_{\theta} \bar{z}_{\theta} / \bar{z}$.

Substituting:

$$\frac{dW}{d\tau} = \Lambda \bar{z} (1 - \bar{g}) - \frac{\Lambda \tau e \bar{z}}{1 - \tau} + \sum_{\theta} \pi_{\theta} \frac{e_{\theta} \bar{z}_{\theta}}{1 - \tau} \Lambda \tilde{A}_{\theta}.$$

Setting $\frac{dW}{d\tau} = 0$, dividing by $\Lambda\bar{z}$, and multiplying by $(1 - \tau)$:

$$(1 - \tau)(1 - \bar{g}) - \tau e + \sum_{\theta} s_{\theta} e_{\theta} \tilde{A}_{\theta} = 0.$$

Rearranging:

$$(1 - \bar{g}) + \sum_{\theta} s_{\theta} e_{\theta} \tilde{A}_{\theta} = \tau(1 - \bar{g} + e).$$

Solving for τ :

$$\tau^* = \frac{1 - \bar{g} + \sum_{\theta} s_{\theta} e_{\theta} \tilde{A}_{\theta}}{1 - \bar{g} + \sum_{\theta} s_{\theta} e_{\theta}}.$$

□

B.2 Optimal Nonlinear Income Tax

Proof of Lemma 2. Consider the reform function $\rho()$ where we increase the tax liability by 1 for all individuals but leave the marginal tax unchanged, such that $\rho(z(w)) = 1$, and $\rho_z(z(w)) = 0$ for all $z(w)$. This reform shuts down the standard substitution term: it affects behavior through income effects and the induced shift in aspirations. Plugging these values into equation (45) and setting it equal to zero to characterize the optimum writes as:

$$0 = \int \left[1 - \frac{\gamma(w)}{\lambda} u_c - \frac{T_z}{1 - T_z} \eta_z(w) \right] dF(w) + \int \frac{da}{d\kappa} \left[\frac{\gamma(w)}{\lambda} \phi_a + T_z \frac{\partial z(w)}{\partial a} \right] dF(w). \quad (88)$$

Using the notation for $\frac{\gamma(w)}{\lambda} u_c + \frac{T_z}{1 - T_z} \eta_z(w)$, together with $\int dF(w) = 1$, and rearranging terms yields the desired result. □

Proof of Proposition 2. Consider a small reform which increases the tax liability for those above a certain income level. This will mechanically change the marginal income tax for individuals within a small income band:

- $\rho(z(w)) = 0$ for individuals with $z(w) < z^*$;
- $\rho(z(w)) = 1 > 0$ (a fixed increment) for $z(w) > z^* + \delta z$;
- $\rho(z(w)) = \frac{z(w) - z^*}{\delta z}$ for those with $z^* \leq z(w) \leq z^* + \delta z$, so that $\rho_z(z(w)) = \frac{1}{\delta z} > 0$ within this small income band.

In other words, individuals with incomes below z^* face no change in tax liability, those well above $z^* + \delta z$ face a full shift of 1, and only those in the small interval $[z^*, z^* + \delta z]$ face a strictly positive marginal tax rate increase.

To characterize the optimum using this second reform, we again set the net welfare effect of the reform to zero using equation (45)

$$\begin{aligned}
0 = & \int_{z(w) \geq z^* + \delta z} \left[1 - \frac{\gamma(w)}{\lambda} u_c - \frac{T_z}{1 - T_z} \eta_z(w) \right] dF(w) \\
& + \int_{z^* \leq z(w) \leq z^* + \delta z} \left[1 - \frac{\gamma(w)}{\lambda} u_c - \frac{T_z}{1 - T_z} \eta_z(w) \right] \rho(z(w)) dF(w) \\
& - \frac{1}{\delta z} \int_{z^* \leq z(w) \leq z^* + \delta z} \frac{T_z}{1 - T_z} z(w) \varepsilon_z^c(w) dF(w) \\
& + \int \frac{da}{d\kappa} \left[\frac{\gamma(w)}{\lambda} \phi_a + T_z \frac{\partial z(w)}{\partial a} \right] dF(w).
\end{aligned} \tag{89}$$

The second term is of order δz and vanishes as $\delta z \rightarrow 0$. Denote $\bar{\varepsilon}_{z^*}^c$ the local average compensated elasticity at income level z^* :

$$\bar{\varepsilon}_{z^*}^c \equiv \lim_{\delta z \rightarrow 0} \frac{\int_{z^* \leq z(w) \leq z^* + \delta z} \varepsilon_z^c(w) dF(w)}{H(z^* + \delta z) - H(z^*)}, \tag{90}$$

together with the common notation for the average social marginal value of private resources of individuals who earn more than z^* :

$$\bar{\alpha}_{z(w) > z^*} \equiv \frac{\int_{z(w) > z^*} \alpha(w) dF(w)}{1 - H(z^*)}. \tag{91}$$

Taking the limit as $\delta z \rightarrow 0$, using the definition of $h(z^*)$, then yields:

$$\begin{aligned}
\frac{T_z^*}{1 - T_z^*} z^* h(z^*) \bar{\varepsilon}_{z^*}^c = & (1 - H(z^*)) \cdot (1 - \bar{\alpha}_{z(w) > z^*}) \\
& + \int \frac{da}{d\kappa} \left[\frac{\gamma(w)}{\lambda} \phi_a + T_z \frac{\partial z(w)}{\partial a} \right] dF(w).
\end{aligned} \tag{92}$$

Rearranging terms yields:

$$\begin{aligned}
\frac{T_z^*}{1 - T_z^*} = & \frac{1}{\bar{\varepsilon}_{z^*}^c} \frac{(1 - H(z^*)) \cdot (1 - \bar{\alpha}_{z(w) > z^*}) + \int \frac{da}{d\kappa} \left[\frac{\gamma(w)}{\lambda} \phi_a + T_z \frac{\partial z(w)}{\partial a} \right] dF(w)}{z^* h(z^*)} \\
= & \frac{1}{\bar{\varepsilon}_{z^*}^c} \frac{(1 - H(z^*)) \cdot (1 - \bar{\alpha}_{z(w) > z^*}) + \bar{A} + \bar{B}}{z^* h(z^*)}
\end{aligned} \tag{93}$$

where $\bar{A} \equiv \int \frac{\gamma}{\lambda} \frac{da}{d\kappa} \phi_a dF(w)$ and $\bar{B} \equiv \int T_z \frac{da}{d\kappa} \frac{\partial z(w)}{\partial a} dF(w)$. □

Proof of equations (56)–(58) (Top-earners nonlinear case). With $a = \bar{z}^+ = \frac{1}{p} \int_{w \geq \tilde{w}} z(w) dF(w)$, differentiating with respect to the reform parameter κ :

$$\frac{da}{d\kappa} = \frac{1}{p} \int_{w \geq \tilde{w}} \frac{dz(w)}{d\kappa} dF(w).$$

Substituting the behavioral decomposition (42) and collecting the $da/d\kappa$ terms:

$$\frac{da}{d\kappa} \left(1 - \frac{1}{p} \int_{w \geq \tilde{w}} \frac{\partial z(w)}{\partial a} dF(w) \right) = -\frac{1}{p} \int_{w \geq \tilde{w}} \left[\frac{\rho_z(z(w)) z(w)}{1 - T_z} \varepsilon_z^c(w) + \frac{\rho(z(w))}{1 - T_z} \eta_z(w) \right] dF(w),$$

which yields (56). For the standard perturbation that raises tax liability above z^* : if $z^* < z(\tilde{w})$, then for sufficiently small δz , $\rho_z(z(w)) = 0$ for all $w \geq \tilde{w}$ because the substitution band $[z^*, z^* + \delta z]$ lies below the reference group. However, all reference-group members have $z(w) \geq z(\tilde{w}) > z^*$, so $\rho(z(w)) = 1$ and income effects are nonzero in general. When $\eta_z = 0$, both terms vanish and $da/d\kappa = 0$. With income effects, $da/d\kappa$ can be nonzero even for $z^* < z(\tilde{w})$.

Now assume $\eta_z = 0$ and $z^* \geq z(\tilde{w})$. Monotonicity of $z(w)$ ensures $\{z(w) \geq z^*\} \subseteq \{w \geq \tilde{w}\}$, so the reform's substitution effects (at z^*) fall on reference-group members. Equation (56) then becomes

$$\frac{da}{d\kappa} = -\frac{\frac{1}{p} \int_{z^* \leq z(w) \leq z^* + \delta z} \frac{\rho_z(z(w)) z(w)}{1 - T_z} \varepsilon_z^c(w) dF(w)}{1 - \frac{1}{p} \int_{w \geq \tilde{w}} \frac{\partial z(w)}{\partial a} dF(w)}.$$

Substituting this expression into the planner's FOC (45) yields

$$\begin{aligned} 0 = & \int_{z(w) \geq z^* + \delta z} \left[1 - \frac{\gamma(w)}{\lambda} u_c \right] dF(w) + \int_{z^* \leq z(w) \leq z^* + \delta z} \left[1 - \frac{\gamma(w)}{\lambda} u_c \right] \rho(z(w)) dF(w) \\ & - \int_{z^* \leq z(w) \leq z^* + \delta z} \frac{T_z - \Omega^+}{1 - T_z} \rho_z(z(w)) \cdot z(w) \varepsilon_z^c(w) dF(w), \end{aligned}$$

where Ω^+ is defined in (57). The middle term is of order δz and vanishes as $\delta z \rightarrow 0$, which yields (58). □

Proof of Corollary 5. Assume at the interior optimum, that each group earnings distribution H_θ admits a density h_θ continuous at z^* , that $z \mapsto h_\theta(z) \bar{\varepsilon}_{z,\theta}^c$ is continuous at z^* .

For an arbitrary small reform κ in the direction of $\rho(z)$, the planner's FOC is

$$\begin{aligned} 0 = & \sum_{\theta=1}^N \pi_{\theta} \int \left[1 - g(w, \theta) - \frac{T_z}{1 - T_z} \eta_z(w, \theta) \right] \rho(z(w, \theta)) dF_{\theta}(w) \\ & - \sum_{\theta=1}^N \pi_{\theta} \int \frac{T_z}{1 - T_z} \rho_z(z(w, \theta)) z(w, \theta) \varepsilon_z^c(w, \theta) dF_{\theta}(w) \\ & + \sum_{\theta=1}^N \pi_{\theta} \frac{da_{\theta}}{d\kappa} \int \left[\frac{\gamma(w, \theta)}{\lambda} \phi_a(w, \theta) + T_z \frac{\partial z(w, \theta)}{\partial a_{\theta}} \right] dF_{\theta}(w). \end{aligned}$$

By (60) and (61),

$$\frac{da_{\theta}}{d\kappa} \int \left[\frac{\gamma(w, \theta)}{\lambda} \phi_a(w, \theta) + T_z \frac{\partial z(w, \theta)}{\partial a_{\theta}} \right] dF_{\theta}(w) = \Omega_{\theta} \int \left[\frac{\rho_z z}{1 - T_z} \varepsilon_z^c + \frac{\rho(z(w, \theta))}{1 - T_z} \eta_z \right] dF_{\theta}.$$

Substituting this identity into the planner FOC and collecting terms group by group yields

$$\begin{aligned} 0 = & \sum_{\theta=1}^N \pi_{\theta} \int \left[1 - g(w, \theta) - \eta_z(w, \theta) \frac{T_z - \Omega_{\theta}}{1 - T_z} \right] \rho(z(w, \theta)) dF_{\theta}(w) \\ & - \sum_{\theta=1}^N \pi_{\theta} \int \frac{T_z - \Omega_{\theta}}{1 - T_z} \rho_z(z(w, \theta)) z(w, \theta) \varepsilon_z^c(w, \theta) dF_{\theta}(w). \end{aligned}$$

Now take the standard perturbation around z^* :

$$\rho(z) = 0 \text{ for } z < z^*, \quad \rho(z) = \frac{z - z^*}{\delta z} \text{ for } z \in [z^*, z^* + \delta z], \quad \rho(z) = 1 \text{ for } z > z^* + \delta z,$$

so that $\rho_z(z) = 1/\delta z$ on $[z^*, z^* + \delta z]$ and 0 elsewhere.

As δz goes to zero,

$$\int \left[1 - g(w, \theta) - \eta_z(w, \theta) \frac{T_z - \Omega_{\theta}}{1 - T_z} \right] \rho(z(w, \theta)) dF_{\theta}(w) \longrightarrow \int_{z^*}^{\infty} (1 - g_{\theta}(z) - \eta_{z,\theta}(z) \frac{T_z(z) - \Omega_{\theta}}{1 - T_z(z)}) h_{\theta}(z) dz.$$

For the second term, using the definition of the conditional average elasticity $\bar{\varepsilon}_{z,\theta}^c$,

$$\begin{aligned} & \int \frac{T_z - \Omega_{\theta}}{1 - T_z} \rho_z(z(w, \theta)) z(w, \theta) \varepsilon_z^c(w, \theta) dF_{\theta}(w) \\ & = \int_{z^*}^{z^* + \delta z} \frac{T_z(z) - \Omega_{\theta}}{1 - T_z(z)} \frac{1}{\delta z} z \bar{\varepsilon}_{z,\theta}^c h_{\theta}(z) dz \longrightarrow \frac{T_z^* - \Omega_{\theta}}{1 - T_z^*} z^* h_{\theta}(z^*) \bar{\varepsilon}_{z^*,\theta}^c. \end{aligned}$$

Hence, letting $\delta z \rightarrow 0$,

$$\sum_{\theta=1}^N \pi_{\theta} \frac{T_z^* - \Omega_{\theta}}{1 - T_z^*} z^* h_{\theta}(z^*) \bar{\varepsilon}_{z^*, \theta}^c = \sum_{\theta=1}^N \pi_{\theta} \int_{z^*}^{\infty} (1 - g_{\theta}(z) - \eta_{z, \theta}(z) \frac{T_z(z) - \Omega_{\theta}}{1 - T_z(z)}) h_{\theta}(z) dz.$$

Using

$$h(z^*) \bar{\varepsilon}_{z^*}^c = \sum_{\theta=1}^N \pi_{\theta} h_{\theta}(z^*) \bar{\varepsilon}_{z^*, \theta}^c$$

and

$$\Omega(z^*) = \frac{\sum_{\theta=1}^N \pi_{\theta} h_{\theta}(z^*) \bar{\varepsilon}_{z^*, \theta}^c \Omega_{\theta}}{\sum_{\theta=1}^N \pi_{\theta} h_{\theta}(z^*) \bar{\varepsilon}_{z^*, \theta}^c},$$

the left-hand side becomes

$$z^* h(z^*) \bar{\varepsilon}_{z^*}^c \frac{T_z^* - \Omega(z^*)}{1 - T_z^*}.$$

Rearranging gives

$$\frac{T_z^* - \Omega(z^*)}{1 - T_z^*} = \frac{1}{z^* h(z^*) \bar{\varepsilon}_{z^*}^c} \sum_{\theta=1}^N \pi_{\theta} \int_{z^*}^{\infty} \left[1 - g_{\theta}(z) - \eta_{z, \theta}(z) \frac{T_z(z) - \Omega_{\theta}}{1 - T_z(z)} \right] h_{\theta}(z) dz,$$

which is exactly (62). □

C Vertical Pay Transparency as a Policy Tool

There are two simple ways to augment the model with vertical pay transparency policies. First, we can model pay transparency as a multiplicative scalar $\alpha \in [0, 1]$ which increases the salience of relative income concerns in individual utility. Second, we can think of pay transparency policies as correcting misperceptions about the true aspirational threshold a . The actual effect of vertical pay transparency is likely a combination of these two, and will depend on the share of agents for whom social comparisons aren't salient, as well as the share of agents with pre-existing misperceptions. Evidence from Norway's move to searchable tax records online is consistent with the salience channel. Income transparency widened the gap in subjective well-being between rich and poor (Perez-Truglia, 2020).

C.1 When Pay Transparency Increases the Salience of Aspirational Concerns

I start by considering the first case. Fix the tax rate τ and ask when it is desirable to increase the salience of aspirations, denoted by α . The individual maximization problem now rewrites as:

$$\max_{z \geq 0} \left\{ u((1 - \tau)z + T(\alpha), z; w) + \alpha \phi(z, a(\alpha)) \right\}, \quad (94)$$

where the notation makes it clear that for a given linear tax rate τ , the lump-sum transfer $T(\alpha) = \tau \bar{z}(\tau, \alpha)$ and the aspirational threshold $a(\alpha)$ will depend on the level of pay transparency α via behavioral responses in taxable income. For simplicity, we consider the case where the aspirational reference is the average taxable income in society $a = \bar{z}$.

Once again, consider a utilitarian social planner which maximizes a weighted sum of indirect utilities subject to the government budget constraint, and individual maximization. For a fixed τ , it is desirable to increase α if and only if $dW(\tau, \alpha)/d\alpha > 0$. Using the envelope theorem, we obtain

$$\frac{dW}{d\alpha} = \underbrace{\int \gamma(w) u_c(w) \cdot \tau \frac{d\bar{z}}{d\alpha} dF(w)}_{\text{Fiscal Externality}} + \underbrace{\int \gamma(w) \phi(z(w), \bar{z}) dF(w)}_{\text{Direct Welfare Effect}} + \underbrace{\int \gamma(w) \cdot \alpha \phi_a(w) \frac{d\bar{z}}{d\alpha} dF(w)}_{\text{Indirect Welfare Effect}} \quad (95)$$

Expression (95) reveals three distinct channels:

1. A *fiscal externality* or *resource channel*, capturing how transparency-induced behav-

ioral responses (coming from the increased salience of the aspirational utility component) change average tax revenue and hence the lump-sum transfer. This is a revenue gain when $d\bar{z}/d\alpha > 0$.

2. A *direct welfare effect* via the aspiration utility channel, reflecting how individuals (weighted by γ) value the aspiration component when it becomes more salient at the current tax rate and aspirational threshold a . This might be a gain or loss depending on whether individuals with larger welfare weights derive positive or negative utility from relative income comparisons. This is likely to be negative for individuals with $z(w) < \bar{z}$, and hence negative on average (when weighted by welfare weights).
3. An *indirect welfare effect* from the transparency-induced behavioral responses, reflecting how transparency reshapes the reference point $a = \bar{z}$ and thereby alters the welfare cost of relative income comparisons. If $\phi_a < 0$ (the envy case maintained in this appendix) and $d\bar{z}/d\alpha > 0$, this effect is negative.

In the case $a = \bar{z}$, the sign of $\frac{da}{d\alpha} = \frac{d\bar{z}}{d\alpha}$ is determined by how individuals' taxable incomes respond on average, to a more salient aspiration component. Differentiating the individual first order condition with respect to α yields

$$\mathcal{Y}_\alpha = \phi_z + [(1 - \tau)u_{cc} + u_{cz}] \frac{dT}{d\alpha} + \alpha \phi_{za} \frac{da}{d\alpha}, \quad (96)$$

With $dz/d\alpha = -\mathcal{Y}_\alpha/\mathcal{Y}_z$, $T = \tau\bar{z}$, and $a = \bar{z}$, aggregating across agents yields:

$$\frac{d\bar{z}}{d\alpha} = \frac{-\int \frac{\phi_z}{\mathcal{Y}_z} dF(w)}{1 + \int \frac{\tau[(1-\tau)u_{cc} + u_{cz}] + \alpha\phi_{za}}{\mathcal{Y}_z} dF(w)}, \quad (97)$$

where $\mathcal{Y}_z = (1 - \tau)^2 u_{cc} + 2(1 - \tau)u_{cz} + u_{zz} + \alpha\phi_{zz} < 0$. This expression shows how the aggregate behavioral response will typically be positive since $\phi_z > 0$, and features a multiplier effect. The aggregate behavioral response $d\bar{z}/d\alpha$ is amplified if, on average, aspirations motivate ($\phi_{za} > 0$). The response is dampened if aspirations frustrate ($\phi_{za} < 0$). This multiplier effect is lower for lower initial values of α .

It will thus be desirable to increase the salience of aspirations (via vertical pay transparency policies) if and only if:

$$\underbrace{\int \gamma(w) u_c(w) \cdot \tau \frac{d\bar{z}}{d\alpha} dF(w)}_{\text{Revenue Gain}} > \underbrace{\int \gamma(w) \left[\phi(z(w), \bar{z}) + \alpha \phi_a(w) \frac{d\bar{z}}{d\alpha} \right] dF(w)}_{\text{Total Aggregate Utility Costs}}. \quad (98)$$

C.2 When Pay Transparency Corrects Misperceptions

An alternative way to model pay transparency is as a correction of existing misperceptions about the aspirational threshold. For example, one might aspire to earn what their manager earns, but does not know exactly what this value is and may underestimate it. Let $a(w, 1)$ denote the *true* aspirational reference point for type w under full transparency, and let $\tilde{a}(w, \alpha)$ denote the *perceived* aspirational threshold when transparency is $\alpha \in [0, 1]$, with

$$\tilde{a}(w, 1) = a(w, 1),$$

and $\tilde{a}(w, \alpha)$ converging monotonically towards $a(w, 1)$ as α increases. Here we explicitly allow aspirational thresholds to depend on an agent's type. In contrast to the case in the previous subsection, α now affects utility only by changing perceived aspirational thresholds, not by scaling the weight on the aspiration utility component.

For a fixed tax rate τ , the individual problem is

$$\max_{z \geq 0} \left\{ u((1 - \tau)z + T(\alpha), z; w) + \phi(z, \tilde{a}(w, \alpha)) \right\}, \quad (99)$$

where $T(\alpha) = \tau \bar{z}(\tau, \alpha)$ adjusts with α through behavioral responses in taxable income. The optimal choice of taxable income $z(w; \tau, \alpha)$ will depend on an agent's type, on the linear tax rate, and on the level of pay transparency.

Solving for individual maximization, applying the envelope theorem, and aggregating across types with weights $\gamma(w)$ yields the following welfare impact of marginally increasing pay transparency:

$$\frac{dW}{d\alpha} = \underbrace{\int \gamma(w) u_c(w) dF(w) \tau \frac{d\bar{z}}{d\alpha}}_{\text{Fiscal Externality}} + \underbrace{\int \gamma(w) \phi_a(w) \frac{d\tilde{a}(w, \alpha)}{d\alpha} dF(w)}_{\text{Indirect Welfare Effect}}. \quad (100)$$

Relative to (95), there is no separate “direct” aspiration utility term here: transparency enters only through the lump-sum transfer $T(\alpha) = \tau \bar{z}(\alpha, \tau)$ and the perceived reference point $\tilde{a}(w, \alpha)$.

The fiscal externality term captures how transparency-induced behavioral responses (stemming from corrected misperceptions) change average tax revenue and hence the lump-sum transfer. Note that we can write the aggregate behavioral response as

$$\frac{d\bar{z}}{d\alpha} = \frac{- \int \frac{\phi_{za}}{\mathcal{Y}_z} \frac{d\tilde{a}(w, \alpha)}{d\alpha} dF(w)}{1 + \int \frac{\tau \cdot [(1 - \tau)u_{cc} + u_{cz}]}{\mathcal{Y}_z} dF(w)}, \quad (101)$$

where $\mathcal{Y}_z = (1 - \tau)^2 u_{cc} + 2(1 - \tau) u_{cz} + u_{zz} + \phi_{zz} < 0$.

The indirect welfare effect captures how aligning perceived aspirations $\tilde{a}(w, \alpha)$ closer to their true level $a(w, 1)$ affects the utility from relative income concerns. With an envious externality ($\phi_a < 0$), the sign of this term is governed by the sign of $d\tilde{a}(w, \alpha)/d\alpha$ (which also determines the sign of $d\bar{z}/d\alpha$, together with ϕ_{za} when aggregated up).

For types who *underestimate* the aspirational threshold (i.e. $\tilde{a}(w, \alpha) < a(w, 1)$), increasing transparency raises their perceived benchmark, so $d\tilde{a}(w, \alpha)/d\alpha > 0$. With $\phi_a < 0$, this lowers their utility: correcting underestimation is welfare-costly for them. This will also induce them to supply more (less) labor if they are motivated (frustrated) by higher aspirations.

For types who *overestimate* the aspirational threshold (i.e. $\tilde{a}(w, \alpha) > a(w, 1)$), transparency lowers their perceived benchmark, so $d\tilde{a}(w, \alpha)/d\alpha < 0$. With $\phi_a < 0$, this raises their utility: correcting overestimation is welfare-improving. This will also induce them to supply less labor if they are motivated by higher aspirations.

The net sign of the fiscal externality and the indirect welfare effect in (100) depends on how misperceptions are distributed across the population, and how strongly individuals care about aspirations (through ϕ_a). A marginal increase in transparency is desirable at a given tax rate τ if and only if the sum of the fiscal externality and this misperception-correction effect is positive.

D Relative Consumption vs. Relative Income Concerns

The main text models aspirations as entering individual utility as a reference point relative to taxable income via $\phi(z, a; w)$, with e.g. the reference point determined by average pre-tax income, $a = \bar{z}$. An alternative specification, prominent in the relative concerns literature (Boskin and Sheshinski, 1978; Oswald, 1983; Kanbur and Tuomala, 2013) is to model social comparisons to operate through *consumption* instead. For example, utility takes the form $u(c, a; w) - v(z; w)$ with the aspirational threshold $a = \bar{c} \equiv \int c(w) dF(w)$. Importantly, I do not impose separability between c and a in u . This appendix derives the optimal nonlinear tax formula under relative *consumption* concerns and identifies the key differences with the relative *income* case.

Agents choose taxable income z to maximize $u(z - T(z), a; w) - v(z; w)$, where aspirations enter through consumption utility. The first-order condition is $u_c(c, a; w) \cdot (1 - T_z) = v_z(z; w)$. Differentiating implicitly with respect to a yields

$$\frac{\partial z}{\partial a} = -\frac{u_{ca}(c, a; w) (1 - T_z)}{\mathcal{Y}_z}, \quad (102)$$

where $\mathcal{Y}_z \equiv u_{cc}(1 - T_z)^2 - u_c T_{zz} - v_{zz} < 0$ is the second-order condition. When higher aspirations, i.e. higher consumption of peers, may raise or lower the marginal utility of consumption (e.g. $u_{ca} > 0$, the “keeping up” motive), agents may increase or decrease labor supply.

Under a nonlinear tax reform $T(z, \kappa) = \mathcal{T}(z) + \kappa \rho(z)$, the individual consumption response is $dc/d\kappa = (1 - T_z) dz/d\kappa - \rho(z)$, which differs from $dz/d\kappa$ via both the net-of-tax rate, and the mechanical change in tax liability from the reform. Aggregating and using the decomposition of $dz/d\kappa$ into standard (substitution and income effects) and aspiration-driven components yields

$$\frac{da}{d\kappa} = \frac{\int \left[(1 - T_z) \frac{\partial z(w)}{\partial \kappa} - \rho(z(w)) \right] dF(w)}{1 - \int (1 - T_z) \frac{\partial z(w)}{\partial a} dF(w)}, \quad (103)$$

where $\partial z(w)/\partial \kappa$ denotes the standard behavioral response holding aspirations fixed. Two features distinguish this from the relative income case (equation 51). The numerator contains a *mechanical* term $-\int \rho(z) dF$: collecting additional tax revenue reduces consumption and hence $a = \bar{c}$, even absent behavioral responses. The denominator features the marginal retention rate $(1 - T_z)$ weighting the aspiration feedback, because a \$1 increase

in z translates into only $(1 - T_z)$ dollars of additional consumption.

Define the total aspiration externality as

$$\Lambda \equiv \frac{- \int \left[\frac{\gamma(w)}{\lambda} u_a + T_z \frac{\partial z(w)}{\partial a} \right] dF(w)}{1 - \int (1 - T_z) \frac{\partial z(w)}{\partial a} dF(w)}, \quad (104)$$

combining the direct welfare externality (e.g. $u_a < 0$ from envious comparisons) and the fiscal externality from aspiration-driven behavioral responses, scaled by the now *consumption-based* aspiration multiplier. Applying the [Gerritsen \(2024\)](#) style perturbation to the planner's first-order condition and rearranging yields the following result.

In the tax optimum with $a = \bar{c}$, the marginal tax rate at income level z^* satisfies

$$\frac{T_z^*}{1 - T_z^*} - \Lambda = \frac{1}{\varepsilon^c(z^*) z^* h(z^*)} \int_{z^*}^{+\infty} \left[1 - g(z) + \Lambda - \eta_z(z) \left(\frac{T_z}{1 - T_z} - \Lambda \right) \right] h(z) dz. \quad (105)$$

where $g(z) = \gamma(w)u_c/\lambda$ is the social welfare weight, $\varepsilon^c(z^*)$ is the compensated elasticity of taxable income, and $\eta_z(z)$ is the income effect.

Comparing equation (105) with the relative income result (Corollary 3) reveals three main differences.

First, there is a *mechanical* rather than only behavioral effect of a tax reform on aspirations. Under relative income concerns ($a = \bar{z}$), the aspirational threshold is affected only through behavioral labor supply responses: the tax liability $T(z)$ is a transfer that does not mechanically alter pre-tax income. Under relative consumption concerns ($a = \bar{c}$), the budget constraint $c = z - T(z)$ implies that a tax reform *mechanically* changes average consumption and thus a , even if no one changes their labor supply. This generates something akin to a “double dividend”: additional revenue collected from higher taxes both funds redistribution and corrects the externality.

Second, the total aggregate externality wedge appears not only on the left hand side. Abstracting from income effects ($\eta_z = 0$) simplifies the exposition. Under relative *income* concerns, the optimal schedule is

$$\frac{T_z^* - \Omega}{1 - T_z^*} = \frac{1}{\varepsilon^c(z^*) z^* h(z^*)} \int_{z^*}^{+\infty} [1 - g(z)] h(z) dz.$$

The wedge Ω shifts the effective marginal tax rate on the left-hand side, but the redistribu-

tive benefit on the right-hand side remains standard. Under relative consumption,

$$\frac{T_z^*}{1 - T_z^*} - \Lambda = \frac{1}{\varepsilon^c(z^*) z^* h(z^*)} \int_{z^*}^{+\infty} [1 - g(z) + \Lambda] h(z) dz.$$

The wedge Λ appears on both sides: raising the effective marginal tax rate (left) *and* augmenting the marginal value of redistribution (right).

Third, under $0 < 1 - T_z < 1$ and a nonnegative aggregate aspiration response ($\int \partial z / \partial a dF \geq 0$), the magnitude of the aspiration multiplier is attenuated. The aspiration multiplier denominator is $1 - \int \frac{\partial z}{\partial a} dF$ under relative *income* concerns (equation 51), but $1 - \int (1 - T_z) \frac{\partial z}{\partial a} dF$ under relative *consumption* concerns (equation 103). The net-of-tax rate $(1 - T_z)$ attenuates the feedback loop. A behavioral increase in z raises c by only $(1 - T_z)$ cents per dollar. This translates into a smaller multiplier under relative consumption for the same $\partial z / \partial a$, particularly at the top of the income distribution if marginal tax rates are higher. Intuitively, when comparisons run through consumption, the tax system directly dampens the aspiration feedback, an effect absent when comparisons run through pre-tax income.