Inequality and Environmental Taxation

Hand-out for Bachelor's Project Defence

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Plan

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Motivation & Questions

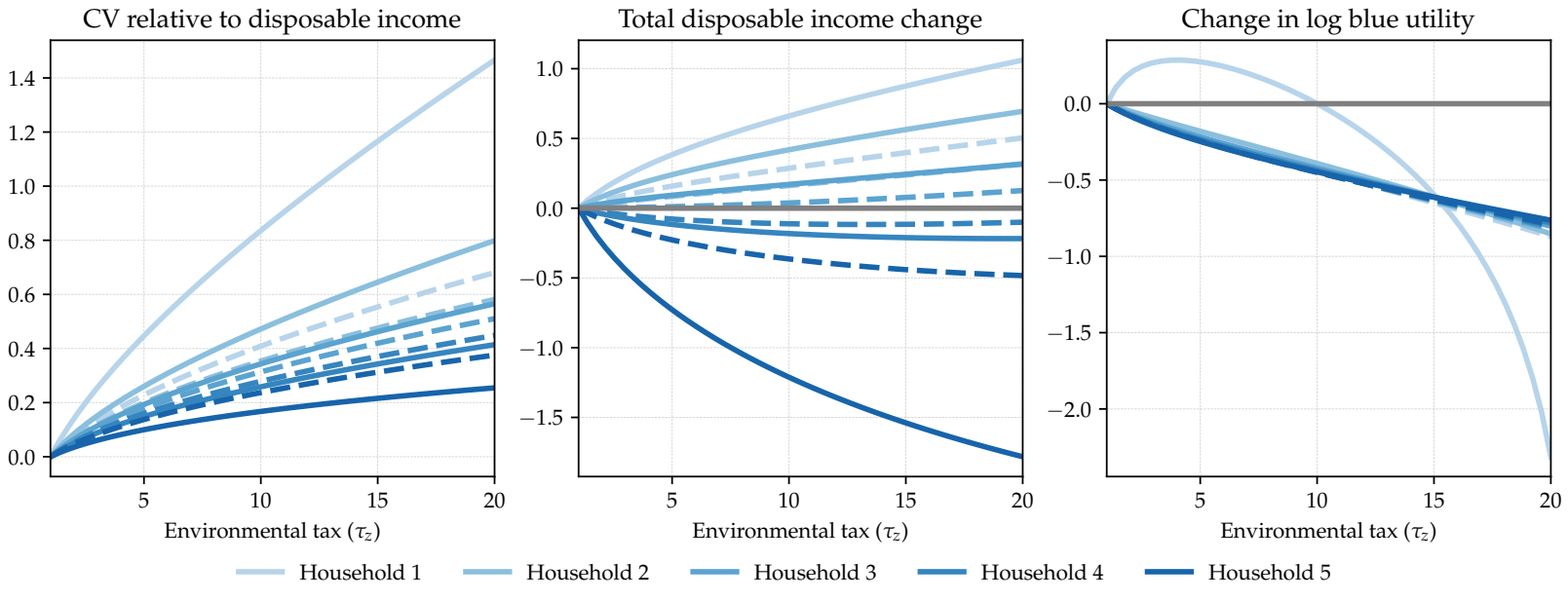
- **Motivation**
  - Environmental change and rising income inequality are *both* at the forefront of public debate.
  - Increasing demand for a clean environment & international environmental treaties warrant more environmental taxation.
  - Literature shows that such taxation tends to be regressive in the absence of adequate compensation mechanisms (Bento et al., 2009; Wier et al., 2005).
  - Recent work shows that the regressiveness can be mitigated by redistribution of env. tax revenues (Klenert et al., 2018; Fried et al., 2024; Chiroleu-Assouline and Fodha, 2014).
- Hence, we address the following **questions**
  - What mechanisms connect environmental taxation and inequality under compensation through flat lump-sum transfers? How do these mechanisms depend on income taxation/inequality?
  - How does an inequality-averse government choose the optimal level of environmental taxation? How does this choice depend on the income tax system & the ability to optimally adjust the income tax system, when increases in environmental taxation are warranted?

Approach

- **Approach**
  - Adopt GE-model from Klenert et al. (2018)
    - Two firms producing goods of distinct pollution intensities.
    - Households exhibit Stone-Geary preferences, such that poorer households spend a larger share of income on the pollution intensive good.
    - Government sets policy instruments to maximize a social welfare function, which exhibits inequality-aversiveness in households' utility from goods and leisure and takes households' environmental preference into account.
  - Solve model numerically in Python
    - Construct an *inner layer* that solves for GE for given policy and an *outer layer* that finds the optimal policy.
  - Describe model dynamics
    - How does environmental taxation affect the economy?
    - How does it affect inequality?
  - Explain optimal taxation
    - What determines optimal changes in env. taxation when env. preference increases?
    - How do these changes depend on the income tax system? The government's ability to adjust the income tax system simultaneously with the env. tax?

Results (Dynamics)

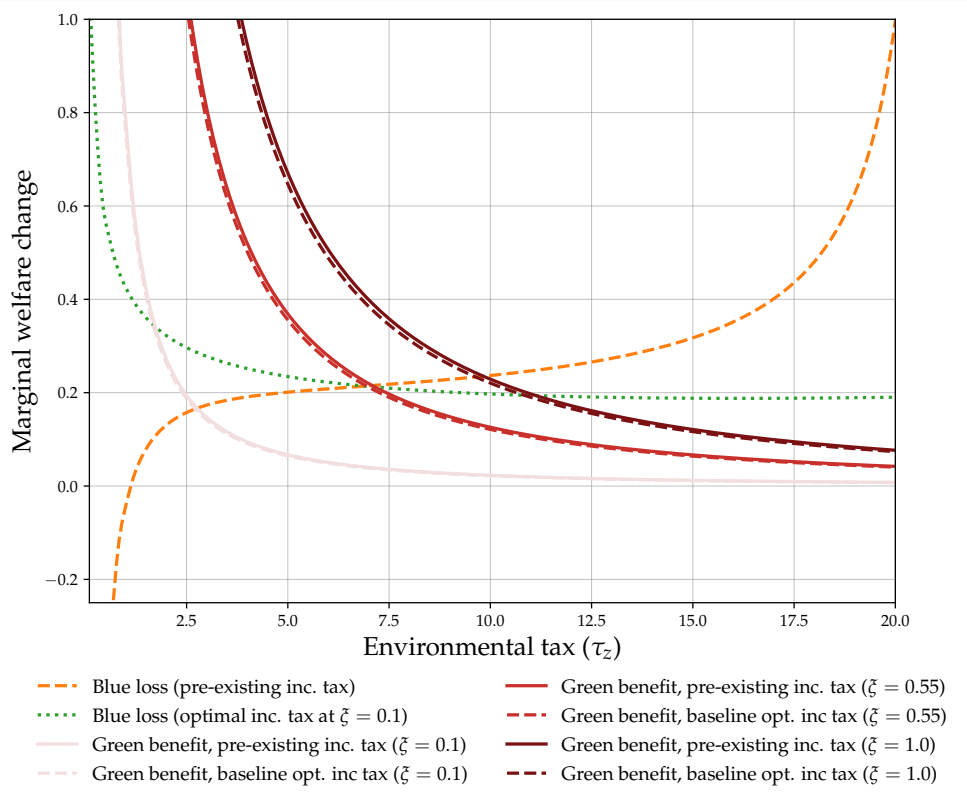
Figure 1: Distributional Effects of Env. Taxation



- Increases in the environmental tax
  1. hit poorer households harder (in relative terms)
  2. increase income for poor and decrease it for rich (due to decreases in wage & growing lump-sum transfers)
  3. make the poorest household better off when the initial income tax system is *less* progressive (an equality dividend)

Results (Trade-off)

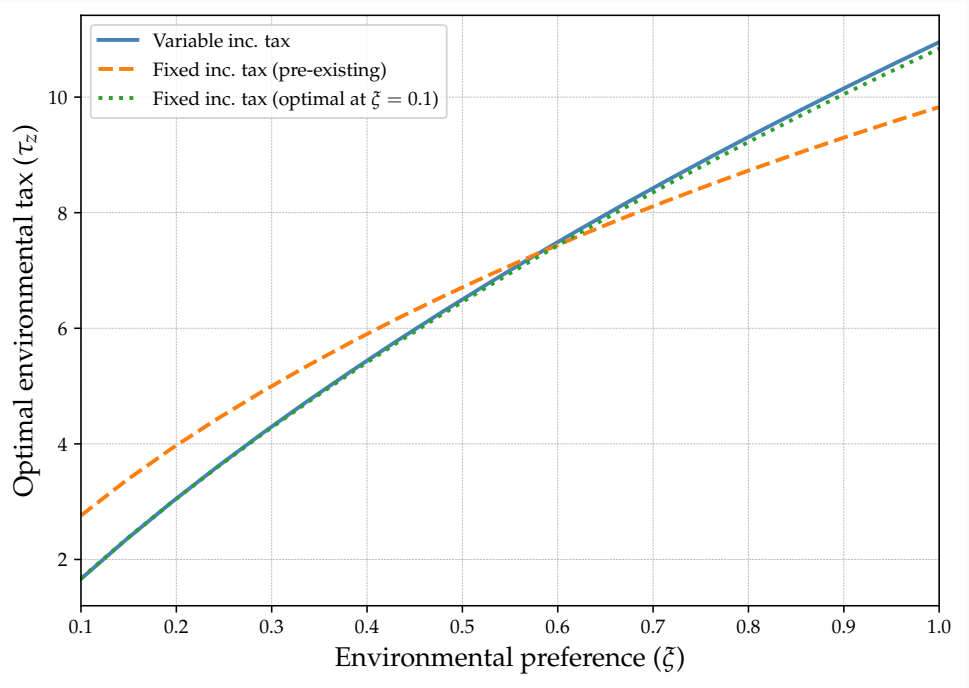
Figure 2: Trade-off faced by the Government



- Under a relatively less progressive inc. tax system, env. taxation is *cheaper* when taxation levels are *low* (due to the double dividend).
- As the tax rate increases the picture *flips* due to diminishing lump-sum growth.

Results (Optimal Taxation)

Figure 3: Optimal Environmental Taxation



- Hence, at low levels of society's environmental preference, an inequality-averse government without the ability to adjust the less progressive (pre-existing) inc. tax system, will tax pollution more.
- At higher levels of the pref., however, pollution will be taxed more when the tax system is more progressive. As the poorest household is better off, diminishing lump-sum transfer growth is less critical.

Discussion

- **Robustness**
  - Our findings are robust to sensitivity analysis of key parameters and a clean technology input extension.
- **Limits of our calibration**
  - The highly stylized nature of the applied framework only yields qualitative insights rather than specific quantitative predictions.
- **(Questionable) model assumptions**
  - Perfectly flexible labor market.
  - Homogeneous effects from pollution on households.
  - Limited access to revenue recycling instruments.
- **Empirical relevance**
  - While empirical literature is limited, some studies corroborate our findings.
    - Andersson and Atkinson (2020) find that environmental taxes are less regressive in countries with lower income inequality.
    - Oueslati et al. (2016) also find that countries with revenue recycling schemes see a negative relationship between the environmental tax burden and income inequality.
    - Metcalf (1999) documents the possibility of obtaining an equality dividend through adequate redistribution of increased environmental tax revenues.

References

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