Labour Income Taxes and Social Responsibility in an Unequal World

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Motivation

- households' **willingness to pay to avoid negative externalities** ("social responsibility") is rising

→ graph, → rise

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- but: **inequality** renders sustainable goods unaffordable for poor households

→ graph, → rise

Therefore, ...

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  $\Rightarrow$ **What is the optimal policy as social responsibility increases?**

Preview of results

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- ... labour income taxes are optimally used to target the externality due to inequality.

As social responsibility rises, ...

- ... the optimal policy shifts away from corrective taxation to redistribution since inequality aggravates.
- **... the government redistributes even more to target the externality.**

Model

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Timing: static model

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Inequality:

- fraction λ is rich with productivity z_h
- fraction $1 - \lambda$ is poor with productivity $z_l < z_h$

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Production:

- two perfectly competitive sectors s and n
- production function: $Y_j = A_j H_j$, for $j \in \{s, n\}$
- profits: $\pi_s = p_s Y_s - wH_s$,
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Markets: for goods and labour clear

Household problem

$$\max_{c_{si},c_{ni},l_i} U_i = \max_{c_{si},c_{ni},l_i} \log(c(c_{si}, c_{ni})) - \chi \frac{l_i^{1+\frac{1}{\theta}}}{1+\frac{1}{\theta}}$$

$$s.t. \qquad p_s c_{si} + c_{ni} \leq w(1 - \tau_l) z_i l_i + T$$

c_s: sustainable good

c_n: unsustainable good

τ_l: linear labour tax

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- c_s: sustainable good
- c_n: unsustainable good
- τ_l: linear labour tax

- σ: governs price elasticity of substitution
- ω: *social responsibility*; governs willingness to pay for sustainable goods

→ Attitudes by income

Household problem

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→ Willingness to pay
→ Engel curves

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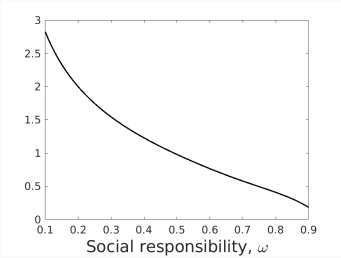
- ϕ: importance penalty
- H_n: unsustainable labour input

→ Calibration, → Ramsey

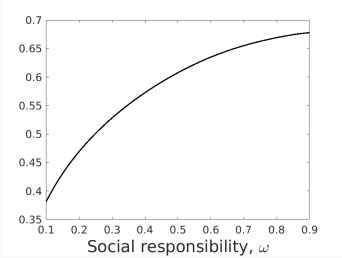
Results

Optimal policy

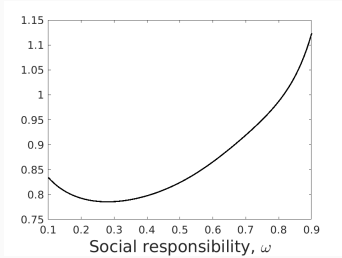
Corrective tax, τ_n



Income tax, τ_l



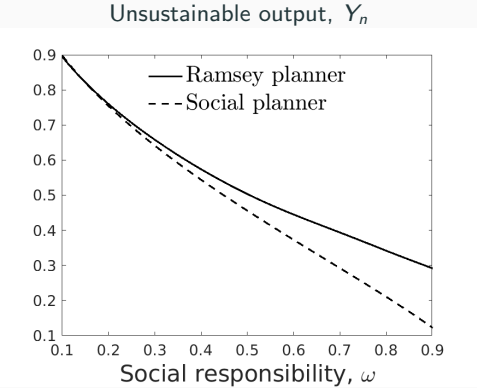
Transfers, T



- shift in optimal policy mix away from corrective taxation to redistribution

→ allocation

Efficient allocation



- the Ramsey planner forfeits an efficient reduction of the externality due to inequality and basic needs

Decomposing income taxes

How much of the income tax is explained by equity and how much by the externality motive?

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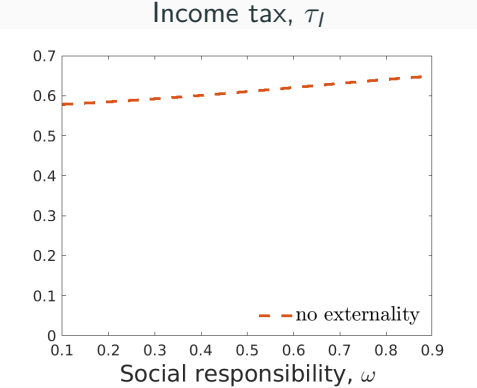
- difference to full model due to externality

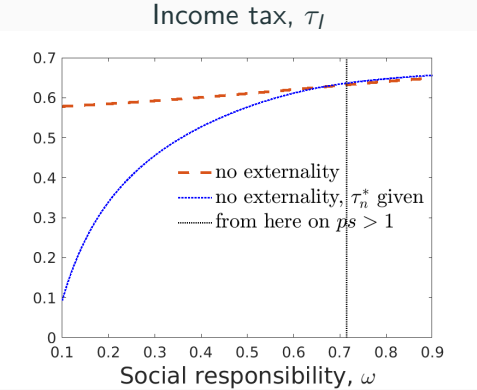
Optimal income tax: no externality



- more redistribution when social responsibility is high to avoid poverty and rising consumption inequality

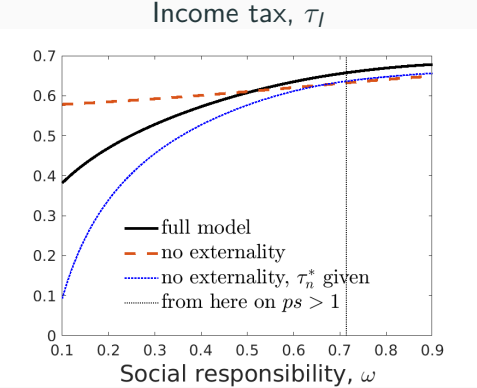
→ Laissez-faire

Optimal income tax: τ_n as parameter



- corrective tax revenues used to lower income tax, when ω is low
- τ_n regressive, when the sustainable good is more expensive $\Rightarrow$ higher labour tax

Optimal income tax: with externality



- income tax optimally used as a corrective policy tool for all levels of ω
- use of income tax to target the externality persists without basic needs

→ standard model, → quantification, → sensitivity

Conclusion

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- How should the optimal policy react if we all became more socially responsible?
- The optimal policy shifts away from corrective taxes to redistribution.
- Inequality aggravates with social responsibility. Therefore, the government forfeits an efficient reduction in the externality.
- **The income tax is used to lower the externality for all levels of social responsibility due to inequality.**

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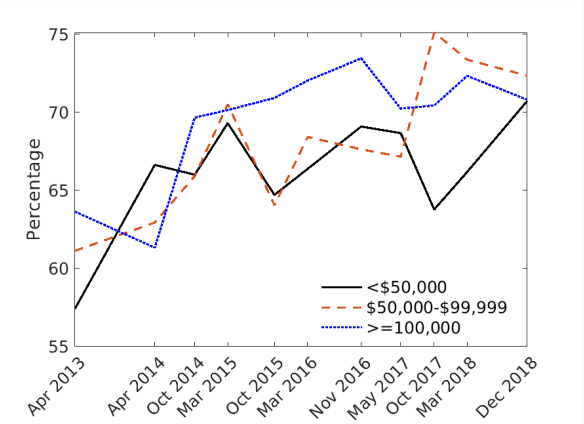
Social responsibility

- Bartling et al. (2015) provide experimental evidence for the existence of social responsibility in markets
- in the US, the market share of sustainable consumer-packaged goods rose from 14% in 2013 to 16% in 2018 despite a price premium (Kronthal-Sacco et al., 2020)
- accepted price premium on average: 25% (Simon-Kucher & Partners, 2021)

→ back

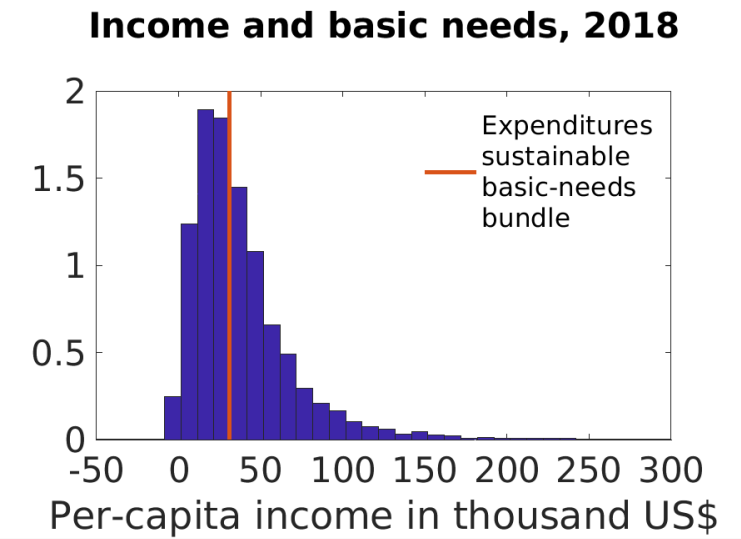
Income dependent support for costly policy



Source: Howe, P., Mildenberger, M., Marlon, J., & Leiserowitz, A. (2015); "*How much do you support or oppose the following policy? Set strict carbon dioxide emission limits on existing coal-fired power plants to reduce global warming and improve public health. Power plants would have to reduce their emissions and/or invest in renewable energy and energy efficiency. The cost of electricity to consumers and companies would likely increase*"

→ back

In the US



Sources: Disposable Income: PSID, TAXSIM; Basic Needs: Institute for Women's Policy Research, Prices: USDA

→ back

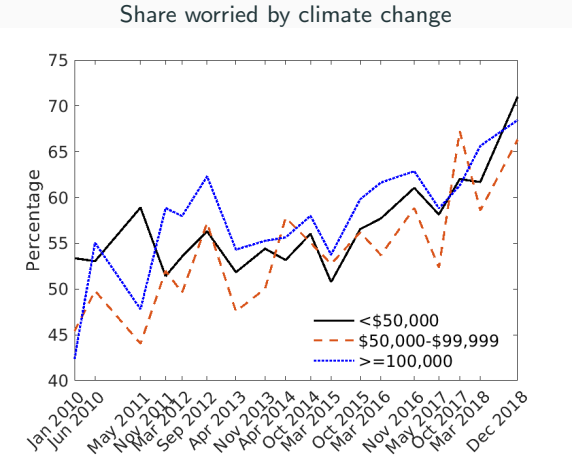
Contribution to the literature

impact of **social responsibility** on (1) **optimal policy** in an (2) **unequal economy**

- **social responsibility** in behavioural economics (Bénabou and Tirole, 2010; Bartling et al., 2015; Falk et al., 2021); a macro example: Aghion et al. (2022)
  $\Rightarrow$ basic needs
- optimal **corrective policy in distortionary fiscal setting**
  - with representative agent (e.g. Bovenberg and De Mooij, 1994; Barrage, 2020)
  - Vona and Patriarca (2011); Jacobs and van der Ploeg (2019) role of redistribution due to non-linear Engel curves $\Rightarrow$ non-linearity as a function of social responsibility
- **structural transformation**
  (Herrendorf et al., 2014; Matsuyama, 2002; Foellmi and Zweimüller, 2008; Boppart, 2014)

Empirical Backup

Social Responsibility: homogeneous across income groups



Source: Howe, P., Mildenberger, M., Marlon, J., & Leiserowitz, A. (2015)

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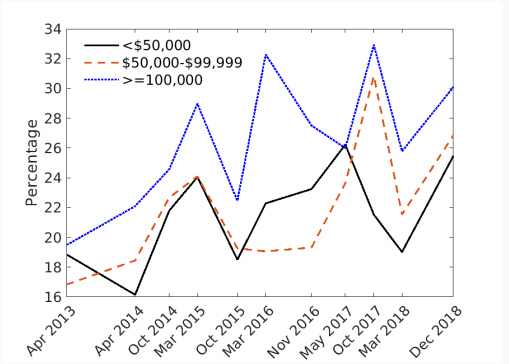
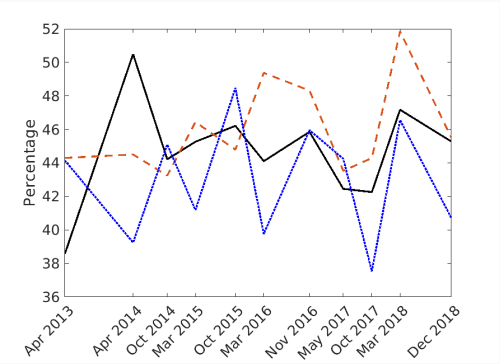
Decomposition policy support

Strong support



Weak support



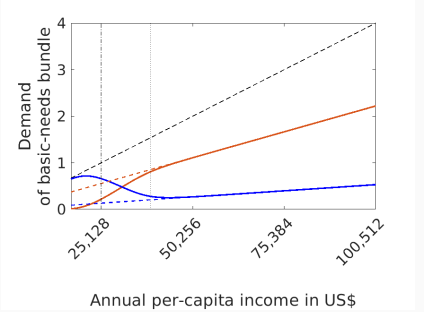
Source: Howe, P., Mildenberger, M., Marlon, J., & Leiserowitz, A. (2015)

→ back

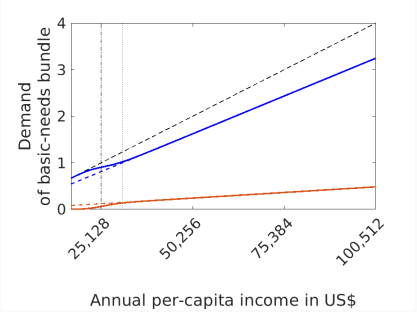
Model behaviour

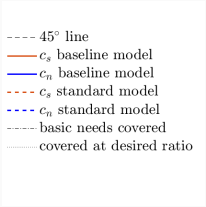
Engel Curves

$p_s = 1.56;\ \omega = 0.9$



$p_s = 1.56;\ \omega = 0.24$





→ back

Model

Model: Ramsey planner

$$\max_{\{\tau_n, \tau_l\}} \lambda U_r + (1-\lambda) U_p$$

$s.t.$

(1) $T = \tau_l w H + \tau_n w H_n$

(2) behaviour of firms and households

(3) feasibility

(4) $H = \lambda z_h l_r + (1-\lambda) z_l l_p$

→ back

Calibration

Calibration overview

- calibration to the US in 2018

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- I proceed in three steps

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    1. separately match λ, $\bar{c}$, ϕ, ω, θ, L, τ_l, and τ_n

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1. separately match λ, $\bar{c}$, ϕ, ω, θ, L, τ_l, and τ_n
2. jointly calibrate A_n, A_s, χ, z_h, z_l

Calibration overview

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1. separately match λ, $\bar{c}$, ϕ, ω, θ, L, τ_l, and τ_n
2. jointly calibrate A_n, A_s, χ, z_h, z_l
3. calibrate parameters governing the externality, η and ψ

Calibration I

Parameter	Calibrated value	Meaning	Target/Source
ϕ	12	importance of basic needs	-
σ	1.71	governs price elasticity of substitution	price elasticities in US milk market Chen et al. (2018)
ω	**0.24**	governs social responsibility	market share of sustainable goods (cpg) Kronthal-Sacco et al. (2020)
$\bar{c}$	**1**	basic needs, normalised	in US$: 25,128$ Institute for Women's Policy Research (2018)
λ	**0.56**	share of rich households	can cover basic needs with sustainable goods alone prices from USDA, food bundle from EAT-Lancet Commission (2019) Income from PSID, TAXSIM
L	1	annual time endowment, normalised	14.5 hours per day, Jones et al. (1993)
θ	0.75	Frisch elasticity	Chetty et al. (2011)
τ_l	0.24	labour income tax	Barrage (2020)
τ_n	0	corrective tax	-

Calibration II

Parameter	Calibrated value	Meaning	Target/Source
z_l	**0.03**	effective labour productivity poor	average income poor (PSID): 0.68 basic-needs bundles
z_h	**2.13**	effective labour productivity rich	difference average income poor and GDP p.c.: 4.00 basic-needs bundles
χ	23.51	disutility from labour	average annual labour supply per worker worked: 34.29 per week OECD (2021)
A_n	8.62	TFP unsustainable sector	GDP p.c.: 63,043$; 2.5 basic-needs bundles (OECD)
A_s	5.52	TFP sustainable sector	relative price of sustainable food bundle: 1.56 USDA, EAT-Lancet Commission (2019)
η	1.34	curvature externality	rich willing to give up 2% of annual con-
ψ	9.98	weight on externality	sumption for 1% reduction in H_n at baseline

→ back

Average annual income per capita in 2018

Variable	poor	rich	total
in US$	17,249	67,330	45,083
in basic needs unsustainable prices	0.69	2.68	1.79
in basic needs sustainable prices	0.56	2.19	1.47

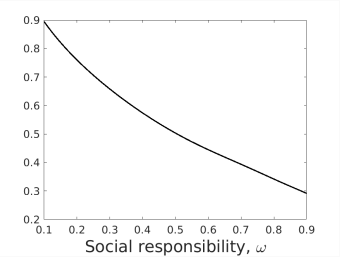
Sources: PSID, TAXSIM

→ back

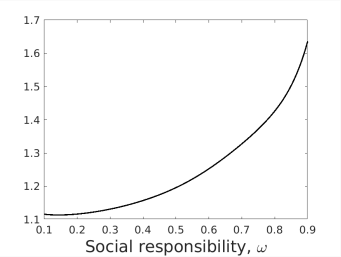
Additional results

Optimal allocation

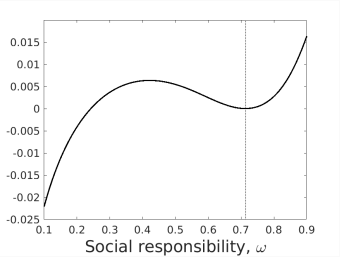
Externality, Y_n



Output



Gini of consumption

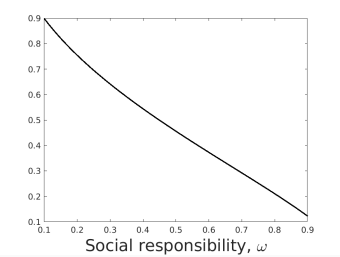


- reduced externality at higher output
- inequality rises

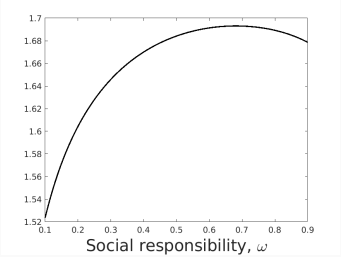
→ back

Efficient allocation

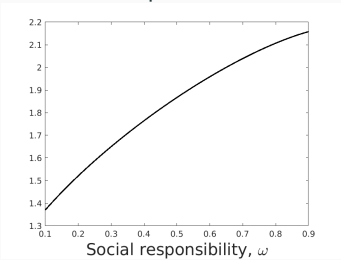
Externality, Y_n



Output



Composite consumption rich/ poor

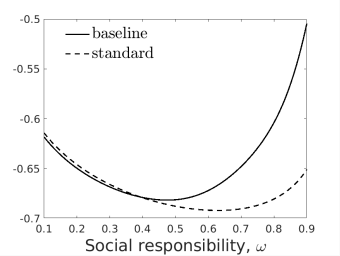


- trade-off between consumption and pollution loses intensity as social responsibility rises: $\Rightarrow$ higher composite consumption and lower unsustainable production
- disutility from labour exceeds utility from consumption when ω is very high
- no inequality

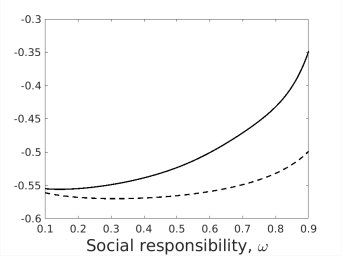
→ back

Policy effect

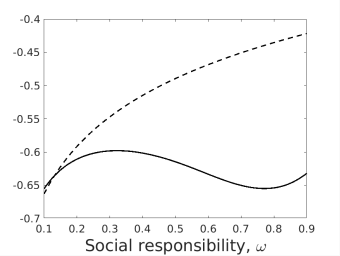
Externality, Y_n



Output



Gini of consumption

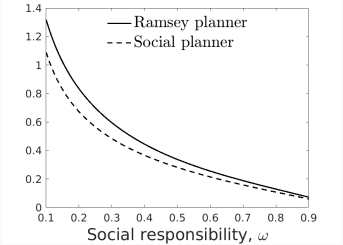


- with basic needs, the policy focus shifts away from the externality to inequality
- inequality explains shift to redistribution

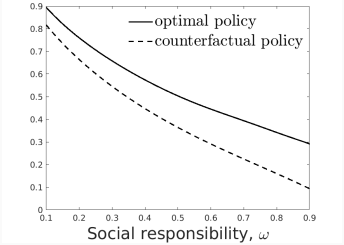
→ back

Counterfactual Policy: More aggressive corrective tax

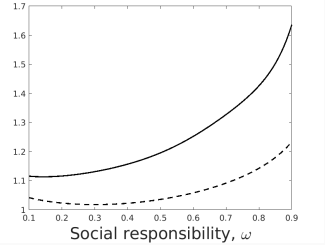
Output ratio, y_n/y_s



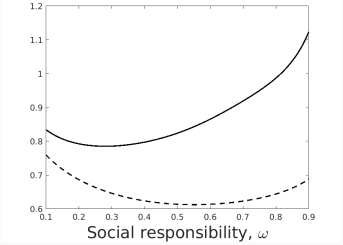
Externality, Y_n



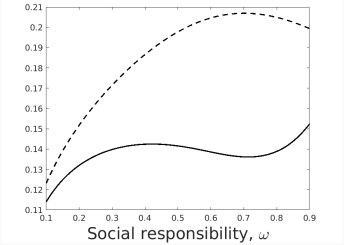
Output



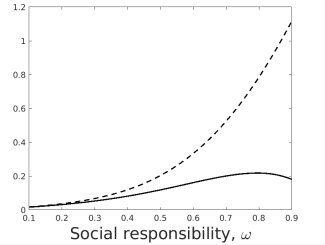
Transfers, T



Gini of consumption



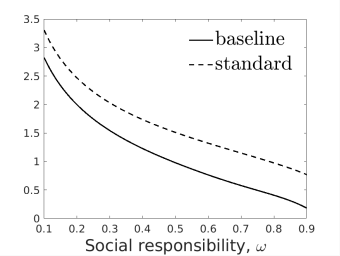
Penalty poor



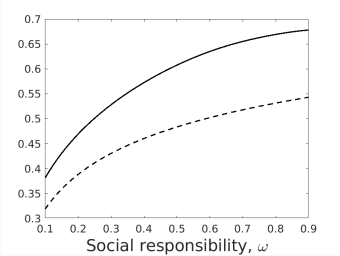
→ back

Optimal policy without basic needs

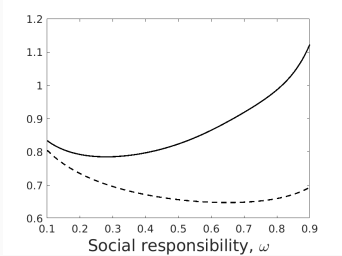
Corrective tax, τ_n



Income tax, τ_l



Transfers, T

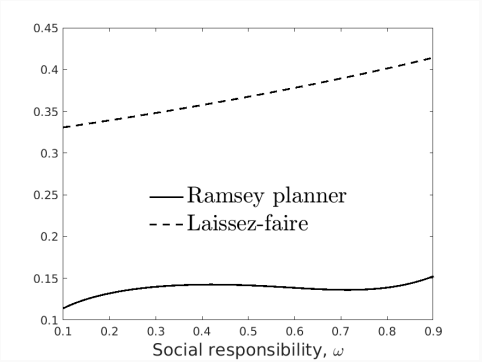


- optimal corrective tax decreases; rise in income tax to mitigate drop in revenues from corrective tax
- no shift to redistribution!

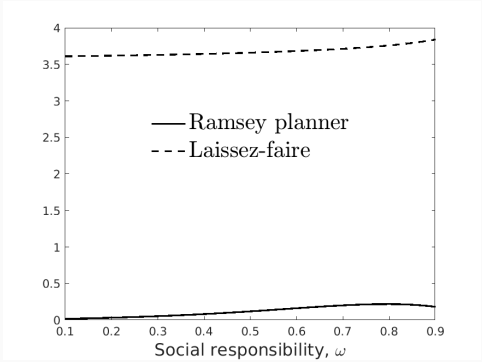
→ back

Laissez-faire allocation

Gini of consumption

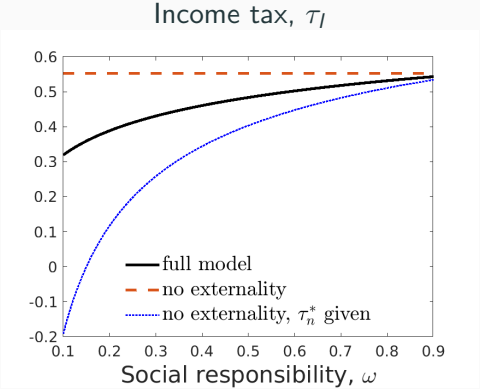


Penalty poor



→ back

Decomposition: no basic needs



- income tax also chosen higher to reduce the externality
- presence of corrective tax lowers income tax below optimal level without externality

→ back

Effectiveness of policy instruments

What is the role of the different policy channels on the externality?

- **Problem:** policy effects are interrelated

$\Rightarrow$ additional timing assumption

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Effectiveness of policy instruments

What is the role of the different policy channels on the externality?

- **Problem:** policy effects are interrelated

$\Rightarrow$ additional timing assumption

1. solve for the optimal policy tuple in full model
2. in laissez-faire allocation, impose optimal corrective tax $\Rightarrow$ effect of corrective tax

Effectiveness of policy instruments

What is the role of the different policy channels on the externality?

- **Problem:** policy effects are interrelated

$\Rightarrow$ additional timing assumption

1. solve for the optimal policy tuple in full model
2. in laissez-faire allocation, impose optimal corrective tax $\Rightarrow$ effect of corrective tax
3. next, add the optimal income tax but keep labour supply fixed $\Rightarrow$ redistribution channel

Effectiveness of policy instruments

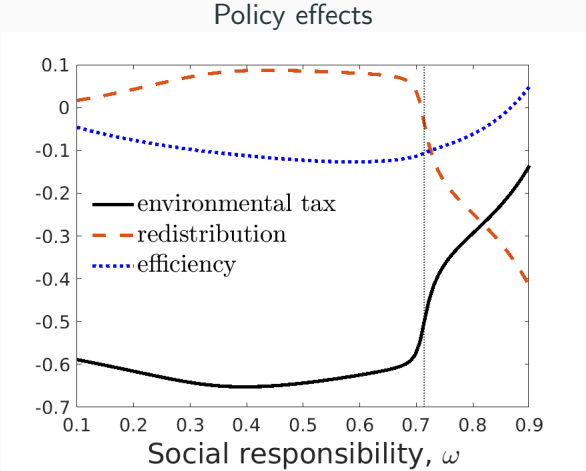
What is the role of the different policy channels on the externality?

- **Problem:** policy effects are interrelated

$\Rightarrow$ additional timing assumption

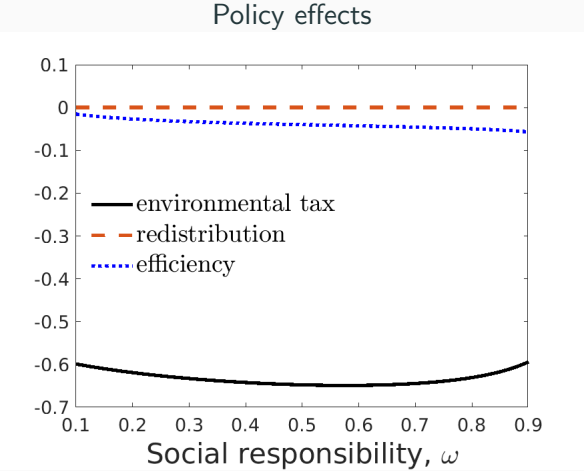
1. solve for the optimal policy tuple in full model
2. in laissez-faire allocation, impose optimal corrective tax $\Rightarrow$ effect of corrective tax
3. next, add the optimal income tax but keep labour supply fixed $\Rightarrow$ redistribution channel
4. allow labour supply to adjust $\Rightarrow$ efficiency channel

Effectiveness of policy instruments



→ back

Effectiveness of policy instruments: no basic needs

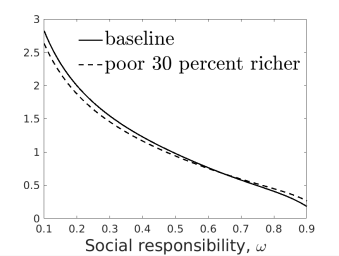


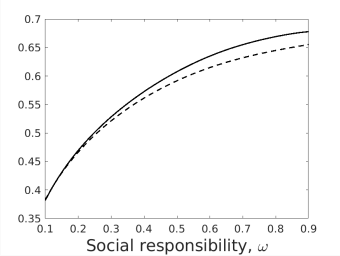
→ back

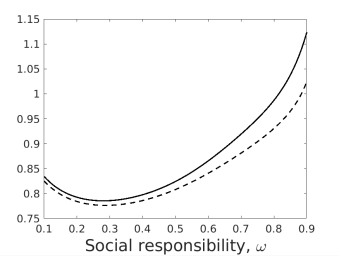
Sensitivity

Less inequality

Corrective tax, τ_n | Income tax, τ_l | Transfers





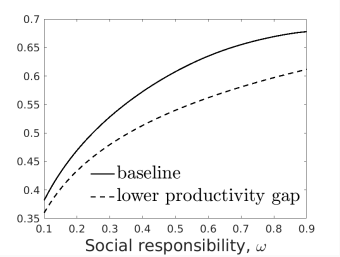


- $z_h = 2.14$, $z_l = 0.14$ in contrast to $z_h = 2.13$, $z_l = 0.03$
- even if the poor were 30% richer, the shift to redistribution would remain optimal

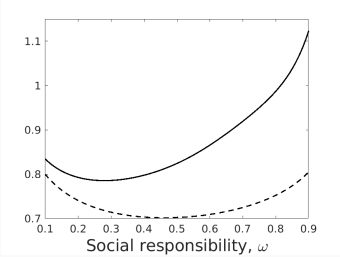
→ back, → conclusion

Lower productivity gap: $\frac{A_n}{A_s} = 1.26$

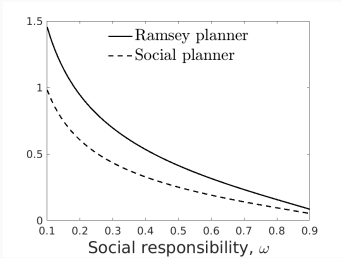
Labour tax, τ_l



Transfers, T



Output ratio, y_n/y_s

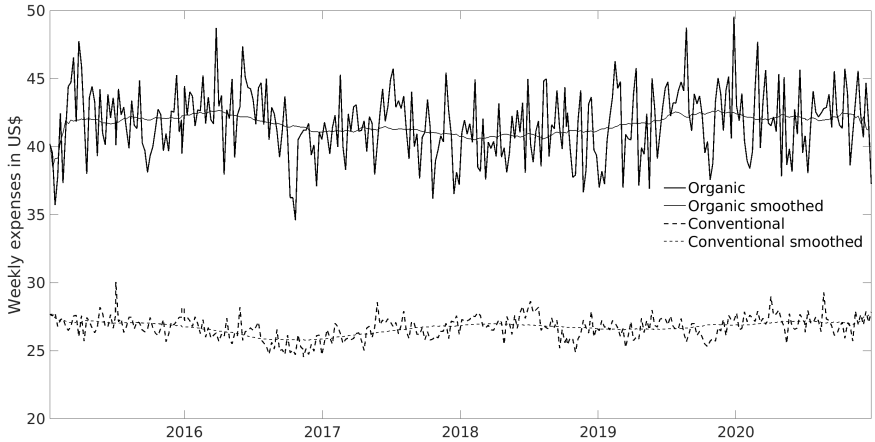


- redistribution is not used as an corrective policy instrument
- the output ratio approaches the efficient one

→ back, → conclusion

Data supplement

Weekly expenses for an organic and a conventional food bundle



The food bundle is determined by the EAT-Lancet Commission (2019), which provides a food bundle in line with planetary and bodily health.

Monthly basic expenses for a US single working adult in US$ in 2018

Category	(1) Unsustainable	(2) Sustainable	(3) Sustainable exists
Housing & Utilities	785	785	false
Food	267	417.23	true
Transportation	476	476	false
Personal & Household items	389	607.88	true
Healthcare	177	276.59	true
Monthly basic needs (sum)	2,094	2,562.70	
Annual basic needs	25,128	30,752.38	

Source: Institute for Women's Policy Research (2018)