SOCIAL STATUS, INFORMATION PROVISION AND ENVIRONMENTAL TAXES

Regulating Green and Brown Quality Tiers

Leonidas Ourgantzidis
Eftichios Sartzetakis

University of Macedonia

July 11, 2026

Motivation

Roadmap

1. Motivation and research question
2. Model: quality tiers, status and emissions
3. Solution strategy
4. Tax-only, information-only and joint-policy regimes
5. Main analytical takeaways and welfare implications

Motivation

- Many consumption choices are simultaneously *private*, *social* and *environmental*.
- High hedonic-quality goods may also be more emission-intensive:
  1. premium SUVs versus smaller cars,
  2. larger dwellings versus compact housing,
  3. premium travel services versus basic alternatives.
- If quality conveys social status, status-seeking can reinforce environmentally harmful consumption.
- The policy problem is not only how much to tax emissions, but also how to weaken status-driven overconsumption.

Research Question

Main question

How should environmental policy be designed when consumers care about both emissions-effective quality and social status?

- We compare three regulatory regimes:
  1. environmental taxation only,
  2. information provision only,
  3. environmental taxation and information provision jointly.
- The key question is how taxation and information provision respond to emissions, monopoly power and status-driven demand.
- The model shows whether the instruments operate through different market margins: participation, product choice and emissions.

Contribution

- We combine two literatures that are usually treated separately:
  1. vertical product differentiation and environmental policy,
  2. status preferences and information-based regulation.
- Status affects both market participation and sorting across quality tiers.
- Information provision is not eco-labeling: it reduces the salience of status concerns.
- The tractability of the model allows us to identify how each instrument affects participation, product choice, prices and welfare.

Model

Environment

- A monopolist supplies two vertically differentiated variants, $j \in \{1, 2\}$.
- Variant 2 has higher hedonic quality and higher emissions:

$$s_2 > s_1, \qquad e_2 > e_1.$$

- Consumers value emissions-effective quality:

$$\gamma_j \equiv s_j - e_j, \qquad \gamma_2 > \gamma_1, \qquad \Delta\gamma \equiv \gamma_2 - \gamma_1 > 0.$$

- A unit mass of consumers is indexed by $\theta \sim U[0, 1]$.
- Each consumer buys variant 2, variant 1, or does not buy.

Status Preferences

- Let Q_2, Q_1 and Q_0 denote the shares of high-quality buyers, low-quality buyers and non-buyers.
- Under symmetric status concerns, $a_1 = a_2 \equiv \alpha$.
- Information provision reduces the effective strength of status through ϕ.

$$
\begin{aligned}
U_2 &= \theta\gamma_2 + \phi\alpha(Q_1 + Q_0) - P_2, \\
U_1 &= \theta\gamma_1 + \phi\alpha(Q_0 - Q_2) - P_1, \\
U_0 &= -\phi\alpha(1 - \theta_1).
\end{aligned}
$$

Higher ϕ means more salient status concerns; information policy lowers ϕ.

Consumer Sorting

- Two marginal consumers determine the market allocation.
  1. θ_1: indifferent between product 1 and no purchase.
  2. θ_2: indifferent between product 2 and product 1.
- Market shares are:

$$Q_0 = \theta_1, \qquad Q_1 = \theta_2 - \theta_1, \qquad Q_2 = 1 - \theta_2.$$

- Low-θ consumers abstain, intermediate consumers buy the low-quality variant, and high-θ consumers buy the high-quality variant.

Firm and Government

- Given a unit emission tax t, the monopolist chooses prices:

$$\Pi = (P_1 - c_1 - te_1)Q_1 + (P_2 - c_2 - te_2)Q_2.$$

- The government maximizes welfare:

$$W = CS + \Pi + TR - D(E), \qquad E = e_1 Q_1 + e_2 Q_2.$$

- With constant marginal environmental damage δ:

$$D(E) = \delta(e_1 Q_1 + e_2 Q_2).$$

- Policy intervention is warranted by monopoly distortion, environmental damage and status externalities.

Solution Strategy

1. Derive the two indifferent consumers from $U_1 = U_0$ and $U_2 = U_1$.
2. Translate cutoffs into market shares:

$$Q_0 = \theta_1, \qquad Q_1 = \theta_2 - \theta_1, \qquad Q_2 = 1 - \theta_2.$$

3. Solve the firm's pricing problem for given policy instruments:

$$\max_{P_1, P_2} \Pi(P_1, P_2; t, \phi).$$

4. Substitute optimal prices back into cutoffs and quantities.
5. Let the government choose t and/or ϕ to maximize welfare.
6. Compare welfare and allocations across the three regimes.

Policy Regimes

Regime	Policy instrument and role
Tax only	The emission tax must address environmental damage and, indirectly, status-driven overconsumption.
Information only	Information provision reduces ϕ, weakening status salience and affecting mainly market participation.
Joint policy	The tax prices emissions while information provision targets status distortions directly.

Core idea

The comparison identifies how social status changes policy design: taxation prices emissions, while information provision weakens status-driven demand.

Tax Only

Tax Only: Cutoffs and the Status Channel

- With $\phi = 1$, the lower cutoff is:

$$\theta_1^T(P_1, P_2) = \frac{\alpha^2 + \alpha(P_1 - P_2) + P_1\Delta\gamma}{\gamma_1\Delta\gamma + \alpha^2}.$$

- Differentiating the cutoff with respect to the high-quality price:

$$\frac{\partial\theta_1^T}{\partial P_2} = -\frac{\alpha}{\gamma_1\Delta\gamma + \alpha^2} < 0.$$

- Without status concerns, $\alpha = 0$:

$$\frac{\partial\theta_1^T}{\partial P_2} = 0.$$

Takeaway

Status creates a cross-price participation channel: a higher P_2 can induce entry into the low-quality segment. Without status, this channel disappears.

Tax Only: Firm Pricing

- Given t, the firm solves:

$$\max_{P_1,P_2}(P_1 - c_1 - te_1)Q_1 + (P_2 - c_2 - te_2)Q_2.$$

- The optimal prices are linear in the tax:

$$P_1^{T*} = \frac{\Delta\gamma(\gamma_1 + c_1) + \alpha\Delta c}{2\Delta\gamma} + \frac{\alpha\Delta e + \Delta\gamma e_1}{2\Delta\gamma}t,$$

$$P_2^{T*} = \frac{\gamma_1(\gamma_2 + \alpha + c_2) + \alpha^2}{2\gamma_1} + \frac{\alpha(\gamma_1 c_2 - \gamma_2 c_1)}{2\gamma_1\Delta\gamma} + \frac{\gamma_1 e_2\Delta\gamma + \alpha(\gamma_1 e_2 - \gamma_2 e_1)}{2\gamma_1\Delta\gamma}t.$$

Tax Only: Status and Tax Pass-Through

- Starting from the optimal low-quality price:

$$P_1^{T*} = \frac{\Delta\gamma(\gamma_1 + c_1) + \alpha\Delta c}{2\Delta\gamma} + \frac{\alpha\Delta e + \Delta\gamma e_1}{2\Delta\gamma} t.$$

- Differentiating with respect to the tax gives:

$$\frac{\partial P_1^{T*}}{\partial t} = \frac{e_1}{2} + \frac{\alpha(e_2 - e_1)}{2\Delta\gamma}.$$

- Without status, pass-through is the benchmark $e_1/2$.
- With status, taxation changes market composition and the firm can pass through more to low-quality buyers.

Tax Only: Equilibrium Allocation

- Substituting optimal prices back into quantities gives:

$$Q_1^{T*}(t) = \frac{\alpha\Delta\gamma + c_2\gamma_1 - c_1\gamma_2}{2\gamma_1\Delta\gamma} + \frac{e_2\gamma_1 - e_1\gamma_2}{2\gamma_1\Delta\gamma}t,$$
$$Q_2^{T*}(t) = \frac{\Delta\gamma - \Delta c}{2\Delta\gamma} - \frac{\Delta e}{2\Delta\gamma}t.$$

- Therefore:

$$\frac{dQ_2^{T*}}{dt} = -\frac{\Delta e}{2\Delta\gamma} < 0.$$

- The high-quality/high-emission variant always contracts under the tax.

Tax Only: Reallocation Across Quality Tiers

- Starting from:

$$Q_1^{T*}(t) = \frac{\alpha\Delta\gamma + c_2\gamma_1 - c_1\gamma_2}{2\gamma_1\Delta\gamma} + \frac{e_2\gamma_1 - e_1\gamma_2}{2\gamma_1\Delta\gamma}\, t.$$

- Differentiating with respect to t:

$$\frac{dQ_1^{T*}}{dt} = \frac{e_2\gamma_1 - e_1\gamma_2}{2\gamma_1\Delta\gamma}.$$

- Hence:

$$\frac{dQ_1^{T*}}{dt} > 0 \quad \Longleftrightarrow \quad \frac{e_2}{\gamma_2} > \frac{e_1}{\gamma_1}.$$

- The tax shifts demand toward variant 1 only when variant 2 is dirtier per unit of emissions-effective quality.

Tax Only: Optimal Tax

- The government chooses t after anticipating the firm's pricing response:

$$\max_t W\left(Q_1^{T*}(t), Q_2^{T*}(t), P_1^{T*}(t), P_2^{T*}(t)\right).$$

- The optimal tax has three components:

$$t^{T*} = \underbrace{2\delta}_{\text{environmental}} + \underbrace{\frac{\alpha e_1 \Delta\gamma}{e_1^2\Delta\gamma + \gamma_1 \Delta e^2}}_{\text{status distortion}} + \underbrace{\frac{e_1\Delta\gamma(c_1 - \gamma_1) + \gamma_1 \Delta e(\Delta c - \Delta\gamma)}{e_1^2\Delta\gamma + \gamma_1\Delta e^2}}_{\text{monopoly component}}.$$

Takeaway

When taxation is the only instrument, the optimal tax is not purely Pigouvian: it also responds to status-driven overconsumption and monopoly distortion.

Information Only

Information Only: Status Salience

- Information provision lowers ϕ and weakens the effective status term $\alpha\phi$.
- The cutoffs are:

$$\theta_1^{\phi}(P_1, P_2) = \frac{\alpha^2\phi^2 + \alpha\phi(P_1 - P_2) + P_1\Delta\gamma}{\gamma_1\Delta\gamma + \alpha^2\phi^2},$$

$$\theta_2^{\phi}(P_1, P_2) = \frac{\alpha\phi(P_1 - \gamma_1) + \gamma_1(P_2 - P_1)}{\gamma_1\Delta\gamma + \alpha^2\phi^2}.$$

- The tax-only demand system is obtained by setting $\phi = 1$.
- For given prices, decreasing ϕ has the same qualitative effect as weakening status concerns.

Information Only: Firm Pricing

- The firm solves the same pricing problem, but there is no emission tax.
- Optimal prices are:

$$P_1^{I*}(\phi) = \frac{\Delta\gamma(c_1 + \gamma_1) + \alpha\Delta c\phi}{2\Delta\gamma},$$

$$P_2^{I*}(\phi) = \frac{c_2 + \gamma_2}{2} + \frac{\alpha[c_2\gamma_1 - c_1\gamma_2 + \gamma_1\Delta\gamma]}{2\gamma_1\Delta\gamma}\phi + \frac{\alpha^2}{2\gamma_1}\phi^2.$$

- Stronger status salience allows the firm to charge higher prices.

Information Only: Equilibrium Allocation

- Substituting optimal prices back into quantities gives:

$$Q_1^{I*}(\phi) = \frac{c_2\gamma_1 - c_1\gamma_2}{2\gamma_1\Delta\gamma} + \frac{\alpha}{2\gamma_1}\phi,$$
$$Q_2^{I*}(\phi) = \frac{\Delta\gamma - \Delta c}{2\Delta\gamma}.$$

- Differentiating with respect to ϕ:

$$\frac{\partial Q_1^{I*}}{\partial\phi} = \frac{\alpha}{2\gamma_1} > 0, \qquad \frac{\partial Q_2^{I*}}{\partial\phi} = 0.$$

Takeaway

Information provision changes market participation, but under symmetric status concerns it does not reallocate demand toward the high-quality product.

Information Only: Optimal Information Policy

- The government chooses ϕ after anticipating firm prices:

$$\max_{\phi} W\left(Q_1^{I*}(\phi), Q_2^{I*}, P_1^{I*}(\phi), P_2^{I*}(\phi)\right).$$

- The optimal information parameter is:

$$\phi^{I*} = \frac{\gamma_1 - c_1 - 2e_1\delta}{\alpha}.$$

- Equivalently, the planner pins down effective status:

$$\alpha\phi^{I*} = \gamma_1 - c_1 - 2e_1\delta.$$

- Stronger underlying status concerns require a lower ϕ, i.e. stronger information provision.

Information Only: Final Cutoffs

- Substituting ϕ^{I*} back into the cutoffs gives:

$$\theta_1^{IW} = \frac{c_1 + \delta e_1}{\gamma_1}.$$

- The participation cutoff depends only on the low-quality product's fundamentals and environmental damage.
- The information instrument mainly controls how much status-driven demand enters the market at the bottom tier.

Takeaway

Information provision is not mainly a product-reallocation tool; it is a participation-margin tool.

Joint Policy

Joint Policy: Firm and Government Problems

- With both instruments, the firm solves:

$$\max_{P_1,P_2}(P_1 - c_1 - te_1)Q_1(P_1, P_2, \phi) + (P_2 - c_2 - te_2)Q_2(P_1, P_2, \phi).$$

- The government then chooses both t and ϕ:

$$\max_{t,\phi} W\left(Q_1^{J*}(t,\phi), Q_2^{J*}(t), P_1^{J*}(t,\phi), P_2^{J*}(t,\phi)\right).$$

- This allows a cleaner assignment of instruments to distortions.

Joint Policy: Equilibrium Quantities

- After firm pricing, quantities are:

$$Q_1^{J*}(t,\phi) = \frac{\gamma_1 c_2 - \gamma_2 c_1}{2\gamma_1 \Delta\gamma} + \frac{e_2\gamma_1 - e_1\gamma_2}{2\gamma_1 \Delta\gamma} t + \frac{\alpha}{2\gamma_1}\phi,$$

$$Q_2^{J*}(t) = \frac{\Delta\gamma - \Delta c}{2\Delta\gamma} - \frac{\Delta e}{2\Delta\gamma} t.$$

- Q_1 depends on both taxation and effective status salience.
- Q_2 depends on taxation and technological-cost differences, not directly on status salience.

Joint Policy: Separation of Roles

- The optimal policy values are:

$$t^{J*} = 2\delta + \frac{\Delta c - \Delta\gamma}{\Delta e}, \qquad \phi^{J*} = \frac{\gamma_1 - c_1}{\alpha} + \frac{e_1}{\alpha}\frac{\Delta c - \Delta\gamma}{\Delta e}.$$

- Starting from t^{J*}, differentiating with respect to status gives:

$$\frac{\partial t^{J*}}{\partial \alpha} = 0.$$

Takeaway

Status remains important, but it is corrected through information provision; the emission tax no longer has to carry the status correction.

Joint Policy: Market Partition

- Substituting the optimal joint policy gives final cutoffs:

$$\theta_1^{JW} = \frac{c_1 + \delta e_1}{\gamma_1}, \qquad \theta_2^{JW} = \frac{1}{2} + \frac{\Delta c + \delta \Delta e}{\Delta \gamma}.$$

- The final allocation is governed by:
  1. costs,
  2. emissions,
  3. emissions-effective qualities,
  4. environmental damage.
- It is no longer directly governed by the strength of status preferences.

Welfare and Policy Implications

Welfare and Policy Implications: Role of Status

- Social status is not only a preference parameter; it changes how consumers respond to prices and policy.
- In the tax-only regime, status affects participation, pass-through and the corrective tax.
- In the information-only regime, status mainly works through the participation margin.
- Welfare comparisons therefore show why both instruments can be important: one prices emissions, the other weakens status-driven overconsumption.

Welfare Comparison: Analytical Form

- Using the closed-form optimal policies, the welfare gaps are:

$$W^J - W^T = \frac{\alpha^2 \Delta e^2 (\phi^{J*} - 1)^2}{8(e_1^2 \Delta\gamma + \gamma_1 \Delta e^2)} \geq 0,$$

$$W^J - W^I = \frac{\Delta e^2 (t^{J*})^2}{8\Delta\gamma} \geq 0.$$

- These expressions measure the welfare gain from restoring the missing correction.
- The first gap highlights the value of correcting status-driven demand; the second highlights the value of pricing emissions.

Tax Only versus Information Only

- The ranking between the two single-instrument regimes is not fixed:

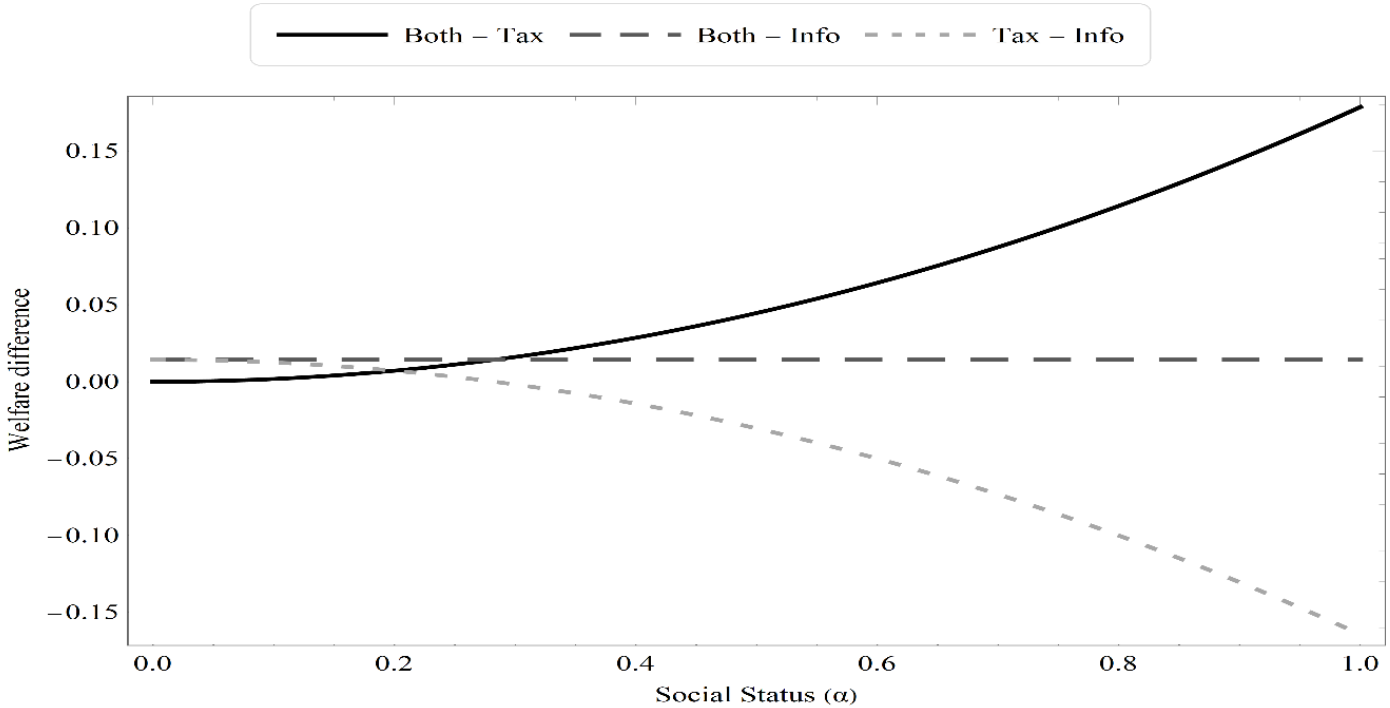
$$W^T - W^I \gtrless 0.$$

- It depends on which omitted correction is more costly:

$$W^T - W^I \gtrless 0 \iff (e_1^2 \Delta\gamma + \gamma_1 \Delta e^2)(t^{J*})^2 \gtrless \alpha^2 \Delta\gamma(\phi^{J*} - 1)^2.$$

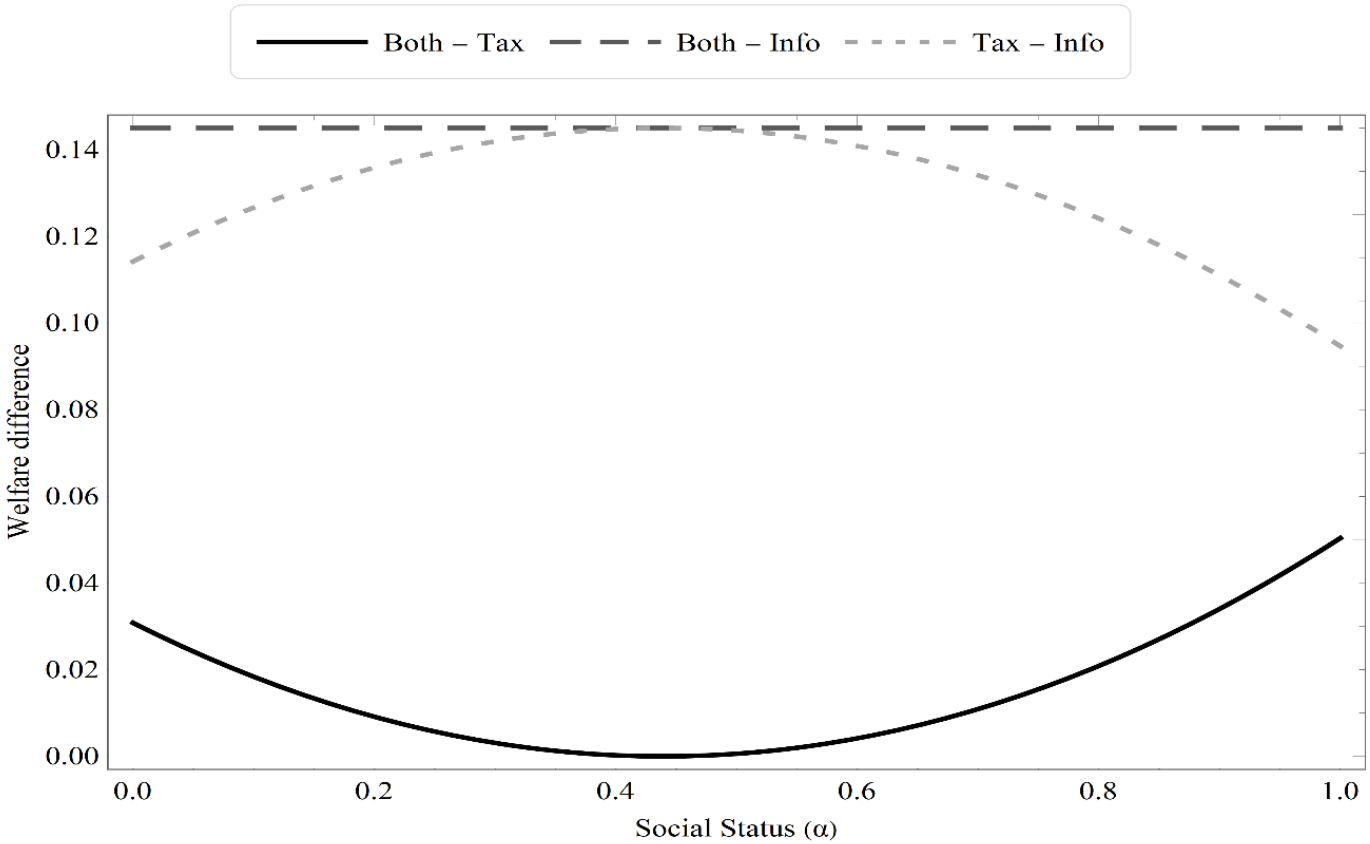
- This is the more interesting welfare result: information may dominate taxation when status-driven demand becomes sufficiently important.

Welfare Gaps: Status Can Reverse the Single-Instrument Ranking



- As α rises, the welfare cost of omitting information provision increases.
- In this calibration, $W^T - W^I$ eventually becomes negative.

Welfare Gaps: But the Ranking Is Parameter-Dependent



- Under an alternative calibration, tax-only remains above information-only.
- Thus, the robust result is joint-policy dominance; the single-instrument ranking is conditional.

Optimal Tax: The Role of Status

- The difference between the joint-policy tax and the tax-only optimum is:

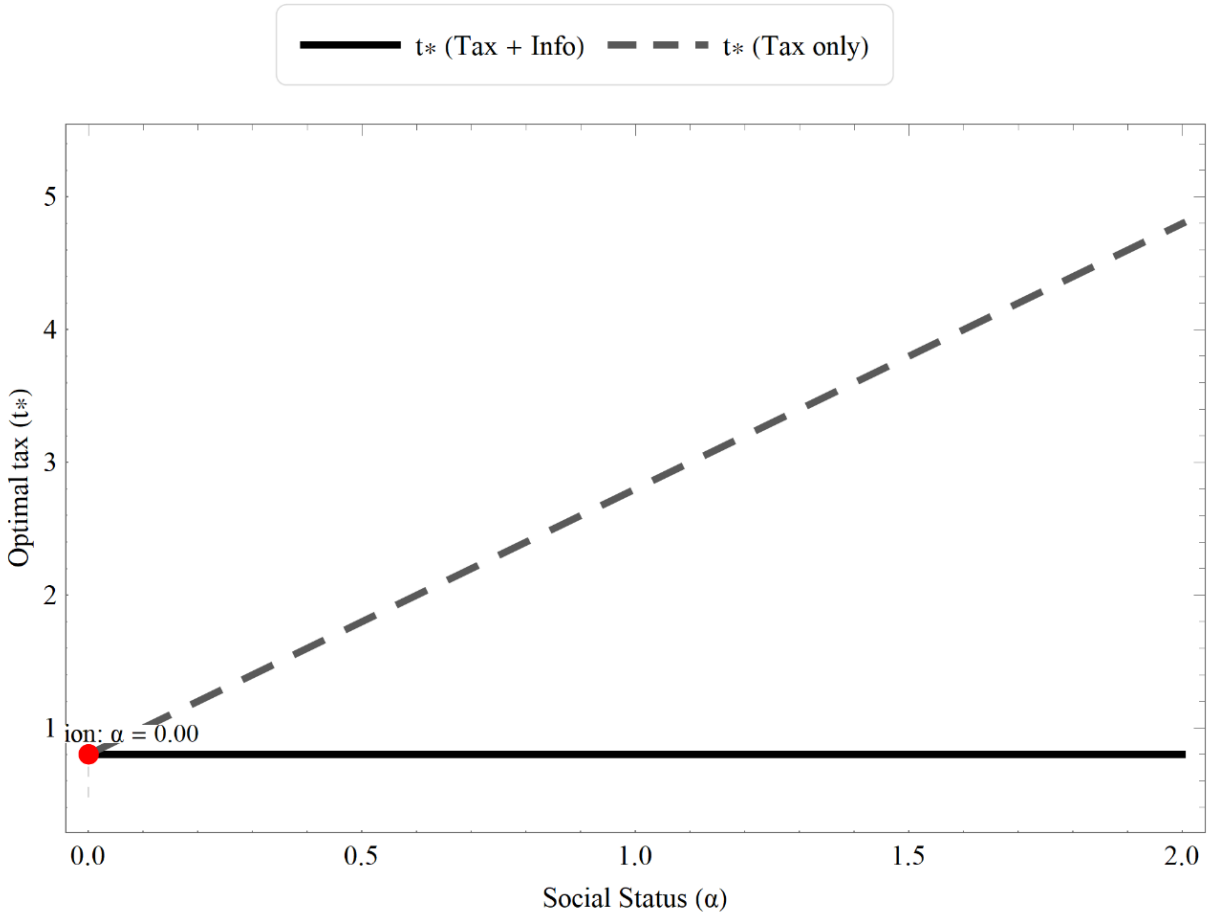
$$t^{J*} - t^{T*} = \frac{\alpha e_1 \Delta\gamma}{e_1^2 \Delta\gamma + \gamma_1 \Delta e^2}(\phi^{J*} - 1).$$

- Equivalently:

$$t^{J*} - t^{T*} = \alpha(\phi^{J*} - 1)\frac{\partial t^{T*}}{\partial \alpha}, \qquad \frac{\partial t^{T*}}{\partial \alpha} > 0.$$

- In the corrective region, information provision lowers the tax because the tax no longer needs to carry the status correction.

Optimal Tax Comparison



- Tax-only rises with status concerns; joint-policy tax is independent of α.
- This visualizes the division of labor between the two instruments.

Optimal Information Provision: The Role of Status

- Comparing the information instrument across regimes:

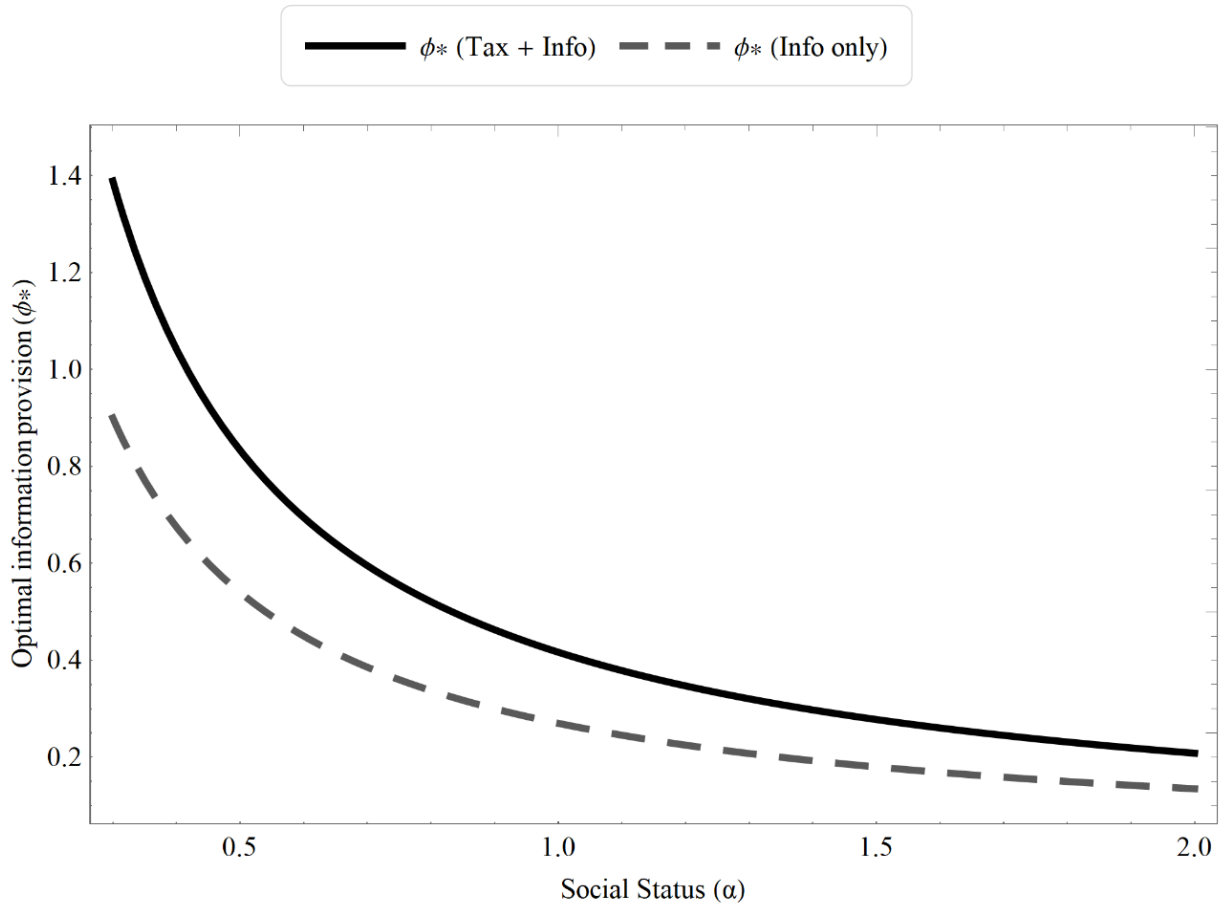
$$\phi^{J*} - \phi^{I*} = \frac{e_1}{\alpha} t^{J*}.$$

- If the optimal joint-policy tax is positive, then:

$$\phi^{J*} > \phi^{I*}.$$

- Since lower ϕ means stronger information provision, information-only requires the more aggressive information campaign.

Optimal Information Comparison



- Both schedules decline with α: stronger status requires stronger information correction.
- Joint policy uses a weaker information intervention because part of the burden is shifted to taxation.

Policy Implications

Main lesson

Social status is a policy-relevant distortion in environmental markets with vertically differentiated products.

- Status changes participation, tax pass-through and the composition of demand across quality tiers.
- A tax prices emissions, but on its own it also has to respond to status-driven overconsumption.
- Information provision weakens the status channel, but on its own it cannot price emissions.
- A policy mix is therefore valuable because it allows the regulator to respond to environmental, monopoly and status distortions at the same time.

Conclusions

Conclusions

- Social status alters demand responses, tax pass-through, equilibrium quantities and optimal policy design.
- Taxation reshapes substitution across quality tiers and directly prices emissions.
- Information provision mainly affects market participation by weakening the status channel.
- Welfare comparisons show that both instruments can be important when environmental damage and status-driven demand coexist.
- **Next steps:** introduce a cost of information provision, decompose welfare by channel, and extend the model to asymmetric status concerns or competition.

Thank you for your time!