Rethinking the Taxation of Luxuries: Leveraging Status for Redistribution

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Abstract

We develop a theory showing how luxury taxes promote welfare equity by reducing status inequality. These taxes discourage conspicuous consumption, weaken status signaling by the wealthy, and increase the status share of the less wealthy. We derive a modified Ramsey rule showing that the ability to raise revenue is inversely related to the price elasticity, while the ability to achieve status equity is positively related to this elasticity. Our results highlight that even with modest revenue gains, high tax rates on luxury goods can significantly improve welfare equity and be an effective complement to traditional monetary redistribution policies.

Keywords: optimal taxation, signaling, status, redistribution, inequality

JEL classification: H21, D63, D82

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1 Introduction

Status is a social evaluation. It captures how individuals are regarded and ranked by others, and how they regard themselves, considering observable traits such as wealth, education, occupation, or patterns of consumption. In modern economies, a central channel through which status is produced and perceived is visible consumption of so-called luxury or status goods. When a household buys a certain car, watch, or handbag, it does not only get direct consumption services from the good; it also buys a signal about its position in the social hierarchy. That signal in turn affects the well-being of both the purchaser and those who observe it.[1]

Our analysis is firmly welfarist. Social welfare is represented by an individualistic social welfare function (SWF) that depends only on individuals' well-being. Well-being, in turn, is understood broadly to include both material consumption and the status component of utility. We do not treat equality of status as an independent maximand that could justify making everyone worse off in utility terms. Instead, we emphasize that when individuals care about their relative standing, the way in which status is produced and distributed in equilibrium is itself a first-order determinant of well-being. A tax system that changes who enjoys high status, and at what resource cost, affects social welfare through its impact on utilities, not by appealing to a separate non-welfarist notion of "status justice."

Within this framework, we view social status as a scarce, socially produced surplus. In our model, status is generated by a noisy process of observation and inference: members of society see some of each other's visible consumption and update their beliefs about who is "rich" or "poor." The resulting "status surplus" is a fixed aggregate prize that must be divided among types. How that surplus is shared depends on equilibrium signaling behavior, and, importantly, on policy. The key normative idea in the paper is that the tax system can redistribute not only income, but also access to this status surplus, in ways that matter for well-being in a standard SWF.

This welfarist approach is also responsive to non-welfarist accounts of equality that emphasize status and social relations. Relational egalitarians such as Anderson (1999) and Schemmel (2011) argue that justice is not exhausted by a fair distribution of resources, but

[1] This idea is well established in the social sciences and has roots in ancient philosophy. Plato already noted in The Republic: "Since then, as philosophers prove, appearance tyrannizes over truth and is lord of happiness, to appearance I must devote myself" (Rep. 3.414b, trans. Jowett 1888). Adam Smith likewise recognized the influence of social expectations on consumption norms: "A creditable day-labourer would be ashamed to appear in public without a linen shirt, the want of which would be supposed to denote that disgraceful degree of poverty" (Wealth of Nations, 1776, V.2.148). A rich empirical literature using survey-experimental methods underscores the role of relative consumption concerns and visibility in shaping consumer behavior. An early and important contribution is that of Alpizar et al. (2005), who develop the empirical concept of the "marginal degree of positionality," measuring the fraction of a total utility change that is attributable to increased relative consumption. Alpizar et al. (2008) find that contributions made publicly, in front of solicitors at a national park in Costa Rica, were 25 percent higher than contributions made privately. Heffetz (2011), using survey data from the United States, constructs a visibility index for various consumption categories and shows that it can account for as much as one-third of the variation in income elasticities across these categories. Bursztyn et al. (2017) find that Indonesian consumers are willing to pay more for visibly prestigious platinum credit cards, while Butera et al. (2022) show that donors to the Red Cross demand public recognition, reflecting a preference for visibility.

also requires the avoidance of oppressive status hierarchies, stigmatizing forms of poverty, and relationships of domination. On their view, social norms of status—shared patterns of esteem and disesteem that structure everyday interactions—are a core concern of justice when they systematically impair individuals' self-respect and opportunities by coordinating others' negative esteem judgments. Democratic or relational equality thus focuses on securing relations of equal standing among citizens, and these writers often explicitly reject purely welfarist metrics in favor of ideals such as democratic equality, non-domination, and social equality as independent moral values.

Our contribution is to show that many of these concerns about social status and standing can be incorporated within a SWF by explicitly modelling how legal and fiscal institutions influence individuals' status and self-respect through the signaling environment. We do not abandon welfarism; instead, we enrich both the utility functions and the space of policy instruments. Letting individual utility depend not only on material outcomes but also on the process and social meaning of status interactions—as is standard in behavioral and identity economics—we can still aggregate utilities, but those utilities already embed the relational harms emphasized in the egalitarian literature. Stigma, subordination, and the loss of opportunities due to coordinated negative esteem judgments then appear as welfare-relevant consequences of legal rules and commodity tax design. Because social status is produced through observable behaviors and institutional arrangements that law and the commodity tax system directly shape, once status depends on the signaling environment, income taxation alone will generally be unable to replicate the status allocation induced by a given structure of commodity taxes. Once status is admitted as an argument of utility, commodity taxes therefore acquire an independent equity role, alongside their familiar revenue-raising function.

The existing public-finance literature on conspicuous consumption has mostly framed luxury or positional taxes as Pigouvian instruments: they correct negative status externalities, and, because they fall disproportionately on the rich, they also raise revenue that can be used for conventional income redistribution. Status is typically modeled as a relative-consumption argument in utility, not as an independent "resource" to be fairly allocated. Explicit redistribution of status itself as a dimension of distributive justice is largely absent from this literature.

A first strand, following Veblen (1899) and Hirsch (1976), focuses on the welfare costs of positional goods. Frank (1997, 2005) emphasizes that when utility depends on relative consumption, spending on highly positional goods generates large "positional externalities" and wasteful arms races. His policy recommendation is essentially Pigouvian: heavier taxation of consumption, especially of highly positional items to internalize externalities and shift resources toward less positional uses. The distributional gains he highlights operate through the revenue side and the induced changes in labor supply and savings, rather than through an explicit analysis of who ends up holding the available status "slots."

A second strand develops formal models of conspicuous consumption as signaling. Bagwell and Bernheim (1996) study Veblen effects in oligopolistic markets where firms sell status goods, showing how conspicuous consumption can generate supranormal profits and how excise taxes on such goods can, in some cases, be interpreted as non-distortionary taxes on rents. Hopkins and Kornienko (2004) model status as ordinal rank in the consumption distribution and show how strategic status concerns lead to "running to keep in the same place," with higher conspicuous spending and lower utility in richer or more equal societies. They show that suitably designed consumption taxes and subsidies can raise welfare by correcting this externality. In both cases, status is an argument in utility and a source of external effects; policy is evaluated in terms of aggregate welfare and standard monetary redistribution, rather than in terms of the distribution of a status surplus across types.

A third strand, exemplified by Corneo and Jeanne (1997), takes seriously the zero-sum nature of status (viewing status as a pure rent-seeking game). In their model, production of a conspicuous good is socially wasteful because aggregate status is fixed: more spending just reshuffles ranks. They show that prohibiting the conspicuous good always raises social welfare and can even be a Pareto improvement; small specific taxes on the good can also raise welfare when they reduce wasteful signaling. Although their analysis comes closest to our view in treating status as a fixed aggregate, their normative focus is on eliminating an inefficient externality. They do not treat the induced redistribution of status itself as a separate equity channel within a SWF.

Ireland (2001) embeds status concerns directly into the optimal income tax problem. Individuals over-supply labor to finance status-seeking, while income taxation discourages labor supply. In this setting, income or consumption taxes can be Pareto-improving because they offset the distortion induced by status motives and reduce wasteful signaling. Ireland then derives how status concerns affect the shape and level of the optimal marginal tax schedule. Status here is again a utility argument that modifies standard efficiency and equity tradeoffs in income space; there is no explicit focus on how the tax system reallocates a status surplus among types.

An early optimal-tax treatment of relative income by Boskin and Sheshinski (1978) specifies individual welfare as a function of both absolute and relative after-tax consumption, showing that concern for relative position can justify substantially more progressive linear income taxes than in a standard Mirrleesian model. Yet even in their analysis, relative status enters only as an extra argument in utility that strengthens the case for income redistribution through the income tax; they do not consider commodity taxation or the possibility that policy might deliberately reallocate a fixed status surplus between types.

Bilancini and Boncinelli (2012) emphasize that the welfare effects of income redistribution depend on how status is modeled. With ordinal status, greater income equality can increase wasteful competition and hurt the poor, as in Hopkins and Kornienko (2004). Under a cardinal notion of status, however, redistributing income toward the poor can reduce the incentive for wasteful signaling and may even be Pareto-improving. Their contribution shows that the link between income inequality and "social waste" is sensitive to the structure of status preferences. But redistribution operates through the income distribution; status is not treated as a separate object of distributive concern, and there is no explicit role for commodity taxes that target the status channel as distinct from the monetary channel.

A more recent line of work brings status into applied policy domains such as the political economy of public provision of private goods. Friedrichsen et al. (2020) analyze how status concerns affect voting over the public provision of goods like education or housing. In their model, opting out of the public system yields a status rent. This can make richer households support higher public provision of services they do not use, because greater public provision increases the exclusivity and thus the status value of private alternatives. Their focus is positive and political: status helps explain puzzling patterns of support for the welfare state. They do not study optimal taxation of status goods, nor do they consider the deliberate redistribution of status as an equity goal.

Survey work on commodity taxation, such as Bastani and Koehne (2024), classifies status concerns under the broader heading of externalities or "relative consumption concerns." In that perspective, status considerations provide one of several rationales for differential consumption taxes, along with environmental and health externalities. The main message is that differential taxes can improve efficiency by internalizing neglected social costs and that, because positional goods are often skewed toward high-income households, such taxes can also have desirable distributional effects. Status is not conceptualized as a resource to be allocated, but as one more source of external effects.

Against this background, our paper makes two main contributions. Conceptually, we recast the role of luxury taxes in a welfarist social welfare framework that takes status seriously as part of individual well-being. We model conspicuous consumption as pure signaling and show that, because signals are only partially observed, equilibrium behavior generates a fixed "status surplus" that is unevenly split between high- and low-type agents. Luxury taxes affect not only how much wasteful signaling occurs, but also how that status surplus is divided. This creates a second channel, alongside the familiar revenue channel: the government can redistribute status within a standard SWF that weighs both material consumption and status-induced utility.

Technically, we analyze a two-type signaling model in which high-wealth individuals can purchase a variety of purely signaling goods that are imperfectly observed by others. The government levies a uniform ad valorem tax on these goods and rebates the revenue as a lump-sum transfer. Within an individualistic welfarist SWF that focuses on the well-being of the worse-off type and allows inequality aversion over both consumption and status, we derive a modified Ramsey rule for the optimal luxury tax. The ability to raise revenue is inversely related to the price elasticity of demand for status goods, as in the standard Ramsey (1927) logic, while the ability to equalize status is positively related to that elasticity. As a result, the optimal tax rate typically exceeds the Laffer rate whenever status equality carries some weight in social welfare, and in some cases it is optimal to set tax rates high enough to shut down status signaling altogether, even when little revenue is raised. Our analysis thus highlights how, within a fully welfarist framework, luxury taxation can be understood as a tool for redistributing both income and status, with the latter playing a distinct and policy-relevant role in the evaluation of tax systems.

From this perspective, the existing economic literature on status goods can be reinterpreted rather than discarded. Much of that work takes the aggregate status surplus as fixed and focuses on the welfare costs of wasteful signaling. Frank's analysis of positional externalities, Ng (1987)'s "diamond goods," and related Pigouvian arguments can be seen as implicitly holding the distribution of status across individuals constant and asking how to reduce the resource cost of generating that surplus. On our account, these contributions identify an important efficiency motive for taxing conspicuous consumption, but they do not track how the tax system changes who actually captures the available status rents. They can be viewed as studying the limit case of our framework in which the planner is effectively indifferent over the allocation of status and cares only about the waste generated by status-seeking behavior.

A similar reinterpretation applies to the formal signaling models of conspicuous consumption, such as Bagwell and Bernheim (1996)'s theory of Veblen goods, Hopkins and Kornienko (2004)'s "running to keep in the same place," and Corneo and Jeanne (1997)'s analysis of snobbism and conformism. These papers model status as a function of observable consumption and explore how strategic interaction over visible goods produces inefficient equilibria. In our language, they richly describe the technology for producing status and show that equilibrium status races are often socially wasteful, but they largely treat the resulting distribution of status positions as a by-product. The policy implications they draw—bans, Pigouvian taxes, or subsidies to non-positional goods—are evaluated in terms of aggregate welfare and standard income redistribution, not in terms of how the status surplus itself is shared between groups.

Work that embeds status in optimal tax models, such as Ireland (2001)'s contribution and later analyses of redistribution with status concerns, can be read as isolating one particular channel of our framework: the way that status preferences distort labor supply and savings. In those models, status alters the standard Mirrleesian trade-off and may justify higher or differently shaped income and commodity taxes. Our approach complements this by emphasizing that status is not only a source of behavioral distortions, but also a scarce prize that tax policy can reallocate. Optimal income and commodity taxation must therefore balance three forces: correcting status-induced distortions, redistributing income, and reshaping the division of the status surplus. The existing literature focuses primarily on the first two; our analysis makes the third channel explicit.

Finally, empirical and policy-oriented discussions of luxury taxation—including work on the U.S. luxury excise on yachts, cars, jewelry, and furs—can be understood as practical explorations of the revenue and incidence implications of taxing conspicuous goods, conducted under the implicit assumption that the role of status is to pick out a plausible tax base. In our framework, these same taxes have a further, largely unremarked effect: by making certain forms of visible consumption more or less attractive as signals, they alter who is likely to be perceived as high-status and how costly it is to attain that perception. Thus, what appears in the policy debate as a narrow excise on "luxuries" can be reinterpreted as a crude instrument for reallocating shares of the status surplus. Our model provides a way to evaluate such policies within a welfarist SWF that counts both their monetary and their status-distributive consequences.

Moreover, using a simple two-type framework with noisy signals, our model provides a tractable analysis of how the tax system influences the information structure in equilibrium, thereby shaping redistributive outcomes through the status channel. By contrast, the existing literature on taxation with status-driven, noiseless signaling has primarily focused on separating equilibria, effectively holding the information structure fixed. By neglecting alternative equilibria—such as hybrid or pooling configurations, which differ in their information structure—this literature has overlooked the potential for the tax system to redistribute through the status channel in addition to traditional monetary income redistribution.

The rest of the paper proceeds as follows. Section 2 presents the main elements of our model, while Section 3 describes the two-stage signaling game, where the main results are Proposition 1, which characterizes individual consumption behavior, Proposition 2, which characterizes the elasticity of conspicuous consumption, and Proposition 3, which provides the optimal tax formula. Finally, Section 4 provides a concluding discussion.

2 Model

In the economy under consideration, there are two types of agents, denoted by $j = 1, 2$, characterized by their different wealth endowments. The rich type is represented by the endowment w^2, while the poor type has an endowment of w^1, where $w^2 > w^1 > 0$. The population size of each type is normalized to one for simplicity. Individual wealth endowments are private information, undisclosed to the government and other agents.

Each agent allocates their endowment among $n+1$ consumption goods. The numeraire good, denoted by y, generates intrinsic utility from consumption and remains unobserved by the government and other agents. In addition, there are n binary signaling goods, denoted by x_i with $i = 1, \dots, n$, which are used for status signaling purposes. These signaling goods are binary in nature, meaning that an agent can choose to either consume or not consume each signaling good, $x_i \in \{0, 1\}$.

The utility of an agent of type j is given by the following expression:

$$U^j(y^j, x_1^1, \dots, x_n^1, x_1^2, \dots, x_n^2) = y^j + \mathbf{P}[\tilde{w}^j = w^2 | x_1^1, \dots, x_n^1, x_1^2, \dots, x_n^2] \cdot B. \tag{1}$$

An agent's utility consists of two terms. The first term accounts for the intrinsic satisfaction derived from consuming the numeraire good, denoted by y. The second term captures the utility derived from social status, which is determined by two components. The first component, $\mathbf{P}$, represents the conditional probability that an agent of type j will be perceived as having a high wealth endowment, given the consumption choices of both types of individuals. The perceived wealth endowment is denoted by $\tilde{w}^j$. The second component, $B > 0$, represents the social status satisfaction associated with being perceived as a wealthy type.

The vector x_i^j represents the consumption choices made by agents of type $j = 1, 2$ with respect to the pure signaling goods x_i ($i = 1, \ldots, n$). These are considered pure signaling goods because neither type derives any direct utility from consuming them.[2] The formulation of the utility function in equation (1) is chosen to focus specifically on pure strategies when analyzing the perfect Bayesian equilibrium of the signaling game. It is assumed that all agents of the same type will choose the same consumption bundle along the equilibrium path. The formation of perceptions is done by Bayesian updating, conditioned on the vector x chosen by both types along this path.

In our context, a low level of utility experienced by poor agents is not only a result of being deprived and consuming a smaller quantity of the numeraire good. It is also influenced by the status channel, specifically by being perceived as poor. Consequently, type-1 agents with lower wealth endowments have an incentive to imitate their wealthier counterparts by behaving as if they were type-2 agents. This, in turn, induces wealthy type-2 agents to credibly signal their greater endowments by allocating their resources to conspicuous consumption, even though such consumption does not provide them with any intrinsic utility.

The budget constraints faced by the two types of agents are given by equation (2):

$$y^j + \sum_{i=1}^{n} p_i^j \cdot x_i^j = w^j, \quad j = 1, 2, \tag{2}$$

where p_i^j represents the price paid by type $j = 1, 2$ when purchasing a unit of good $i = 1, \ldots, n$. Specifically, we assume that $p_i^2 = \theta/n$ and $p_i^1 = 1/n$, where $0 < \theta < 1$.

The fact that the unit prices of type 2 are lower than those of type 1 can be interpreted in several ways. First, it is consistent with the canonical signaling model of Spence (1973), where the cost of acquiring the signal may be lower for type 2. Second, the lower cost of type 2 may reflect, in a simplified form, the diminishing marginal utility of consuming the numeraire good y, which is assumed to be constant for tractability. This implies that the effective prices of x decrease with respect to the wealth endowment. Third, the lower costs incurred by type 2 may reflect heterogeneity in preferences, where type 2 derives either direct utility or higher direct utility from the consumption of x. In this case, the effective price incurred by type 2 would be lower than that incurred by type 1.

To illustrate this, consider the scenario where $n = 1$ (and let $x_1^j \equiv x^j$ for simplicity). If the utility derived by type 2 is given by $u^2(y^2, x^1, x^2) = y^2 + \frac{1}{n}(1-\theta)x^2 + \mathbf{P}[\tilde{w}^2 = w^2 | x^1, x^2] \cdot B$, Assuming that both types incur the same price per unit of x (given by $1/n$) implies that the budget constraint faced by type 2 is $w^2 = y^2 + \frac{1}{n}x^2$. By substituting y^2 from the budget

[2] Our assumption simplifies the analysis for tractability, but the qualitative features of the analysis would remain unchanged even if intrinsic utility were derived from these signaling goods, as long as wasteful signaling is measured relative to a nonzero reference level (which may differ across types).

constraint into the utility function, we obtain an expression identical to the utility function in equation (1), after substituting for y^2 from equation (2).

We now examine the role of visibility in status generation, drawing on the literature on noisy signaling (e.g., Matthews and Mirman 1983).[3] We assume that conspicuous consumption is not perfectly visible to the target audience, thus introducing noise into the signaling process. This feature is central to our model and has important implications for policy analysis. In a separating equilibrium, each individual faces a trade-off: allocate resources to the numeraire good y or to signaling activities. Investing more in signaling increases the probability of being perceived as a high type, thereby increasing expected social status. This trade-off arises due to imperfect observability of signals; with perfectly visible signals, a fully revealing equilibrium would eliminate this choice. This dynamic provides the government with an opportunity to redistribute through the status channel. By adjusting the level of noise, which is endogenously determined in equilibrium, the government can shape the signaling process to complement traditional income-based redistribution, providing multiple ways to achieve distributional goals.

For tractability, we adopt a simplified structure for the stochastic process governing noise levels in our model, with qualitative results that remain robust under alternative specifications. Specifically, we assume that the visibility of each signaling good x_i ($i = 1, \ldots, n$) purchased by a signaling agent is determined by a binary random variable z. This variable z takes the value 1 ("visible") with probability $0 < \frac{q}{n} < 1$ and 0 ("not visible") with complementary probability $1 - \frac{q}{n}$. We assume that z is realized independently for each good. For simplicity, we impose symmetry across goods in our main analysis, although we discuss a more general model that allows asymmetry in Appendix B.

A straightforward interpretation of the stochastic process generating the noise can be drawn from the literature on informative advertising, following the seminal works of Butters (1977) and Grossman and Shapiro (1984). In this framework, an individual's consumption of each signaling good functions as an "advertisement" received by the target population with some probability. For example, consider that there are n social events over a given period of time (e.g., a year). Each event is attended by $q/n \cdot B$ individuals from the target population of size B, meaning that a fraction q/n of the target population is exposed to each event. Assuming random assignment of individuals across events, we further assume that the probability of any individual in the target population attending a given event, q/n, is independent of his or her probability of attending other events.

Consider an individual who signals wealth by renting a luxury car for events he attends. By arriving in a luxury car, the individual wants to convey that he is wealthy. He may choose to rent the car for only some events (including none or all as limiting cases). In an effort to "impress" as many individuals from the target population as possible, and given the independence of event attendance, different people attend different events. This cre-

[3] Matthews and Mirman (1983) is a seminal work on noisy signaling, introducing the concept within a classical model of limit pricing. More recently, de Haan et al. (2011) has extended this with theoretical and experimental insights into the behavioral effects of varying levels of noise in signaling.

ates an incentive to rent the car for multiple events to maximize exposure. If the signaling agent attends m events with a rented luxury car (motivated by signaling rather than intrinsic enjoyment of the events), the probability of being perceived as wealthy increases with exposure, i.e., the probability that each individual in the target population will encounter them at least once. This probability of exposure increases with the number of events attended by the signaling agent.

The benefit from social status can be represented by the probability that an observer perceives the signaling agent as wealthy. If the observer is exposed, they believe with certainty (probability 1) that the agent is wealthy. Otherwise, if the observer is not exposed, they assign a probability of 1/2, reflecting the prior distribution of wealth types in the population. The agent's status benefit from this observer is then derived using the law of total probability, factoring in the likelihood of exposure. Summing over all observers in the target population yields the agent's total social status utility.

3 The two-stage game

We analyze a two-stage game. In the first stage, the government imposes a uniform ad valorem tax, denoted by $t \geq 0$, on all signaling goods, which affects their after-tax prices for types $j = 1, 2$. Specifically, the after-tax prices for types 1 and 2 are $p^1 = (1+t) \cdot \frac{1}{n}$ and $p^2 = (1+t) \cdot \frac{\theta}{n}$, respectively, with $p^1 > p^2$. The collected tax revenue finances a universal lump-sum transfer, T. In the second stage, given the tax instruments set by the government, a signaling game unfolds. Each agent allocates resources among consumption goods based on her wealth endowment. The tax instruments (t and T) are chosen by the government in the first stage to maximize social welfare, subject to a balanced revenue constraint and taking into account the optimal choices of consumers in the second stage. We analyze the second stage and then solve the government's constrained maximization problem.

3.1 Stage II: The signaling stage

Consider a separating equilibrium in which type 2 agents allocate their spending between the numeraire good y and a set of signaling goods ($0 \leq m \leq n$), while type 1 agents spend their entire wealth endowment solely on the numeraire good.[4]

Formally, the separating equilibrium can be characterized as the solution to the following constrained maximization program:

$$\max_{0 \leq m \leq n} w^2 - \theta \cdot (1+t) \cdot \frac{m}{n} + T + \left\{ \left[1 - (1 - \frac{q}{n})^m\right] + \frac{1}{2} \cdot (1 - \frac{q}{n})^m \right\} \cdot B \tag{3}$$

[4]In non-equilibrium situations, where agents' beliefs cannot be formed based on Bayesian updating, an agent is assumed to be perceived as a low type with probability 1. In other words, if agents do not adhere to the equilibrium strategies and their behavior deviates from the expected pattern, they are assumed to be perceived as low types by default.

subject to

$$w^1 - (1+t) \cdot \frac{m}{n} + T + \left\{ \left[1 - (1 - \frac{q}{n})^m \right] + \frac{1}{2} \cdot (1 - \frac{q}{n})^m \right\} \cdot B \leq w^1 + T + \frac{1}{2} \cdot (1 - \frac{q}{n})^m \cdot B. \tag{4}$$

It is important to note that in cases where none of the signals are observed, which occurs with a probability of $(1 - \frac{q}{n})^m$ based on the stochastic process outlined earlier, the social status surplus is evenly distributed between the two types according to the prior symmetric distribution. However, in situations where at least one signal is observed that occurs with a probability of $1 - (1 - \frac{q}{n})^m$, a Bayesian update leads to a posterior distribution that supports full separation. Consequently, the entire social status surplus is received by the high-type agents.

However, due to the presence of noisy signaling and partial observability, the low-type agents benefit from the 'benefit of the doubt' and are able to derive a positive fraction of the surplus under the separating equilibrium. Furthermore, this 'benefit of the doubt' derived by the low-type agents diminishes as the intensity of the signaling chosen by the high-type agents, m, increases. These two qualitative features of the model are generic and do not depend on the specific stochastic process invoked that generates the noise.

The constraint (4) captures a standard incentive constraint known as the no-mimicking constraint. This constraint may or may not be binding in the optimal solution, and states that low-type agents have a weak preference for not spending on the signaling goods.

Let $\alpha \equiv \frac{m}{n}$ denote the fraction of signaling goods on which the high types allocate their spending. Suppose also that both m and n are large. In this case, we can use the fact that $e = \lim_{h\to\infty} \left(1 + \frac{1}{h}\right)^h$ to reformulate the constrained maximization problem in (3)–(4) as follows:

Problem $\mathcal{P}1$

$$\max_{0\leq\alpha\leq 1} V(\alpha) \equiv w^2 - \theta \cdot (1+t) \cdot \alpha + T + \left(1 - \frac{1}{2} \cdot e^{-q\alpha}\right) \cdot B \tag{5}$$

subject to

$$(IC) \quad (1 - e^{-q\alpha}) \cdot B \leq (1+t) \cdot \alpha. \tag{6}$$

Before proceeding with the formal analysis of the constrained maximization program in $\mathcal{P}1$, two important observations must be made.

First, note that the reformulated constrained maximization problem in (5)–(6) implicitly exchanges the 'max' and 'limit' operators. In other words, it maximizes the limiting expression instead of taking the limit of the maximized expression. These procedures are equivalent if and only if the convergence of the limiting expression is uniform rather than pointwise. In our analysis, we assume that α is chosen from a fixed finite partition of the unit interval $[0, 1]$. Under this assumption, uniform convergence is guaranteed. However, since we can set the finite grid to be arbitrarily fine, we adopt the continuum approximation for the following analysis.

Second, within $\mathcal{P}1$ we implicitly assume that type-1 agents have two choices: either to refrain from spending on the signaling goods, or to mimic the spending behavior of type-2 agents by choosing the same α. In principle, type-1 agents could choose to spend on a smaller subset of signaling goods ($0 < \tilde{\alpha} < \alpha$). However, it can be shown that the constrained maximization program solved by type-1 agents, which involves maximizing their expected utility by choosing $\tilde{\alpha} \in [0, \alpha]$, is strictly convex given the separating equilibrium strategies outlined above. As a result, we can focus on the two corner solutions: $\tilde{\alpha} = 0$ and $\tilde{\alpha} = \alpha$.[5] The incentive compatibility constraint (6) is thus well defined. The formal details are given in Appendix A.1.

Before proceeding with the analysis, we invoke Assumption 1, which guarantees an interior solution for α in the laissez-faire ($t = 0$).

Assumption 1.

$$1 - \frac{1}{B} < e^{-q} < \frac{2\theta}{qB} < 1, \tag{7}$$

The solution to problem $\mathcal{P}1$ is characterized by the following Proposition.

Proposition 1. *For $\theta < 1/2$, there exists a threshold value, denoted by $0 \leq t^* < \frac{qB}{2\theta} - 1$, such that the optimal solution to $\mathcal{P}1$ can be characterized as follows:*

$$\alpha(t) = \begin{cases} \alpha_2(t), & 0 \leq t < t^* \\ \frac{1}{q} \ln \frac{qB}{2\theta(1+t)}, & t^* \leq t < \frac{qB}{2\theta} - 1 \\ 0, & t \geq \frac{qB}{2\theta} - 1, \end{cases}$$

where $\alpha_2(t)$ is the strictly positive interior solution to the binding incentive compatibility constraint (6), and $\frac{1}{q} \ln \frac{qB}{2\theta(1+t)}$ represents the optimal solution to the unconstrained maximization of (5). Conversely, for $\theta \geq 1/2$, we have $\alpha(t) = 0$ for all $t \geq 0$.

Proof. See Appendix A.2. □

Proposition 1 highlights that status signaling serves two purposes for type-2 agents. First, by increasing the number of status goods purchased, they can increase their expected utility from status. This property holds for sufficiently high tax rates, where the incentive compatibility constraint is not binding and the threat of mimicking by type-1 agents is not a concern. In this case, the choice of α achieves the optimal tradeoff between status and non-status goods, given the noisy signaling environment. This is a non-standard property driven by the presence of noisy signaling.

[5] It is worth noting that spending on a larger subset, $\alpha' > \alpha$, would be suboptimal because of our assumption about off-equilibrium beliefs (see footnote 4) and because the cost of acquiring the signal is higher for the low type.

Second, spending on signaling goods serves to deter mimicking by low types and allows high types to distinguish themselves from their less wealthy counterparts. This property may hold for sufficiently low tax rates where the incentive compatibility constraint is binding. By spending on signaling goods, high types can effectively distinguish themselves from low types and maintain their higher perceived social status.[6]

Based on the characterization of the optimal solution to problem $\mathcal{P}1$, we can observe that $\frac{d\alpha}{dt} \equiv \alpha'(t) < 0$ for all $t < \frac{qB}{2\theta} - 1$.[7] This means that as tax rates on signaling goods increase, type 2 individuals choose to spend their income on a smaller subset of signaling goods, reducing the intensity of signaling.

We now turn to an analysis of the first stage of the game, in which the government sets its tax instruments. To make our analysis non-trivial, we will focus on the case where $\theta < 1/2$.

3.2 Stage I: Government problem

We now formulate the government program and characterize the optimal redistribution policy. The (binding) revenue constraint is formulated as follows:

$$\theta \cdot \alpha(t) \cdot t = 2T, \tag{8}$$

where $\alpha(t)$ denotes the optimal fraction of signaling goods that type-2 spends on in equilibrium, and is characterized by Proposition 1.

In a separating equilibrium, where type-1 agents refrain from signaling and spend all their wealth on the numeraire good y, their equilibrium utility is given by:

$$u^1 = w^1 + T + \frac{1}{2} \cdot e^{-q\alpha(t)} \cdot B = w^1 + \frac{1}{2} \cdot \theta \cdot \alpha(t) \cdot t + \frac{1}{2} \cdot e^{-q\alpha(t)} \cdot B. \tag{9}$$

The second equality follows by substituting the expression for T from the revenue constraint in equation (8). We consider an egalitarian government that aims to maximize the welfare of type-1 agents. The social welfare measure is given by

$$W(\delta) = \delta \cdot \left[w^1 + \frac{1}{2} \cdot \theta \cdot \alpha(t) \cdot t\right] + (1-\delta) \cdot \left[\frac{1}{2} \cdot e^{-q\alpha(t)} \cdot B\right]. \tag{10}$$

The parameter δ governs the normative stance of the social planner. Before proceeding with the characterization of the optimal policy, we elaborate on the welfarist foundations of our welfare measure.

[6]Formally, one can show that the threshold, t^*, is strictly positive when θ approaches $1/2$ from below. In this case the IC constraint binds for all $0 \le t < t^*$.

[7]See Appendix A.2. For the case where (IC) is slack, this follows immediately from (A8). If (IC) is binding, it follows from Figure 3. Note that we are focusing on the interior solution. Thus, as the red curve shifts upward, the intersection shifts to the left.

Welfarist Foundations

The weight $\delta \in [0.5, 1]$ represents the importance assigned to consumption of the numeraire good, whereas $(1 - \delta)$ represents the weight assigned to social status. When $\delta = 0.5$, we invoke a standard Rawlsian welfare measure and hence seek to maximize the well-being of type-1 individuals, who are the least well-off. We also consider the possibility of 'laundering out' (partially or fully) the component in type-1's utility that represents the benefit from social status, by allowing for $\delta > 0.5$.

Prima facie, our welfare measure thus appears to deviate from the welfaristic paradigm, as for $\delta > 0.5$ we assign different weights to the components of the utility function than those assigned by the individuals themselves. We address this concern next.

First, it is worth noting that the normative literature in public economics which heavily draws on welfarism often deviates from the welfaristic paradigm, by 'laundering out' (fully or partially) components of the utility function of individuals that are associated with 'psychic benefits' not related to material consumption of goods and services. For instance, in the context of private provision of public goods (say, via charitable contributions), the 'warm glow' component in the utility function of individuals is often discarded to avoid 'double counting' of the benefits associated with public goods (see the discussion in Diamond, 2006). Another example is the literature on poverty alleviation, which often focuses on 'income maintenance' rather than 'utility maintenance', hence laundering out the leisure component in the utility function. The latter may be due to pragmatic reasons (see the discussion in Besley and Coate, 1992, 1995) or potentially relate to a normative distinction between 'deserving' and 'undeserving' poor, where incurring high disutility from work may reflect socially unjustified 'laziness' (see the discussion in Blumkin and Danziger, 2014) which calls for omission of the 'extra' dis-utility from work (above the normative acceptable level) from the social calculus. For a recent discussion of the concept of status laundering in social welfare functions, see Aronsson and Johansson-Stenman (2018).

Second, one can provide an alternative plausible specification of the utility function that abides by welfarism. To see this, assume that the utility of the individual takes the following functional form:

$$V^i = \begin{cases} 0 & \text{if } y^i < \hat{y} \\ U^i & \text{otherwise} \end{cases}, \quad i = 1, 2 \tag{11}$$

where U^i is the utility defined in condition (1). In words, we add a subsistence threshold, denoted by $\hat{y}$, measured in units of the numeraire consumption good with no positional attributes. When the level of consumption falls short of the threshold, individual utility significantly drops (we normalize the sub-threshold level of utility to zero, with no loss of generality). This utility specification captures a lexicographic order, where status benefits from spending on positional goods cannot substitute for the loss of utility from scarcity of the numeraire consumption good below the threshold.

Let $t^*(\delta)$ denote the optimal ad-valorem tax rate levied on the set of signaling/positional goods, maximizing the welfare function $W(\delta)$ in (10), with δ denoting the weight assigned to the consumption of the numeraire good. Further, denote by $y^{1*}(\delta)$ the corresponding level of consumption of the numeraire good by type-1 in the optimal solution, given by:

$$y^{1*}(\delta) = w^1 + 1/2 \cdot \theta \cdot \alpha(t^*(\delta)) \cdot t^*(\delta) \tag{12}$$

Finally, set the subsistence threshold to satisfy $\hat{y}(\delta) = y^{1*}(\delta)$.

One can show that the optimal solution obtained under a Rawlsian SWF, where the utility of a type-1 individual is given by the modified specification in (11) with the subsistence threshold set to $\hat{y}(\delta)$ as in (12), would be the same as the optimum under the SWF given by $W(\delta)$, with δ denoting the weight assigned to consumption of the numeraire good by type-1 individuals, under the baseline utility specification. The formal argument follows from the proof of Proposition 3 below, which characterizes the solution for the maximization of W for different values of δ. Here we offer a brief heuristic argument.

In the absence of a binding subsistence threshold, the Rawlsian optimum would be given by maximizing $W(\delta)$ while setting $\delta = 0.5$ (coinciding with the type-1 utility, u^1). As will be shown below (see Proposition 3), the optimal solution for this case would be to set a sufficiently high tax on signaling/positional goods in order to fully crowd out spending on such goods and carry out redistribution exclusively via the status channel (no tax revenues are raised and hence no transfer is offered).

With a binding subsistence threshold in place, in contrast, the Rawlsian optimal solution would be modified: lowering the tax rate on signaling/positional goods would be called for to raise just enough funds to cover the cost of a subsistence grant, thus trading off redistribution via the status and consumption channels (the latter at the expense of the former). This modified optimum would replicate a scenario in which there is no subsistence constraint in place, but the relative weight assigned to consumption versus status is increased above the weight assigned by type-1 individuals in their utility function, i.e., $\delta > 0.5$. The more binding the subsistence constraint would become, the higher the relative weight that would be assigned to consumption.[8]

Finally, notice that an alternative interpretation of the welfare measure in (10) would be to assume a Rawlsian government that seeks to maximize the utility of type-1 individuals, as given by (1), subject to a subsistence constraint as defined in the re-formulated utility specification. The latter quasi-welfaristic approach is consistent with recent empirical evidence (see Bellet and Colson-Sihra (2025) and the references therein) documenting that, in environ-

[8]A binding subsistence threshold necessarily implies that the incentive compatibility constraint associated with type-1 individuals would be slack. To see this notice that gaining higher status by mimicking type-2 agents, via spending on signaling goods at the expense of the numeraire good, would necessarily violate the subsistence threshold, hence rendering mimicking strictly undesirable. Maximizing a Rawlsian welfare function invoking the re-formulated 'lexicographic' utility specification, hence, would be consistent with maximizing the welfare measure given in (10), invoking the baseline utility specification, provided that the incentive compatibility constraint of type-1 individuals in the optimal solution for the latter maximization would remain slack, which is not necessarily the case. It is, however, easy to provide parametric assumptions consistent with Assumption 1, which would guarantee that t^*=0, where t^* is defined in Proposition 1 as the tax threshold above which IC is slack, implying hence that for all t>0 IC would be slack, as needed. For example: B=1, $1/e$<q<1 and $1/\,(2e) < \theta < q/2$.

ments characterized by income growth accompanied by rising inequality, individuals tend to 'violate' subsistence constraints in the pursuit of social status. In particular, the evidence shows that calorie consumption among the poor in India has declined, leading to worsening malnutrition, as poor households shift resources away from basic staples toward goods consumed by wealthier peers whom they seek to emulate to enhance their social standing.

Characterization of the Optimal Policy

By differentiating equation (10) with respect to t, we obtain the first-order condition (FOC) for the government maximization program:

$$\frac{\delta}{2}\left[\alpha(t)+t\alpha'(t)\right]\theta-\frac{1-\delta}{2}qB\alpha'(t)e^{-q\alpha(t)}=0, \tag{13}$$

or equivalently,

$$\delta\theta\left(t+\frac{\alpha(t)}{\alpha'(t)}\right)-(1-\delta)\,qBe^{-q\alpha(t)}=0. \tag{14}$$

By denoting η as the elasticity of α with respect to the after-tax price $(1+t)$, defined as $\eta\equiv\frac{\alpha'(t)\cdot(1+t)}{\alpha(t)}$, equation (14) can be rewritten as follows:

$$\frac{t}{1+t}=\frac{1-\delta}{\delta\theta}\frac{qBe^{-q\alpha(t)}}{1+t}+\frac{1}{|\eta|}. \tag{15}$$

Equation (15) shows that, except in the limiting case when $\delta=1$, the optimal tax rate exceeds the Laffer rate $t/\,(1+t)=|\eta|^{-1}$. When $\delta=1$, meaning that the government ignores social status, the optimal tax rate follows the inverse elasticity rule. In this scenario, revenue is maximized by taxing signaling goods (purchased only by high types), and redistribution is achieved exclusively through the income channel by maximizing the demogrant value T. For $\delta\in[0.5,1)$ the optimal tax rate exceeds the Laffer rate. This divergence arises because revenue considerations are tempered by the desire to promote a more equitable distribution of social status using t as an instrument.

To gain further insight into the optimal tax system, we can reformulate equation (15). By introducing λ as the Lagrange multiplier associated with the IC constraint (6), we can express the first-order condition for the high-type agent's optimal choice of α as follows:

$$-(1+t)\,\theta+\frac{qB}{2}e^{-q\alpha}+\left(1+t-qBe^{-q\alpha}\right)\lambda=0. \tag{16}$$

Solving for $e^{-q\alpha}$ in (16), we obtain the expression:

$$e^{-q\alpha}=\frac{2\,(1+t)\,(\theta-\lambda)}{(1-2\lambda)\,qB}. \tag{17}$$

Substituting the value of $e^{-q\alpha(t)}$ from (17) into (15), we can restate (15) as follows:

$$\frac{t}{1+t} = 2\frac{1-\delta}{\delta}\frac{1-\lambda/\theta}{1-2\lambda} + \frac{1}{|\eta|}. \tag{18}$$

Recalling that t^*, when bounded away from zero, represents the threshold for t that distinguishes the region where the IC constraint is binding from the region where it is slack, the following proposition characterizes the relationship between the absolute value of the elasticity $|\eta|$ and the tax rate.

Proposition 2. *$|\eta|$ is endogenous to the tax rate t and is characterized as follows:*

(i) For $t \in [0, t^*)$, we have that

$$|\eta| = \frac{1-2\lambda}{1-2\theta},$$

which monotonically increases in t since λ decreases in t.

(ii) As t approaches t^* from the left, $|\eta|$ drops discontinuously.

(iii) For $t \in [t^*, \frac{qB}{2\theta} - 1]$, we have that

$$|\eta| = \left(\ln \frac{qB}{2\theta\,(1+t)}\right)^{-1},$$

which monotonically increases in t and tends to infinity at $t = t^{max} \equiv \frac{qB}{2\theta} - 1$.

Proof. See Appendix A.3 □

Note that according to (iii), the inverse elasticity is equal to $\ln \frac{qB}{2\theta(1+t)}$ and reflects the return to status signaling, which is given by the ratio of the expected benefit to the cost of signaling.[9] The characteristics of the inverse elasticity $|\eta|^{-1}$ as a function of t are illustrated graphically in Figure 1, based on the presumption that $t^* > 0$. The figure also shows that two different tax rates can be consistent with the same elasticity. For example, if we define $\hat{t} = -1 + \frac{qB}{2\theta}e^{2\theta-1}$, we have that $\lim_{t\to t^{*-}} |\eta(t)| = |\eta(\hat{t})| = \frac{1}{1-2\theta}$.

[9] To see this, consider a single signaling good x that is visible with probability q and has an associated cost θ, while the gains from status are denoted by B. If x is not purchased, the status surplus is divided equally between the two agents, and type 2 derives an expected net benefit of $B/2$. Alternatively, if type 2 purchases a unit of x that costs θ, the social status derived by type 2 is $qB + (1-q)B/2$, since x is only visible with probability q. The net benefit associated with spending on x is therefore $[(qB + (1-q)B/2) - B/2] = qB/2$. Dividing by the cost θ gives $qB/2\theta$.

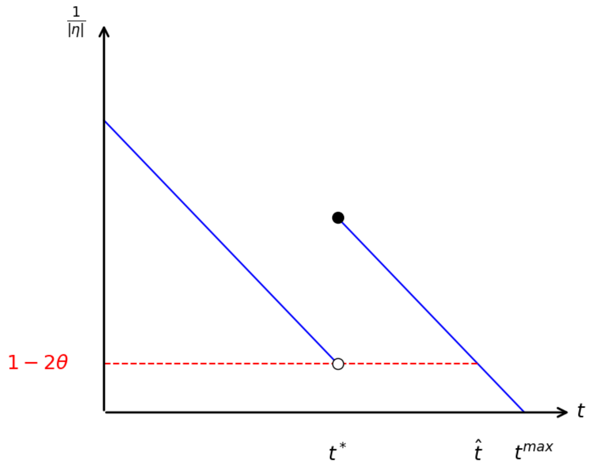

Figure 1: The shape of $|\eta|^{-1}$.

The reason why there is a discrete decrease in $|\eta|$ at $t = t^*$ is that for $t < t^*$, the value of α (as a function of t) is dictated by the binding IC constraint $(1+t)\,\alpha = (1-e^{-q\alpha})\,B$, while for $t^* \leq t \leq t^{\max}$ we have that α is given by the unconstrained demand function $\alpha\,(t) = \frac{1}{q}\ln\frac{qB}{2\theta(1+t)}$. Although this does not break the continuity of $\alpha(t)$ at $t = t^*$, it does imply a discontinuous decrease in $\alpha'(t)$ at $t = t^*$. The intuition is that when the threat of mimicking by type-1 ceases to be a concern for type-2, the demand for α becomes less sensitive to changes in t.[10] Clearly, the discontinuity property disappears when the IC constraint is slack throughout the entire range (i.e., $t^* = 0$). As will be explored in the analysis which follows, the (potential) kink in the demand for status goods would allow for multiple local optima.

In Proposition 3 we provide a characterization of the optimal tax policy based on the analysis of the inverse elasticity $|\eta|^{-1}$ as a function of t. The characterization takes into account the first-order condition (18) for the government problem, considers the potential existence of multiple solutions, and distinguishes between local and global optima.

Proposition 3. *The optimal solution to the government's problem is given by:*

$$t(\delta) = \begin{cases} \frac{qB}{2\theta} - 1 & \text{if } \frac{1}{2} \leq \delta \leq \hat{\delta}, \\ \bar{t}(\delta) & \text{if } \hat{\delta} < \delta \leq \tilde{\delta}, \\ \underline{t}(\delta) & \text{if } \tilde{\delta} < \delta \leq 1, \end{cases}$$

[10] To see this, note that since the existence of t^* requires that $1+t < qB$, we have that $\lim_{t\to t^{*-}} \alpha'\,(t) = -\frac{\alpha}{(1+t)(1+q\alpha)-qB} < -\frac{1}{(1+t)q} = \lim_{t\to t^{*+}} \alpha'\,(t)$ (i. e., $\lim_{t\to t^{*-}} |\alpha'\,(t)| = \frac{\alpha}{(1+t)(1+q\alpha)-qB} > \frac{1}{(1+t)q} = \lim_{t\to t^{*+}} |\alpha'\,(t)|$).

where

$$\frac{\bar{t}(\delta)}{1+\bar{t}(\delta)} = \frac{2(1-\delta)}{\delta} + \underbrace{\ln\left(\frac{qB}{2\theta(1+\bar{t}(\delta))}\right)}_{=\frac{1}{|\eta(\bar{t}(\delta))|}}, \tag{19}$$

$$\frac{\underline{t}(\delta)}{1+\underline{t}(\delta)} = \frac{2(1-\delta)}{\delta}\cdot\frac{1-\lambda/\theta}{1-2\lambda} + \underbrace{\frac{1-2\theta}{1-2\lambda}}_{=\frac{1}{|\eta(\underline{t}(\delta))|}}, \tag{20}$$

and $0.5 < \hat{\delta} < \tilde{\delta} \leq 1$ *are threshold values for the weight assigned to ordinary consumption in the SWF. Moreover,* (19) *and* (20) *are strictly decreasing in* $\delta > \hat{\delta}$*.*

Proof. See Appendix A.4. □

Proposition 3 focuses on cases where the government realistically places at least as much weight on consumption as it does on social status ($\delta \geq 1/2$). Our characterization captures a whole range of objective functions from utility maintenance ($\delta = 1/2$) to income maintenance, ($\delta = 1$), allowing for various degrees of a binding subsistence constraint.

The proposition shows that when δ is sufficiently large, the government does not suppress conspicuous consumption because it serves as a source of tax revenues that can be used to achieve an egalitarian distribution of consumption. Notably, when $\delta = 1$, namely a full weight is assigned to consumption in the welfare measure, redistribution is attained via the consumption channel, by setting the optimal tax at the Laffer rate, which maximizes the transfer offered to type-1 agents. In contrast, for δ sufficiently small, the optimum calls for suppressing signaling and achieving redistribution exclusively through the status channel (as no revenues are being raised). [11] In the range where conspicuous consumption is not suppressed, the optimal tax rate is decreasing with respect to δ. That is, as the weight placed on consumption in the welfare measure increases (the subsistence constraint becomes more binding), the optimal tax rate decreases. This serves to increase tax revenues (in this range the tax rate is set above the Laffer rate) and thereby the transfer offered to type-1 agents, and at the same time, induces an increase in the level of conspicuous consumption by type-2 agents, which renders the status distribution less egalitarian. Thus, as the weight placed on consumption increases, the policy gradually shifts from redistribution via the status channel towards redistribution through the consumption channel.

In summary, Proposition 3 highlights the novel and potentially significant role of redistribution via the status channel, in addition to the traditional income channel, when individuals are concerned about social status and engage in conspicuous consumption to signal their wealth.

According to equation (18) and for given values of δ and η, the upward adjustment to the Laffer rate required for status redistribution is smaller when the IC constraint is binding

[11] The corner solution, where redistribution occurs exclusively through the status channel, is a result of the linearity of the signaling cost. In a more general setting, the optimal policy would involve redistribution through both channels, but the status channel would always require a tax rate higher than the Laffer rate.

($\lambda \neq 0$). This is because a binding IC constraint implies an upward bias in the choice of α relative to the choice made by a type-2 agent in the absence of a type-1 mimicking threat. The smaller adjustment is due to two factors. First, a marginal reduction in α yields smaller gains in terms of status redistribution, as the effects diminish with larger values of α. Second, the base-broadening effect of the binding IC constraint makes it more effective to achieve redistributive goals through the traditional income channel.[12]

Figure 2 provides a graphical illustration of the two possible profiles of the optimal tax function $t(\delta)$, demonstrating the different adjustments of the Laffer rate depending on the binding or slack IC constraint. The two figures focus on the case where $t^* > 0$, hence the IC constraint (associated with type-2 individual optimization program) is binding for small enough values of t. Notice that the case where $t^* = 0$, in which the IC constraint is slack for all values of t, is qualitatively similar to the scenario presented in Figure 2a and is hence omitted.

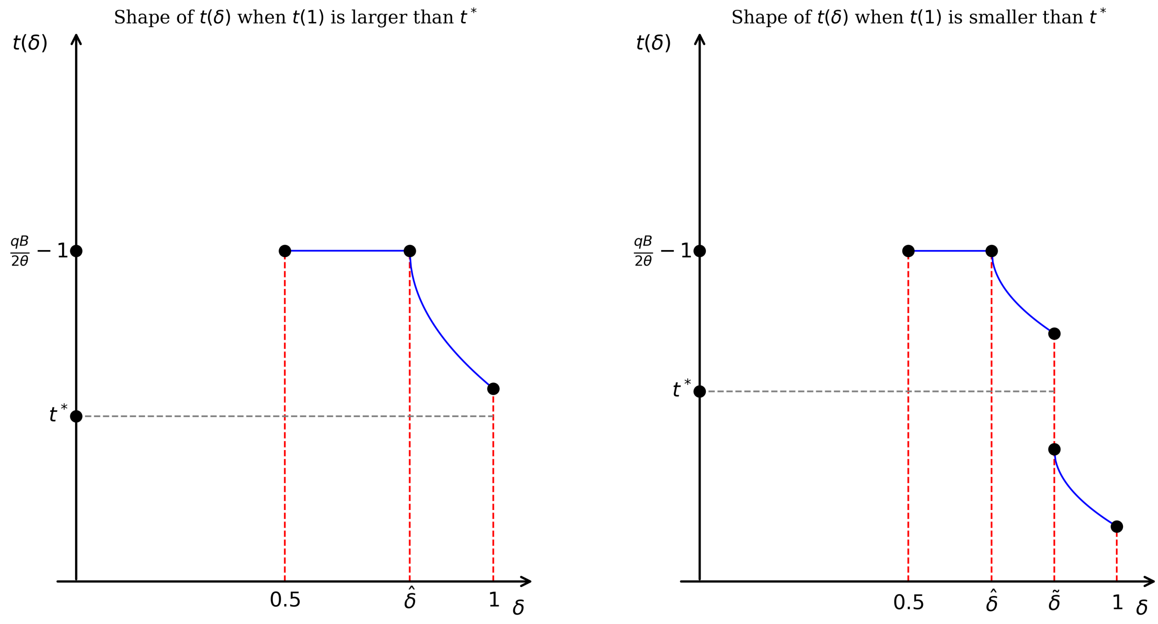

Figure 2: Illustrations of the shape of $t(\delta)$ for different values of $t(1)$.

Figure 2 highlights a crucial difference in the behavior of the optimal tax function $t(\delta)$. In the left panel of Figure 2, where $t(1) > t^*$, the function $t(\delta)$ is continuous within its range $[0.5, 1]$. It starts with a constant optimal tax rate of $\frac{qB}{2\theta} - 1$ for δ in the range $[0.5, \hat{\delta}]$. Then $t(\delta)$ decreases monotonically and continuously until it reaches its minimum for $\delta = 1$. Notice that this scenario trivially holds when $t^* = 0$, namely, the IC constraint is slack for all values of t. In contrast, in the right panel of Figure 2, where $t(1) < t^*$, the optimal tax function $t(\delta)$ has a point of discontinuity. Similar to the left panel, there is an initial range where the optimal tax rate is constant (and fully suppresses signaling). However, starting at $\delta = \hat{\delta}$,

[12]Formally, the partial derivative $\frac{\partial}{\partial \lambda}\left(\frac{1-\lambda/\theta}{1-2\lambda}\right) = \frac{2-1/\theta}{(1-2\lambda)^2} < 0$ (for $0 < \theta < 1/2$). The negative derivative implies that as λ increases from zero to positive values (corresponding to the IC constraint turning binding), the adjustment to the Laffer rate decreases.

there is a continuous and monotonically decreasing region. But instead of extending all the way to $\delta = 1$, there is a threshold, denoted $\widetilde{\delta}$, where a jump occurs. At this threshold, $t(\delta)$ jumps from a value strictly greater than t^* to a value strictly less than t^*. From there, the function follows a continuous decrease.

The presence of a discontinuous jump in the optimal tax function $t(\delta)$ indicates that, as societies become more sensitive to status differences over time, a marginal decrease in δ (i.e., an increase in the weight assigned to the status component by the government) can trigger a regime change in tax policy. This change shifts from a low-tax regime, where most redistribution occurs through the income channel, to a high-tax regime, where the focus of redistribution shifts to the status channel.

Before concluding this subsection, we present a result on the role of the difference in signaling costs between the two agents on the optimal tax rate.

Corollary 1. *The optimal tax rate is strictly decreasing in θ, which represents the cost of signaling by type 2 agents relative to the cost of signaling by type 1 agents.*

Proof. Consider the tax rates defined in Proposition 3. For $1/2 \leq \delta \leq \widehat{\delta}$, we have that $t = \frac{qB}{2\theta} - 1$ and therefore $\partial t/\partial\theta = -(1/2)qB\theta^{-2} < 0$. For $\widehat{\delta} < \delta \leq \widetilde{\delta}$, we have that $\frac{t}{1+t} = 2\frac{1-\delta}{\delta} + \ln \frac{qB}{2\theta(1+t)}$ or, equivalently, $\frac{t}{1+t} + \ln(1+t) = 2\frac{1-\delta}{\delta} + \ln qB - \ln 2\theta$; therefore, we have that $dt/d\theta = -\frac{1}{\theta}\frac{(1+t)^2}{2+t} < 0$. For $\widetilde{\delta} < \delta \leq 1$, the incentive compatibility (IC) constraint is binding and eq. (20) applies. To show that the tax rate is decreasing in θ also in this case, consider eq. (15) which provides an expression for t that is valid irrespectively of whether the IC constraint is binding or not. According to this equation,

$$\frac{t}{1+t} = \frac{1-\delta}{\delta\theta} \cdot \frac{qBe^{-q\alpha(t)}}{1+t} + \frac{1}{|\eta|}, \tag{21}$$

where $\alpha(t)$ is given by the solution to the equation $(1 - e^{-q\alpha})B = (1+t)\alpha$ when the IC constraint is binding. Since this equation does not depend on θ, we have $\partial|\eta|/\partial\theta = 0$ and $\partial\alpha(t)/\partial\theta = 0$. Since, on the right-hand side of equation (21), the only term affected by θ is $\frac{1-\delta}{\delta\theta}$, it follows that, once again, $\partial t/\partial\theta < 0$. □

Corollary 1 shows that, regardless of the tax regime, the optimal tax rate is always decreasing in θ. When the IC constraint is slack, the result is due to the fact that an increase in θ increases the elasticity of demand. In fact, looking at eq. (19), one can see that while the upward adjustment of the Laffer rate does not depend on θ, the Laffer rate $|\eta^{-1}|$ decreases in θ. Exactly the opposite happens when the IC constraint is binding. In this case, we have that while the Laffer rate does not depend on θ, the optimal upward adjustment to the Laffer rate is decreasing in θ. Intuitively, when the IC constraint is binding, an increase in θ, for a given tax rate, generates a higher amount of revenue (given by $\theta t\alpha(t)$); this makes it more attractive to redistribute through the income channel, implying that it is optimal to lower the tax rate to get closer to the Laffer rate $|\eta^{-1}|$.

The key insight of Corollary 1 is that the stronger the comparative advantage of the high ability (type 2) agents in signaling, reflected in a lower value of θ, the greater the leverage of government to increase redistribution by taxing the signaling goods.

3.3 Can luxury taxes be desirable on efficiency grounds alone?

So far, we have focused on equity considerations. In the current subsection, we provide a brief and informal discussion of the efficiency aspects of the model, emphasizing its departure from the standard signaling setups in the literature. As is often the case with pure signaling, the equilibrium allocation in our setup is typically inefficient. Here, the status surplus is fixed at B, and signaling by type-2 agents essentially amounts to rent-seeking behavior. Thus, the only (first-best) Pareto efficient allocation is the one in which type-2 agents refrain from signaling and set $\alpha = 0$. However, due to the presence of asymmetric information, intervention does not necessarily lead to a Pareto improvement over the laissez-faire allocation. That is, the unregulated market allocation may turn out to be second-best efficient. Whether the market allocation is second-best efficient depends crucially on the policy instruments available to the government.

First, suppose that the government has access to nonlinear commodity taxation. We need to distinguish between two different cases. First, suppose that in the laissez-faire equilibrium the incentive constraint of type-1 agents is not binding. In this case, a Pareto improvement can be achieved by slightly reducing the intensity of signaling (i.e., decreasing α), which induces a reduction in the utility of type-2 agents, coupled with an appropriate transfer from type-1 to type-2 agents (in units of the numeraire good y, due to the quasi-linearity of the utility function), which restores the utility of type-2 agents to the laissez-faire level. Note that since the total social surplus (the sum of the utilities of both types) increases (due to the reduction in the amount of signaling that amounts to pure rent-seeking), leaving the utility of type-2 agents unchanged would necessarily imply an increase in the utility of type-1 agents (the gain from achieving a more equitable distribution of the status surplus outweighs the utility loss due to the transfer from type-1 agents to their type-2 counterparts). Note that if we consider a small perturbation to the laissez-faire allocation, continuity would guarantee that the perturbed allocation remains incentive compatible.

Next, consider the case where the incentive constraint of the type-1 agents binds under the laissez-faire allocation. In this case, unlike the previous one, a reduction in the intensity of signaling leads to an increase in the utility of type-2 agents (and, correspondingly, in the utility derived by type-1 mimickers). To maintain incentive compatibility, the reduction in signaling intensity must be complemented by a transfer from type-2 agents to their type-1 counterparts. The overall effect on the utility derived by type-2 agents is ambiguous. Thus, it is not possible to determine unambiguously whether the utility of type-2 agents would increase, and thus a Pareto improvement would be achieved.

Now consider the linear regime of our model, in which ad valorem taxes are imposed on signaling goods, supplemented by a universal lump-sum transfer that is given to everyone.

The taxes serve to reduce the intensity of signaling. The linear regime would induce cross-subsidies from type-2 to type-1 agents.

Obviously, a Pareto improvement is not possible in the case where the incentive constraint of type-1 agents is slack under the laissez-faire allocation. The cross-subsidy flows in the 'wrong' direction. However, it is still possible to achieve a Pareto improvement if the incentive constraint is binding at $t = 0$. As explained above, in this case type-2 agents would benefit from the reduction in excessive signaling (resulting from the binding incentive constraint).[13] Whether a Pareto improvement can be achieved depends on the magnitude of the distortion caused by overconsumption of signaling goods and the degree of cross-subsidization required to maintain allocation incentive compatibility for type 1 agents.

To simplify our exposition, we have focused on a symmetric distribution of types (equal proportions of type-1 and type-2 agents). If we consider a more general distribution, then assuming that the fraction of type-1 agents is sufficiently small would imply that the required degree of cross-subsidization would be moderate (in the limit, as this fraction approaches zero, the degree of cross-subsidization would be zero).Thus, we can conclude that if the distortion associated with over-consumption of signaling goods is substantial and the fraction of type-1 agents in the population is relatively small, a Pareto improvement is feasible because the utility of type-2 agents can be increased in an incentive-compatible way. Of course, in general, a Pareto improvement may turn out to be infeasible in a linear regime.

An important novel observation follows from the above analysis, which contrasts with the traditional rationale for Pareto improvement in the presence of wasteful signaling when linear policy instruments are available.

In the traditional scenario, information content is fixed, and a separating equilibrium requires high types to spend sufficient resources on signaling to deter mimicking. This expenditure may take the form of "burning money," which is wasteful, or it may lead to higher tax payments that can be reallocated to consumption via transfers. Consequently, with common knowledge of tax parameters, paying taxes can serve as an instrumental signal, making it generally desirable to tax signals.

In contrast, in our setting signaling is not wasteful because visible consumption is required to gain status. Status depends on the quantity or variety of signaling goods purchased, not just on the amount of resources spent. Thus, it is conceivable that the laissez-faire equilibrium is second-best efficient, meaning that linear policy instruments may not yield a Pareto improvement. A Pareto improvement is never feasible when the incentive constraint of type 1 agents is slack, and it may be infeasible when it is binding.[14]

[13]The argument is similar to the role played by a binding parental leave mandate in labor markets affected by adverse selection (see, e.g., Bastani et al. 2019).

[14]Ng (1987) and Truyts (2012) explore the use of linear instruments, including confiscatory tax rates on pure signaling goods, to achieve Pareto improvements.

4 Concluding remarks

This paper has argued that social status should be taken seriously as an object of policy analysis within a welfarist social welfare framework. When individuals care about how they are perceived by others, and when those perceptions are formed through observable but imperfect signals, status becomes a scarce, socially produced surplus that affects well-being independently of material consumption. In such environments, public policy does not merely redistribute income; it also shapes the signaling equilibrium through which status is generated and allocated. Luxury and positional taxes therefore have an important equity-enhancing role, beyond their long-acknowledged revenue consequences and externality-correction implications.

Our central contribution is to make this status-redistributive channel explicit. By modeling conspicuous consumption as pure signaling under incomplete information, we show that equilibrium behavior generates a fixed aggregate status surplus that is unevenly divided between types. Commodity taxes on status goods affect not only the resource cost of signaling, but also who captures that surplus. Within a fully welfarist social welfare function that allows inequality aversion over both consumption and status, this creates a distinct normative role for commodity taxation along the status-redistributive channel, supplementing the traditional income-redistributive channel.

This perspective reshapes how luxury taxation should be understood. Much of the existing literature treats taxes on conspicuous goods as Pigouvian instruments aimed at curbing wasteful status races or internalizing positional externalities, with any distributional benefits flowing indirectly through revenue recycling. Our analysis does not displace this logic, but complements it by highlighting an additional channel: once status enters utility directly, and once policy instruments influence the information structure that determines social perceptions, luxury taxes can also be used to redistribute status itself. The optimal policy problem then involves balancing three considerations: the efficiency costs of signaling, the standard redistributive gains from revenue, and the allocation of the status surplus.

Seen in this light, our results also help clarify the scope of foundational results in optimal tax and law-and-economics theory, most notably Atkinson and Stiglitz (1976), Hylland and Zeckhauser (1979), and Kaplow and Shavell (1994). In the Atkinson and Stiglitz (1976) framework, when preferences are separable and the government has access to a nonlinear income tax, differentiated commodity taxation is redundant as a redistributive instrument. Hylland and Zeckhauser (1979) extend this logic to government programs, arguing that "distributional objectives should affect taxes but not program choice or design," because any distributive goal can be achieved more efficiently through the tax system once program benefits are expressed in income-equivalent terms. Kaplow and Shavell (1994) further generalize this reasoning to legal rules, emphasizing that both legal doctrines and commodity taxes are normatively superfluous for redistribution purposes in the presence of income taxation. A key insight shared by these contributions is that non-tax instruments should be evaluated primarily on efficiency grounds, with redistribution delegated to the tax-and-transfer system.

Our analysis builds directly on this shared insight. Like these foundational contributions, we take seriously the claim that, under appropriate assumptions, redistribution through non-tax instruments is unnecessary. The contribution of this paper is to show that when social status is modeled as a distinct component of well-being that is produced through signaling under incomplete information, those assumptions no longer fully capture the relevant policy environment. In such settings, taxes, legal rules, and government programs do more than alter resource allocations or relative prices: they also affect the visibility, interpretation, and social meaning of individuals' actions and characteristics. By doing so, they change how a fixed status surplus is generated and distributed. Because income taxation does not directly control this signaling environment, it cannot in general replicate the redistributive effects that operate through the status channel.

From this perspective, legal rules, commodity taxes, and government programs remain closely analogous instruments, exactly as emphasized by Kaplow and Shavell (1994) and by Hylland and Zeckhauser (1979). Once status is recognized as welfare-relevant, however, all three acquire an additional role alongside income taxation. Policies that affect the cost, visibility, or interpretation of behavior can redistribute not only income but also social esteem, even holding after-tax income constant. Redistribution through the status channel is therefore not redundant, but complementary to redistribution through the income tax.

This insight is particularly relevant for the design of government programs. If programs affect individuals' social visibility or expose them to stigmatizing signals, their welfare consequences cannot be fully captured by income-equivalent transfers alone. Programs should therefore not focus exclusively on resource allocation but also incorporate strategies to minimize negative exposure and stigmatization. This adds a new dimension to the concept of the "visible poor" (Blau, 1992), highlighting how program design can shape status outcomes independently of benefit levels. A prominent example is the replacement of paper food stamps with debit cards in the U.S. federal SNAP program, a reform explicitly aimed at reducing the stigma associated with program participation. By altering the observability of assistance receipt, such design choices change the signaling environment and thereby improve welfare through the status channel, even when monetary benefits remain unchanged.

Although the formal analysis in this paper focuses on uniform ad valorem taxes on status-oriented goods, the underlying insight therefore applies equally to legal rules and public programs. School uniform policies, disclosure mandates, advertising restrictions, benefit delivery mechanisms, and rules governing access to exclusive goods or services all influence the signaling environment and hence the distribution of status. Evaluating these policies solely on efficiency grounds overlooks an important channel through which they affect individual well-being.

At the same time, our approach remains firmly welfarist. We do not appeal to status equality, democratic equality, or other non-welfarist principles as independent moral values. Instead, we show how concerns about hierarchy, stigma, and social standing can be incorporated into a standard social welfare function once utility is allowed to depend on status outcomes generated by social interaction. This preserves the analytical discipline of welfarism while expanding the set of policy-relevant effects that law, taxation, and program design can generate.

Several limitations of our analysis point to directions for future research. We abstract from richer heterogeneity, from dynamic signaling, and from endogenous labor supply and savings decisions. We also assume simple policy instruments and full commitment. Extending the framework along these dimensions, and developing empirical strategies to measure how legal, fiscal, and programmatic rules affect status perceptions, would help assess the quantitative importance of the status channel in practice.

The core message, however, is general. When social status is produced through observable behavior under imperfect information, public policy inevitably affects who is perceived as high-status and at what cost. Once this channel is acknowledged, neither commodity taxes, legal rules, nor government programs can be regarded as distributively irrelevant simply because an income tax exists. Taking status seriously therefore complements, rather than challenges, foundational insights in optimal tax and law-and-economics theory, by identifying an additional redistributive margin that those frameworks have largely abstracted from.

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A Proofs and Derivations

A.1 Strict convexity of type-1 optimization problem

Formulating the constrained maximization program faced by type-1 yields:

$$\max_{0\leq\tilde{\alpha}\leq\alpha} J(\tilde{\alpha}) \equiv \left[w^1 - (1+t)\cdot\tilde{\alpha} + T\right] + e^{-q(\alpha-\tilde{\alpha})}\cdot\left[1-\frac{1}{2}\cdot e^{-q\tilde{\alpha}}\right]\cdot B \tag{A1}$$

In words, type-1, given the separating equilibrium profile of strategies, is choosing to spend on a subset of α, so as to maximize his expected utility. Notice that $e^{-q(\alpha-\tilde{\alpha})}$ measures the probability that none of the signals on which type-2 spends but type-1 refrains from spending on, $(\alpha-\tilde{\alpha})$, is visible. If at least one of these signals is visible, no surplus is derived by type-1, as, in equilibrium, all type-2 agents spend on these signals, which serve to distinguish them from their lower-type counterparts. If none of these signals is visible, the surplus derived by type-1 is given by the last term in brackets in (A1). Notably, this term is identical in structure to the second term in brackets of the objective (5), with the exception that $\tilde{\alpha}$ replaces α. That is, the relevant subset of signaling goods that identify type-2 agents is given by $\tilde{\alpha}$. Differentiating $J(\tilde{\alpha})$ with respect to $\tilde{\alpha}$ yields:

$$\frac{\partial J}{\partial \tilde{\alpha}} = -(1+t) + qB \cdot e^{-q(\alpha-\tilde{\alpha})} \tag{A2}$$

Taking the derivative one more time yields:

$$\frac{\partial^2 J}{\partial \tilde{\alpha}^2} = q^2 \cdot B \cdot e^{-q(\alpha-\tilde{\alpha})} > 0 \tag{A3}$$

Thus, $J(\tilde{\alpha})$ is strictly convex with respect to $\tilde{\alpha}$. The optimum for the maximization in (A1) is hence attained by either one of the two corner solutions: $\tilde{\alpha}=0$ or $\tilde{\alpha}=\alpha$. We conclude that constraint (IC) in program $\mathcal{P}1$ is well defined.

A.2 Proof of Proposition 1

We begin by assuming that (IC) is slack in the optimal solution to $\mathcal{P}1$. Then one can formulate the first-order condition:

$$-\theta \cdot (1+t) + \frac{B}{2} \cdot e^{-q\alpha} \cdot q = 0. \tag{A4}$$

It is straightforward to verify that the second-order condition is satisfied. Denoting by $\alpha(t)$ the optimal choice of the high type (as a function of t) given by the solution to (A4), an interior solution $0 < \alpha(t) < 1$ exists, by virtue of (7), when $1+t < \frac{qB}{2\theta}$. When $1+t \geq \frac{qB}{2\theta}$, a corner solution in which the high-type refrains from spending on the signaling goods emerges, namely, $\alpha(t) = 0$. The IC constraint (6) is not necessarily slack, however. Whether (6) is binding or not depends on parametric conditions. We separate between different cases.

Case I: $1+t \geq \frac{qB}{2\theta}$ As shown above, in this case, assuming (IC) is not violated, the optimal choice is $\alpha(t) = 0$. It is straightforward to verify that for $\alpha = 0$, the IC constraint is trivially satisfied. Thus, this forms indeed the optimal solution. Levying a sufficiently high tax on the x goods, hence, induces the high-type to refrain from engaging in any signaling. Clearly, in such a case, no tax revenues are being collected and $T = 0$. Thus, redistribution is exclusively confined to the status channel, ensuring that the low-type derives the largest possible share of the social status surplus (an expected surplus of $B/2$).

Case II: $1 + t < \frac{qB}{2\theta}$ We will separate this case into two sub-cases. We first assume that $\theta \geq 1/2$. That is, engaging in signaling is fairly costly for the high-type. As shown in Figure 3 below, which represents condition (IC) under the invoked parametric assumptions, for each t, there are two values of α for which (IC) is satisfied as equality: $\alpha_1(t) = 0$ and $0 < \alpha_2(t) < 1$.

To see that there are two values, notice that the relevant range we are considering (when IC is binding) is $1 + t < \frac{qB}{2\theta}$ where $\theta \geq 1/2$. Thus, we have that:

$$qB > 1 + t, \tag{A5}$$

Consider Figure 3.

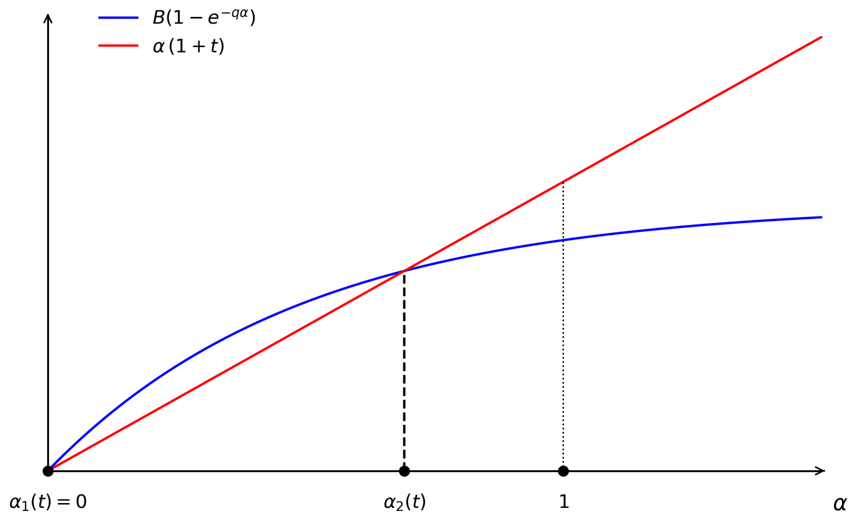

Figure 3: Illustration of the IC constraint (6) for a given t.

Differentiating the left-hand-side of (IC) with respect to α and taking the limit when $\alpha \to 0$ yields:

$$\lim_{\alpha \to 0} \frac{\partial}{\partial \alpha} \left(1 - e^{-q\alpha}\right) \cdot B = qB > 1 + t. \tag{A6}$$

Thus, by virtue of (A6), as (IC) is satisfied as equality for $\alpha = 0$, by invoking a first-order approximation, it follows that for sufficiently small $\alpha > 0$ the left hand side expression of (IC) is strictly exceeding the RHS and hence (IC) is violated. Taking the limit as $\alpha \to 1$ implies that the LHS of (IC) is given by:

$$\lim_{\alpha \to 1} \left(1 - e^{-q\alpha}\right) \cdot B = \left(1 - e^{-q}\right) \cdot B < 1 < 1 + t. \tag{A7}$$

where the first inequality follows from (7). Thus, for sufficiently high $\alpha > 0$, the RHS of (IC) is strictly exceeding the LHS and, hence, (IC) is satisfied as a strict inequality. By virtue of the intermediate value theorem, hence, there exists some $0 < \alpha < 1$ for which (IC) is satisfied as an equality. The strict concavity (with respect to α) of the left-hand side expression of (IC), which can be readily verified, along with the linearity of the RHS expression, imply that this value of α is unique.

Let us now go back to Figure 3. The red line represents the RHS of (6), whereas, the blue curve represents the LHS. For $\alpha > \alpha_2(t)$, (IC) is satisfied as a strict inequality, and for $0 < \alpha < \alpha_2(t)$, (IC) is violated. We next show that the interior (unconstrained) solution $\alpha(t)$ to the first order condition (A4) violates (IC), that is, $0 < \alpha(t) < \alpha_2(t)$, which implies that the optimal solution is either given by $\alpha_1(t)$ or $\alpha_2(t)$.

To show that $0 < \alpha(t) < \alpha_2(t)$, we exploit (A4) and re-arrange to obtain:

$$q \cdot \alpha(t) = -\ln \frac{2\theta \cdot (1+t)}{qB}. \tag{A8}$$

Insertion of (A8) into (IC) given by (6) allows us to express (IC) as follows:

$$H(t) \equiv (1+t) \ln \frac{2\theta \cdot (1+t)}{qB} + qB - 2\theta \cdot (1+t) \leq 0. \tag{A9}$$

It follows immediately that for $1+t = \frac{qB}{2\theta}$, $H(t) = 0$. Thus, to show that (IC) is violated for $1+t < \frac{qB}{2\theta}$, it suffices to show that $\frac{dH(t)}{dt} < 0$ in this range. We have that:

$$\frac{dH(t)}{dt} = \ln \frac{2\theta \cdot (1+t)}{qB} + 1 - 2\theta < 0, \tag{A10}$$

where the inequality follows as $1+t < \frac{qB}{2\theta}$ and the assumption that $\theta \geq \frac{1}{2}$. Thus, $H(t) > 0$ and (IC) is violated in the unconstrained optimum for $1+t < \frac{qB}{2\theta}$. It follows that in the optimal solution, (IC) is binding and the optimal solution is either given by $\alpha_1(t) = 0$ or $0 < \alpha_2(t) < 1$. We can compare the two candidates for the optimal solution by plugging them into the objective function (5). Denoting $\bar{w} \equiv w^2 + T$:

$$V(\alpha_1) = \bar{w} + B/2 \tag{A11}$$
$$V(\alpha_2) = \bar{w} + B \cdot (1-\theta) + B \cdot e^{-q\alpha_2} \cdot (\theta - 1/2). \tag{A12}$$

For $\theta = 1/2$, we have that $V(\alpha_1) = V(\alpha_2)$. Differentiating $V(\alpha_2)$ with respect to θ yields:

$$\frac{\partial V(\alpha_2)}{\partial \theta} = (e^{-q\alpha_2} - 1) \cdot B < 0, \quad \text{as} \quad \alpha_2 > 0. \tag{A13}$$

It follows that $V(\alpha_1) > V(\alpha_2)$ for $\theta > 1/2$. Hence, for any $t < \frac{qB}{2\theta} - 1$ and $\theta \geq 1/2$, the optimal solution is given by: $\alpha(t) = 0$.

We next consider $H(t)$ for the case $\theta < 1/2$. We make the following observations:

- $H(t) = 0$ when $1+t = \frac{qB}{2\theta}$ (as above, by virtue of equation A9)
- $\frac{dH(t)}{dt} > 0$ when $1+t = \frac{qB}{2\theta}$ since $\theta < 1/2$ (by virtue of equation A10)
- $\frac{d^2H(t)}{dt^2} = \frac{1}{1+t} > 0$ for all $1+t \leq \frac{qB}{2\theta}$ implying that $H(t)$ is strictly convex.

We will now consider two separate cases. Assume first that $H(0) > 0$. The properties of $H(t)$ imply that there exists a unique $t^* \in (0, \frac{qB}{2\theta} - 1)$, such that $H(t) \leq 0$ (and hence IC is satisfied) for $t \in [t^*, \frac{qB}{2\theta} - 1)$, whereas $H(t) > 0$ (and hence IC is violated) for $t \in [0, t^*)$. To see this formally, notice that as $H(t) = 0$ and $\frac{dH(t)}{dt} > 0$ when $1 + t = \frac{qB}{2\theta}$, by applying a first-order approximation, it follows that for t smaller than but sufficiently close to $\frac{qB}{2\theta} - 1$, $H(t) < 0$. As $H(0) > 0$, it follows by the Intermediate Value Theorem that t^* exists. Uniqueness follows from the strict convexity of $H(t)$. $H(t)$ is illustrated in Figure 4 below.

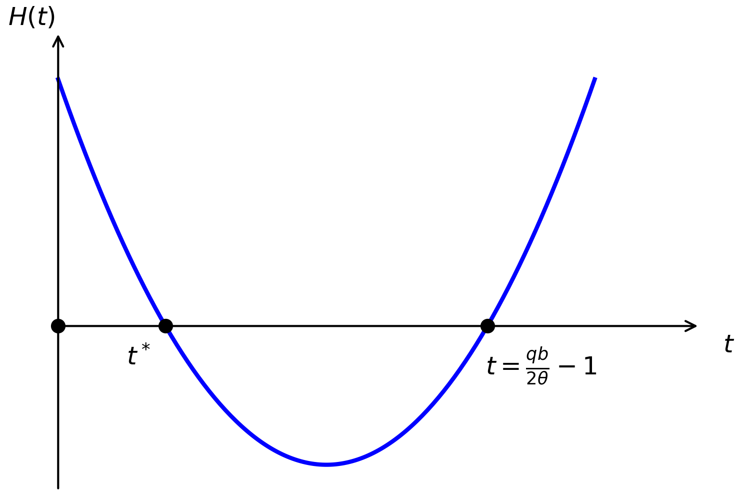

Figure 4: An illustration of $H(t)$ when $\theta < 1/2$. This is the IC constraint as a function of t when the first-order condition holds.

We conclude that for $t \in [t^*, \frac{qB}{2\theta} - 1)$, the optimal solution is given by condition (A4), which upon re-arrangement yields $\alpha(t) = -\frac{1}{q} \ln \frac{2\theta \cdot (1+t)}{qB}$, whereas for $t \in [0, t^*)$, the optimum is given by a solution to the binding incentive constraint (6). As before, there are two possibilities for this constraint to bind, either $\alpha_1(t) = 0$ or $0 < \alpha_2(t) < 1$. To see this, notice that the relevant range we are considering (when IC is binding) is $t \in [0, t^*)$. By definition of t^* (see Figure 4) we have that:

$$H(t^*) \equiv (1 + t^*) \ln \frac{2\theta \cdot (1 + t^*)}{qB} + qB - 2\theta \cdot (1 + t^*) = 0. \tag{A14}$$

Moreover,

$$\left. \frac{dH(t)}{dt} \right|_{t=t^*} = \ln \frac{2\theta \cdot (1 + t^*)}{qB} + 1 - 2\theta < 0. \tag{A15}$$

Substituting for $\ln \frac{2\theta \cdot (1+t^*)}{qB}$ from (A14) into (A15) yields upon re-arrangement:

$$qB > 1 + t^* \implies qB > 1 + t \quad \text{for} \quad t < t^*. \tag{A16}$$

Having established this, we can proceed in an identical fashion as for the case $\theta \geq 1/2$.

The level of the objective in each case is again given by equations (A11) and (A12). The difference now is that $\theta < 1/2$. Exploiting (A13), we conclude that $V(\alpha_2) > V(\alpha_1)$. Hence, for $\theta < 1/2$, the optimal solution is given by: $\alpha(t) = \alpha_2(t) > 0$ when $0 \leq t < t^*$.

Consider next the case where $H(0) \leq 0$. It follows, by virtue of the properties of the function $H(t)$ (see figure 4), that the IC constraint is necessarily slack over the entire range, hence for all $t \in (0, \frac{qB}{2\theta} - 1)$, the optimal solution is given by condition (A4).

A.3 Proof of Proposition 2

By virtue of Proposition 1, there exists a threshold, $t^* \geq 0$, such that for $t \in [t^*, \frac{qB}{2\theta} - 1]$, the IC constraint is slack, and $\alpha(t)$ is given by the unconstrained demand function $\alpha(t) = \frac{1}{q} \ln \frac{qB}{2\theta(1+t)}$. Hence, we have that $\alpha'(t) = -[q(1+t)]^{-1}$ and:

$$\frac{1}{|\eta|} = \ln \frac{qB}{2\theta(1+t)}. \tag{A17}$$

Furthermore, when $t^* > 0$, the IC constraint is binding for $t \in [0, t^*)$, and $\alpha(t)$ is dictated by the binding IC constraint, implying that $(1+t)\alpha = (1 - e^{-q\alpha})B$ and $\alpha'(t) = -\frac{\alpha}{1+t-qBe^{-q\alpha}}$. It hence follows that

$$\frac{1}{|\eta|} = 1 - \frac{qBe^{-q\alpha}}{1+t},$$

or equivalently, exploiting (17),

$$\frac{1}{|\eta|} = 1 - 2\frac{\theta - \lambda}{1 - 2\lambda} = \frac{1 - 2\theta}{1 - 2\lambda}. \tag{A18}$$

Recall that t^*, when bounded away from zero, is the threshold value for t that separates the region where the IC constraint is binding ($t < t^*$) from the region where it is slack ($t > t^*$). It hence satisfies the following equations:

$$\begin{aligned} (1+t)\alpha &= (1 - e^{-q\alpha})B, \\ \alpha &= \frac{1}{q} \ln \frac{qB}{2\theta(1+t)}, \end{aligned}$$

where the first equation states the IC constraint as an equality and the second equation provides the unconstrained optimal choice for α by a high-type individual. Combining these equations, we thus have that t^* is implicitly given by the following condition:

$$(1+t)\left[2\theta + \ln \frac{qB}{2\theta} - \ln(1+t)\right] = qB. \tag{A19}$$

As we have shown in the Proof of Proposition 1, when t^* is strictly positive, for $t \in (0, t^*)$ the LHS of (A19) is smaller than its RHS, and vice versa for $t \in \left(t^*, \frac{qB}{2\theta} - 1\right)$. Consider now the value of $\frac{1}{|\eta|}$ when t approaches t^* from the left (IC constraint is binding) and from the right (IC constraint is slack). When t approaches t^* from the left, we have that (see expression

(A18)) $\frac{1}{|\eta|} = 1-2\theta$ (i.e., $\lim_{t\to t^{*-}} \frac{1}{|\eta|} = \lim_{\lambda\to 0} \frac{1-2\theta}{1-2\lambda} = 1-2\theta$). Now consider (A17) and evaluate at which level for t we get that $\frac{1}{|\eta|} = 1-2\theta$. Solving the equation

$$\ln \frac{qB}{2\theta} - \ln(1+t) = 1-2\theta,$$

we get

$$t = -1 + \frac{qB}{2\theta} e^{2\theta-1} \equiv \hat{t}. \tag{A20}$$

Notice that, inserting into (A19) the value for t provided by (A20), the LHS of (A19) boils down to $\frac{qB}{2\theta} e^{2\theta-1}$, which is a decreasing function of θ (under our assumption that $0 < \theta < 1/2$). Given that $\lim_{\theta\to 1/2} \frac{qB}{2\theta} e^{2\theta-1} = qB$, we have that, for $0 < \theta < 1/2$, the LHS of (A19) is larger than its RHS when $t = -1 + \frac{qB}{2\theta} e^{2\theta-1}$. Thus, the IC constraint is slack for $t = -1 + \frac{qB}{2\theta} e^{2\theta-1}$, which implies that $-1 + \frac{qB}{2\theta} e^{2\theta-1} > t^*$. Moreover, given that the RHS of (A17) is a decreasing function of t, it also follows that $\lim_{t\to t^{*+}} \frac{1}{|\eta|} > 1-2\theta$. We can then conclude that

$$\lim_{t\to t^{*-}} \frac{1}{|\eta|} = 1-2\theta < \lim_{t\to t^{*+}} \frac{1}{|\eta|},$$

i.e., the function $\frac{1}{|\eta|}$ is discontinuous at $t = t^*$. Regarding the shape of $\frac{1}{|\eta|}$ for $t \in (0, t^*)$, i.e. when the IC constraint is binding, rearranging (16) we have that

$$\lambda = \frac{(1+t)(q\alpha + 2\theta) - qB}{2[(1+t)(1+q\alpha) - qB]}, \tag{A21}$$

from which we obtain that

$$\begin{aligned} \frac{\partial\lambda}{\partial t} &= \frac{2[(1+t)(1+q\alpha) - qB]\left[q\alpha + 2\theta + (1+t)q\frac{\partial\alpha}{\partial t}\right]}{4[(1+t)(1+q\alpha) - qB]^2} \\ &\quad - \frac{2[(1+t)(q\alpha+2\theta) - qB]\left[1 + q\alpha + (1+t)q\frac{\partial\alpha}{\partial t}\right]}{4[(1+t)(1+q\alpha) - qB]^2}. \end{aligned} \tag{A22}$$

Taking into account that $\alpha'(t) = -\frac{\alpha}{1+t-qBe^{-q\alpha}}$ for $t \in (0, t^*)$, eq. (A22) can be simplified to obtain

$$\begin{aligned} \frac{\partial\lambda}{\partial t} &= \frac{(1+t-qB)[\alpha(1+t) - B]}{2[(1+t)(1+q\alpha) - qB]^2} \frac{(1-2\theta)q}{qB - (1+q\alpha)(1+t)} \\ &= \frac{(1-2\theta)(1+t-qB)[\alpha(1+t) - B]q}{2[qB - (1+t)(1+q\alpha)]^3}. \end{aligned} \tag{A23}$$

Given that $1-2\theta > 0$ (by assumption), $1+t-qB < 0$ (a necessary condition for the IC constraint to be binding), $\alpha(1+t) - B < 0$ (since a binding IC constraint requires that $(1+t)\alpha - B = -Be^{-q\alpha}$), and $qB - (1+q\alpha)(1+t) < 0$ (since $\alpha'(t) = \frac{\alpha}{qB-(1+q\alpha)(1+t)}$ and we know that $\alpha'(t) < 0$), it follows from (A23) that $\frac{\partial\lambda}{\partial t} < 0$. Therefore, it also follows (see

(A18)) that $|\eta|^{-1}$ is a monotonically decreasing function for $t \in (0, t^*)$.

A.4 Proof of Proposition 3

Throughout the proof, we rely heavily on the first-order condition for the government optimization program. By virtue of Proposition 2, when the IC constraint is slack, the first-order condition (18) can be rewritten as:

$$\frac{t}{1+t} = 2\frac{1-\delta}{\delta} + \ln \frac{qB}{2\theta(1+t)} \tag{A24}$$

In contrast, when the IC constraint is binding, by virtue of Proposition 2, the first-order condition (18) can be rewritten as:

$$\frac{t}{1+t} = 2\frac{1-\delta}{\delta}\frac{1-\lambda/\theta}{1-2\lambda} + \frac{1-2\theta}{1-2\lambda}. \tag{A25}$$

We will separate the proof into two cases depending on whether the IC constraint binds for some values of t.

Case I: $t^* > 0$ Consider first the case where $t^* > 0$, implying that the IC constraint binds for $0 < t < t^*$. A preliminary result that will prove useful in the characterization is stated in the following lemma:

Lemma 1. *The right-hand side of* (A25) *is either monotonically decreasing or monotonically increasing in t when, respectively, $\delta > (1+\theta)^{-1}$ or $\delta < (1+\theta)^{-1}$. Moreover, in the case $\delta \leq (1+\theta)^{-1}$, the optimal value of t (weakly) exceeds t^*.*

Proof. We have that

$$\begin{aligned}
\frac{\partial\left(2\frac{1-\delta}{\delta}\frac{1-\lambda/\theta}{1-2\lambda} + \frac{1-2\theta}{1-2\lambda}\right)}{\partial t} &= \left[2\frac{1-\delta}{\delta}\frac{-(1-2\lambda)\frac{1}{\theta} + 2(1-\lambda/\theta)}{(1-2\lambda)^2} + \frac{2(1-2\theta)}{(1-2\lambda)^2}\right]\frac{\partial\lambda}{\partial t} \\
&= \left[-2\frac{1-\delta}{\delta\theta}\frac{1-2\theta}{(1-2\lambda)^2} + 2\frac{1-2\theta}{(1-2\lambda)^2}\right]\frac{\partial\lambda}{\partial t} \\
&= 2\frac{1-2\theta}{(1-2\lambda)^2}\left(1 - \frac{1-\delta}{\delta\theta}\right)\frac{\partial\lambda}{\partial t} \\
&= -2\frac{1-2\theta}{(1-2\lambda)^2}\frac{1-\delta-\delta\theta}{\delta\theta}\frac{\partial\lambda}{\partial t}.
\end{aligned}$$

We know that $1-2\theta > 0$ (by assumption) and that $\frac{\partial\lambda}{\partial t} < 0$. Thus, we have that

$$\operatorname{sign}\left\{\frac{\partial\left(2\frac{1-\delta}{\delta}\frac{1-\lambda/\theta}{1-2\lambda} + \frac{1-2\theta}{1-2\lambda}\right)}{\partial t}\right\} = \operatorname{sign}\{1-\delta-\delta\theta\}. \tag{A26}$$

From the first-order condition (14) of the government's problem, we have that

$$t = \frac{1-\delta}{\delta}\frac{qB}{\theta}e^{-q\alpha} - \frac{\alpha}{\alpha'}. \tag{A27}$$

Assuming that the IC constraint is binding, we have that $qBe^{-q\alpha} = qB - (1+t)q\alpha$ and $\alpha/\alpha' = qB - (1+q\alpha)(1+t)$, and therefore we can rewrite (A27) as

$$t = \frac{1-\delta}{\delta\theta}\left[-(1+t)q\alpha + qB\right] - qB + (1+q\alpha)(1+t),$$

which, after some algebraic manipulations, gives us

$$t = \frac{\delta\theta}{(1-\delta-\delta\theta)q\alpha} + \frac{B}{\alpha} - 1. \tag{A28}$$

Thus,

$$\alpha(1+t) = \frac{\delta\theta}{(1-\delta-\delta\theta)q} + B.$$

Given that a binding IC constraint requires that $\alpha(1+t) = (1-e^{-q\alpha})B$, we can rewrite this as

$$-Be^{-q\alpha} = \frac{\delta\theta}{(1-\delta-\delta\theta)q},$$

which yields

$$\alpha = \frac{1}{q}\ln\frac{(-1+\delta+\delta\theta)qB}{\delta\theta}. \tag{A29}$$

Substituting this value of α in (A28), we get

$$t = \frac{\delta\theta}{(1-\delta-\delta\theta)\ln\frac{(-1+\delta+\delta\theta)qB}{\delta\theta}} + \frac{qB}{\ln\frac{(-1+\delta+\delta\theta)qB}{\delta\theta}} - 1. \tag{A30}$$

The equation above gives the optimal value of t as a function of the various parameters when α is implicitly given by the equation $\alpha(1+t) = (1-e^{-q\alpha})B$. Notice that a necessary condition for α, as defined by (A29), to be positive is that $1-\delta-\delta\theta < 0$, i.e., $\delta > (1+\theta)^{-1}$. Thus, a necessary (but not sufficient) condition for the first-order condition of the government's problem to be satisfied for $t \in (0, t^*)$ is that $1-\delta-\delta\theta < 0$. □

Next, we establish the solution for the government optimization program.

Lemma 2. *The government optimization program has a well-defined solution for all δ.*

Proof. The solution for the government optimization program is given either by an interior solution, $0 < t < qB/2\theta - 1$, or by a corner solution (which suppresses signaling altogether, i.e., $\alpha(t) = 0$), $t = qB/2\theta - 1$. Notice that conditions (A24) and (A25) represent the candidate interior solutions (given by the first-order conditions of the government optimization program) associated with the scenarios where the IC constraint is slack or binding, respectively. When the (LHS) expressions of (A24) and (A25) are smaller than the corresponding

RHS expressions, an increase in t induces an increase in social welfare and vice versa. It is straightforward to verify that the RHS of (A24) is decreasing in t. By virtue of Lemma 1, the RHS of (A25), provided that (A25) has a feasible solution ($t < t^*$), is also decreasing in t. As the LHS of (A24) and (A25) are both increasing in t, the interior solutions for (A24) and (A25), if they exist, define local optima (which may constitute the social optimum). Notice that there is also a possibility for a corner solution in which for all $t < t^*$, the RHS of (A25) exceeds its LHS and, for all $t^* \leq t < qB/2\theta - 1$, the RHS of (A24) exceeds its LHS, in which case social welfare is increasing in t over the entire range and the social optimum is given by $t = qB/2\theta - 1$. Due to the kinked demand for status goods (as the IC constraint may be either binding or slack for different tax rates), there is a possibility for multiple local optima associated with the range in which the IC constraint binds ($t < t^*$), which is necessarily an interior solution, and the range in which it is slack ($t \geq t^*$), which is either an interior or a corner solution. When multiple local optima emerge (there could be at most two such optima as the RHS of (A24) and (A25) decrease in t whereas their respective LHS increase in t), the one which yields a higher level of social welfare constitutes the social optimum. The existence of a solution for all δ can be proved by negation. To see this, assume that for some δ no solution exists for the government maximization program. Then, for this value of δ, (A25) has no feasible solution, and hence, as the LHS of (A25) is smaller than its RHS at $t = 0$, it necessarily follows that for $t \to t^{*-}$, the LHS of (A25) is smaller than its RHS. Due to the discontinuity at $t = t^*$, the RHS of (A24) at $t = t^*$ is larger than the RHS of (A25) at $t \to t^{*-}$ and is hence larger than the LHS of (A24) at $t = t^*$. As the RHS of (A24) is decreasing in t, whereas its LHS is increasing in t, there are two possibilities to consider: either the LHS of (A24) is larger than its RHS at $t = qB/2\theta - 1$, in which case by continuity a (unique) solution for (A24) exists; or the LHS of (A24) is (weakly) smaller than its RHS at $t = qB/2\theta - 1$, in which case a corner solution is obtained where $t = qB/2\theta - 1$. We therefore obtain the desired contradiction. □

We turn next to show that for values of δ sufficiently small the optimal solution is given by a corner solution.

Lemma 3. *For* $\delta \leq \min\left(\frac{2qB}{3qB-2\theta}, (1+\theta)^{-1}\right)$, $t(\delta) = qB/2\theta - 1$, *which implies that* $\alpha(t) = 0$.

Proof. Suppose that $\delta \leq \min\left(\frac{2qB}{3qB-2\theta}, (1+\theta)^{-1}\right)$. By virtue of Lemma 1, the optimal solution satisfies $t(\delta) \geq t^*$. We hence focus on the first-order condition associated with the case where the IC constraint is slack, given by (A24). Substituting $\delta = \frac{2qB}{3qB-2\theta}$ into the RHS of (A24) yields that $\bar{t}(\delta) = \frac{qB}{2\theta} - 1$, the tax rate which suppresses signaling altogether ($\alpha(t) = 0$). As the RHS of (A24) is decreasing in t, whereas its LHS is increasing in t, it follows that over the range $t^* \leq t < qB/2\theta - 1$, the RHS of (A24) is larger than its LHS; hence social welfare increases in t. Further notice that the RHS of (A24) is decreasing in δ. It follows that the RHS of (A24) is larger than its LHS for all $\delta < \frac{2qB}{3qB-2\theta}$ and $t^* \leq t < qB/2\theta - 1$. The optimum is given by a corner solution, hence, for all $\delta \leq \min\left(\frac{2qB}{3qB-2\theta}, (1+\theta)^{-1}\right)$ as needed. □

We next show that the set of values of δ for which the social optimum is given by an interior solution in the range $0 \le t < t^*$, if the set is non-empty, is connected.

Lemma 4. *If for some δ' the social optimum is given by the solution for (A25), then for all $\delta > \delta'$, the social optimum will be given by the solution for (A25).*

Proof. We need to separate between two different cases. One possibility is that a local optimum associated with δ' in the range $t^* \le t \le qB/2\theta - 1$ exists. This local optimum may be either given by an interior or a corner solution. Another possibility is that no local optimum in the range exists, in which case the LHS of (A24) is larger than its RHS for all $t^* \le t < qB/2\theta - 1$. The interior solution for (A25) associated with δ' (which constitutes by presumption the social optimum) is given by $\underline{t}(\delta')$. Suppose first that a local optimum in the range $t^* \le t \le qB/2\theta - 1$, associated with δ', exists. Denote this local optimum by $\bar{t}(\delta')$, which is given either by a solution to (A24) or by $t = qB/2\theta - 1$, depending on whether there is an interior or a corner solution. By definition of the two local optima, it follows that $\bar{t}(\delta') > \underline{t}(\delta') > 0$. As $\alpha'(t) < 0$ for all $0 \le t < qB/2\theta - 1$, it further follows that $0 \le \alpha[\bar{t}(\delta')] < \alpha[\underline{t}(\delta')]$, where $\alpha[\bar{t}(\delta')] = 0$ in the case of a corner solution and is strictly positive otherwise. The social welfare is given by:

$$W[\delta, t(\delta)] = \delta \cdot \left[w^1 + \frac{1}{2} \cdot \theta \cdot \alpha[t(\delta)] \cdot t(\delta)\right] + (1-\delta) \cdot \left[\frac{1}{2} \cdot e^{-q\alpha[t(\delta)]} \cdot B\right]$$

By our presumption $W[\delta', \underline{t}(\delta')] > W[\delta', \bar{t}(\delta')]$. It hence follows, as $\alpha[\bar{t}(\delta')] < \alpha[\underline{t}(\delta')]$, that $\alpha[\underline{t}(\delta')] \cdot \underline{t}(\delta') > \alpha[\bar{t}(\delta')] \cdot \bar{t}(\delta')$. Differentiation with respect to δ', employing the envelope theorem (which trivially holds under a corner solution), yields:

$$\frac{\partial \left\{W[\delta', \underline{t}(\delta')] - W[\delta', \bar{t}(\delta')]\right\}}{\partial \delta'} = \frac{1}{2} \cdot \theta \cdot \left[\alpha[\underline{t}(\delta')] \cdot \underline{t}(\delta') - \alpha[\bar{t}(\delta')] \cdot \bar{t}(\delta')\right] - \frac{1}{2} \cdot B \cdot \left[e^{-q\alpha[\underline{t}(\delta')]} - e^{-q\alpha[\bar{t}(\delta')]}\right] > 0$$

Thus, for larger values of δ, the local optimum in the range $0 \le t < t^*$ continues to form the social optimum. Suppose next that a local optimum in the range $t^* \le t \le qB/2\theta - 1$, associated with δ', does not exist. Thus, the LHS of (A24) is larger than its RHS for all $t^* < t \le qB/2\theta - 1$. As the RHS of (A24) is strictly decreasing in δ, it follows that for any $\delta > \delta'$, the LHS of (A24) would be larger than its RHS for all $t^* < t \le qB/2\theta - 1$. The only local optimum is in the range $0 \le t < t^*$, hence it constitutes the social optimum. □

The next lemma proves that for values of δ sufficiently large, the social optimum is given by an interior solution.

Lemma 5. *For $\delta > \frac{2qB}{3qB - 2\theta}$, $0 < t(\delta) < qB/2\theta - 1$.*

Proof. As $\delta > \frac{2qB}{3qB - 2\theta}$, the RHS of (A24) is smaller than its LHS at $t = qB/2\theta - 1$. A corner solution is suboptimal; hence one can reduce t slightly below $t = qB/2\theta - 1$ and increase social welfare. By virtue of Lemma 2, the government optimization program has a well-defined solution, which is hence necessarily an interior solution. □

By virtue of Lemmas 1–5, one can establish the following lemma:

Lemma 6. *If $t^* > 0$, there exist threshold levels, $0.5 < \hat{\delta} < 1$ and $\hat{\delta} \leq \tilde{\delta} \leq 1$, such that the optimal solution for the government problem is given by: (i) a corner solution if $0.5 \leq \delta \leq \hat{\delta}$; (ii) an interior solution given by (A24) if $\hat{\delta} < \delta \leq \tilde{\delta}$; (iii) an interior solution given by (A25) if $\tilde{\delta} < \delta \leq 1$.*

Proof. Suppose first that for some δ' the social optimum is given by the solution for (A25). Then there is a connected set $[\underline{\delta}, 1]$, where $\underline{\delta} > \min\left(\frac{2qB}{3qB-2\theta}, (1+\theta)^{-1}\right)$, such that the social optimum is given by a solution to (A25) if and only if $\delta \in [\underline{\delta}, 1]$. If $\underline{\delta} \leq \frac{2qB}{3qB-2\theta}$, then for all $\delta < \underline{\delta}$ the social optimum is given by a corner solution. To see this, notice that for $\delta < \underline{\delta} \leq \frac{2qB}{3qB-2\theta}$, the RHS of (A24) is larger than its LHS at $t = qB/2\theta - 1$. As the RHS of (A24) is decreasing in t, whereas the LHS of (A24) is increasing in t for all $t^* \leq t < qB/2\theta - 1$, there is clearly no interior solution in the range $t^* \leq t < qB/2\theta - 1$. As by construction, for $\delta < \underline{\delta}$ there exists no interior solution in the range $0 \leq t < t^*$, it follows that the social optimum for all $\delta < \underline{\delta}$, which exists by Lemma 2, is necessarily a corner solution. If instead $\underline{\delta} > \frac{2qB}{3qB-2\theta}$, then within the range $(\frac{2qB}{3qB-2\theta}, \underline{\delta})$ the social optimum (which cannot be a solution for (A25) by construction, or a corner solution by virtue of Lemma 5) is given by a solution for (A24). In the range $\delta \leq \frac{2qB}{3qB-2\theta}$, the social optimum is given by a corner solution (replicating the arguments used above). Suppose alternatively that there exists no δ for which the social optimum is given by a solution for (A25), hence the only possibilities are a solution for (A24) or a corner solution. This scenario is equivalent to setting $\underline{\delta} = 1$, hence one can replicate the same arguments and establish that the social optimum is given by the solution for (A24) for $\delta > \frac{2qB}{3qB-2\theta}$ and a corner solution otherwise. This completes the proof. □

Our next lemma shows that in the case where $t^* > 0$, the set of values of δ for which the social optimum is given by a solution for (A24) is non-empty.

Lemma 7. *If $t^* > 0$, then $\tilde{\delta} > \hat{\delta}$.*

Proof. To prove the lemma, it suffices to show that a solution for (A25) and a corner solution cannot co-exist. Hence by continuity, the social optimum will shift from a corner solution to an interior solution given by (A24) in response to a slight increase of δ from $\hat{\delta}$. Assume by negation that two such local optima co-exist: a corner solution and an interior solution given by (A25). By virtue of Lemma 1, the existence of a solution for (A25) implies that for $t \to t^{*-}$, the LHS of (A25) is larger than its RHS. Formally, noting that for $t \to t^{*-}$, $\lambda(t) \to 0$, taking the limit of both sides of (A25) yields the following expression:

$$\frac{t^*}{1+t^*} > \frac{2(1-\delta)}{\delta} + (1-2\theta) \tag{A31}$$

By virtue of Lemma 5, the existence of a corner solution implies that the following condition holds:

$$\delta \leq \frac{2qB}{3qB - 2\theta} \tag{A32}$$

As $0 < t^* < qB/2\theta - 1$ and $t/(1+t)$ is increasing in t, it follows that:

$$\frac{t^*}{1+t^*} < \frac{qB/2\theta - 1}{qB/2\theta} = 1 - \frac{2\theta}{qB} \tag{A33}$$

Employing the previous inequality hence implies that:

$$1 - \frac{2\theta}{qB} > \frac{2(1-\delta)}{\delta} + (1 - 2\theta) \tag{A34}$$

which upon re-arrangement yields:

$$\delta > \frac{qB}{qB \cdot (1+\theta) - \theta} \tag{A35}$$

Combining the two previous conditions, (A32) and (A35), then yields:

$$\frac{2qB}{3qB - 2\theta} > \frac{qB}{qB \cdot (1+\theta) - \theta} \tag{A36}$$

which upon re-arrangement yields:

$$\theta > 1/2 \tag{A37}$$

We have therefore obtained the desired contradiction as $\theta < 1/2$ by presumption. □

This concludes the proof for the case where $t^* > 0$. We turn next to the case where the IC constraint is slack throughout the entire range.

Case II: $t^* = 0$ Consider the case where $t^* = 0$, in which the only possible social optima are given by a solution for (A24) or a corner solution. The following lemma concludes our proof.

Lemma 8. *If $t^* = 0$, the social optimum is given by a corner solution for $\delta \leq \hat{\delta} \equiv \frac{2qB}{3qB - 2\theta}$ and by an interior solution given by* (A24) *otherwise.*

Proof. Invoking the same arguments as those used in the proof of Lemma 6 in the scenario where a solution for (A25) is infeasible, the social optimum is given by a corner solution if $\delta \leq \frac{2qB}{3qB - 2\theta}$ and by a solution for (A24) otherwise. □

Finally, we turn to show that the optimal (interior) solution is strictly decreasing in δ.

Lemma 9. *$t(\delta)$ is strictly decreasing with respect to δ for all $\delta > \hat{\delta}$.*

Proof. When $\delta > \hat{\delta}$, an interior solution exists, which is given either by (A24) or (A25). The LHS of (A24) and the LHS of (A25) are both increasing in t, whereas, the RHS of (A24), and, by virtue of Lemma 1, the RHS of (A25), are both decreasing in t. The lemma then follows by noting that both the RHS of (A24) and that of (A25) are decreasing in δ. □

This completes the proof. QED

B The status production function and tax differentiation

In our present analysis, for the sake of clarity and simplicity, we have made the assumption that all signaling goods exhibit symmetry in terms of their acquisition costs, visibility, and benefits derived from status. However, it is possible to extend the model and consider certain asymmetries. One approach to achieve this while maintaining tractability is to introduce a status-production technology that demonstrates perfect substitutability.

Consider a scenario where we have two distinct categories of signaling goods denoted as x_{ki}, where i ranges from 1 to n_k and k takes values of 1 or 2. Each category corresponds to a particular group of agents: for instance, category $k = 1$ may pertain to colleagues in a professional setting, while category $k = 2$ could be aimed at friends or relatives. The visibility parameters for each category are given by q_k/n_k, and the unit costs are denoted as θ_k/n_k. It is worth noting that these parameters are specific to their respective categories. Within this framework, it is also possible for the benefits derived from signaling to differ between the two groups, potentially due to inherent variations or disparities in group sizes. Let us denote the benefit associated with group k as B_k.

Under the assumption of separable technology, the status obtained by type-2 agents can be expressed as:

$$Status^2(\alpha_1, \alpha_2) = \sum_{k=1}^{2} \left[1 - \frac{1}{2} \cdot e^{-\alpha_k q_k}\right] \cdot B_k, \tag{B1}$$

In this equation, α_k represents the proportion of type-2 agents' wealth allocated to the purchase of signaling goods in category k. The visibility parameter for each category is denoted by q_k, and B_k represents the corresponding benefit associated with signaling to the specific group.

On the other hand, the status derived by type-1 agents can be described as:

$$Status^1(\alpha_1, \alpha_2) = \sum_{k=1}^{2} \left[\frac{1}{2} \cdot e^{-\alpha_k q_k}\right] \cdot B_k, \tag{B2}$$

In this equation, the term $\frac{1}{2} \cdot e^{-\alpha_k q_k}$ represents the contribution of type-1 agents' signaling goods in category k to their status.

By assuming separability, we imply that there are zero cross-tax elasticities between the two categories. This allows us to extend our analysis by introducing differentiated commodity tax rates, denoted as t_k, for the two categories of consumption goods ($k = 1, 2$).

In extending our analysis, we generalize formula (A24), which characterizes the optimal tax formula in the baseline case with a single category of consumption goods when the inequality constraint (IC) is slack. Assuming that the (IC) constraint is slack, as demonstrated earlier for an intermediate range of δ values, we have the following expression:

$$\frac{t_k}{1+t_k} + \ln(1+t_k) = 2\frac{1-\delta}{\delta} + \ln\frac{q_k B_k}{2\theta_k}. \tag{B3}$$

In this equation, t_k represents the tax rate applied to category k of consumption goods. The left-hand side of (B3) increases with t_k. This implies that a higher tax rate is levied on goods that yield a greater return on signaling.

In the case of separable technology, tax differentiation relies on the variation in the returns on status signaling across different categories of consumption goods. By observing the increasing relationship on the left-hand side of (B3) with respect to t_k, we can conclude that a higher tax rate is imposed on goods exhibiting a higher return on signaling.

It is worth noting that an alternative assumption of full complementarity between the categories of consumption goods could be considered. Under such an assumption, all agents would observe both categories of consumption and form beliefs about the agent's type. The utility of status (B) remains the same as in the single-category case. The full benefit is obtained if at least one signal from each category is observed, otherwise the surplus is divided equally between the two types. This alternative technology would result in the status measures $Status^2(\alpha_1, \alpha_2) = [1 - \frac{1}{2} \cdot e^{-\sum_{k=1}^{2} \alpha_k q_k}] \cdot B$ and $Status^1(\alpha_1, \alpha_2) = [\frac{1}{2} \cdot e^{-\sum_{k=1}^{2} \alpha_k q_k}] \cdot B$. In the case of full complementarity, the tax formula would take into account cross-tax elasticities.