Social Segregation, Misperceptions and Emergent Cyclical Choice Patterns

Young Economists Conference 2024

Daniel M. Mayerhoffer, Amsterdam Institute for Social Science Research, University of Amsterdam
Jan Schulz, Economics Institute, University of Bamberg

daniel.mayerhoffer@uni-bamberg.de // d.m.mayerhoffer@uva.nl
jan.schulz-gebhard@uni-bamberg.de

UNIVERSITY OF AMSTERDAM

Computational Social Science

Why does rising inequality not increase (desired) redistribution?

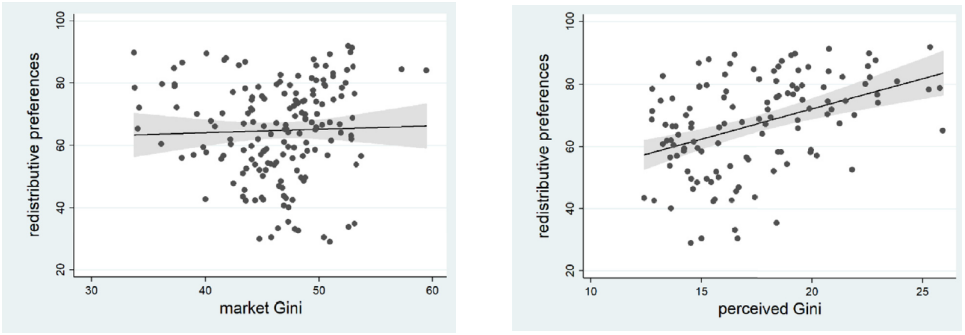
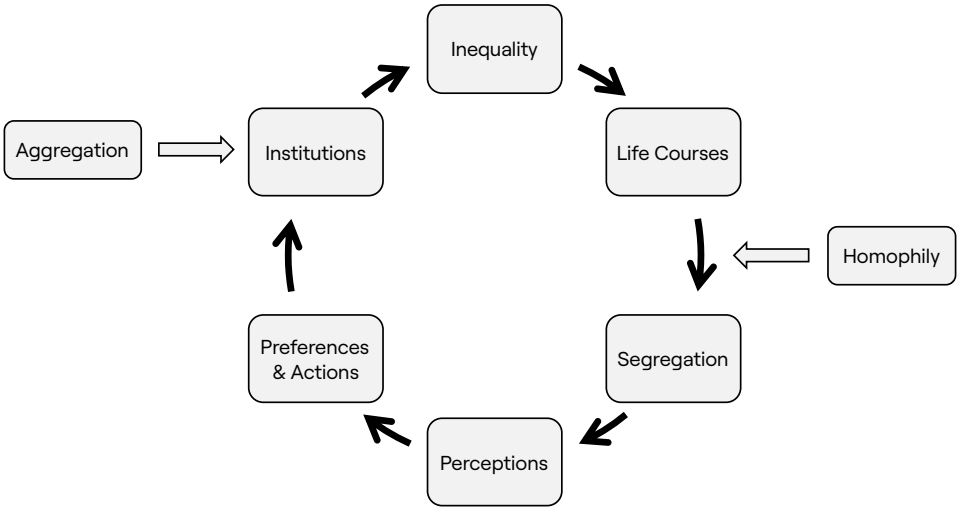


Figure: Taken from Choi (2019): Revisiting the redistribution hypothesis with perceived inequality and redistributive preferences, *European Journal of Political Economy*, 58: 220 – 244.

The Nexus of (Income) Inequality, Its Perception, and Perpetuation



Misperceptions and their Origins

Agents form beliefs based on *social sampling*:

global signal	social sample
mean income $\bar{y}$	own income y_i (EL, 2024)
	homophily-biased sample

Misperceptions and their Origins

Agents form beliefs based on *social sampling*:

global signal	social sample
mean income $\bar{y}$	own income y_i (EL, 2024)
	homophily-biased sample

Homophily and Segregation

Homophilic Network Formation

- Exponential income distribution (Silva and Yakovenko, 2005)
- Preferential attachment procedure applied to a node property other than degree
  $\Rightarrow$ ρ setting the strength of the attachment
- Nodes *choose* their link-neighbours.
  $\Rightarrow$ Homophily in income (McPherson 2001)
- Five links, i.e., closest layer of interaction (MacCarron et al. 2016)
- Choice weight inversely related to the absolute distance in the defining characteristic, i.e., income Y (microfounded by discrete choice model in Schulz et al., 2022):

$$\frac{1}{\text{Exp}[\rho \cdot |y_i - y_j|]}, \text{ with } \rho \in \mathbb{R}_0^+ \text{as homophily strength}$$

Outcome of Homophily: Connected but Segregated Graph

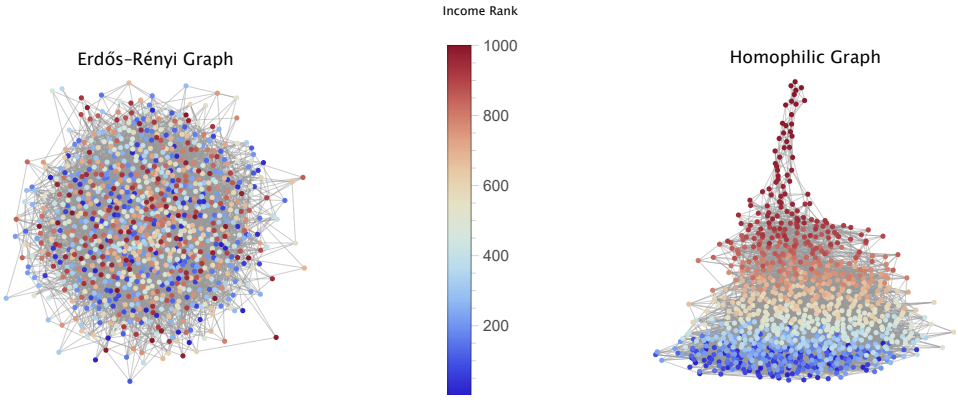


Figure: Graph resulting from homophilic linkage (compared to ER network).

Everybody in the Middle Class?

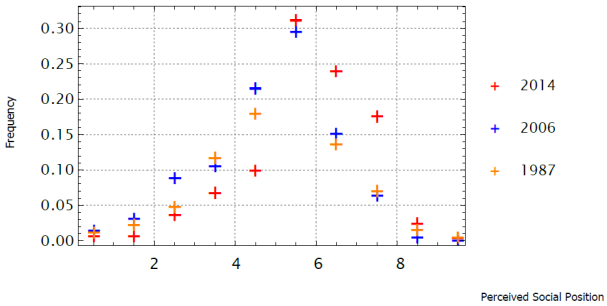


Figure: Self-perceptions of income deciles from a survey for German respondents in the International Social Survey Program (left panel) and as simulation outcomes (right panel).

Everybody in the Middle Class?

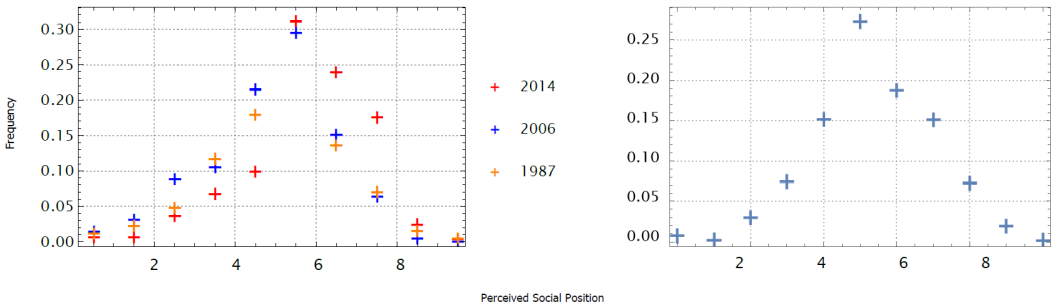
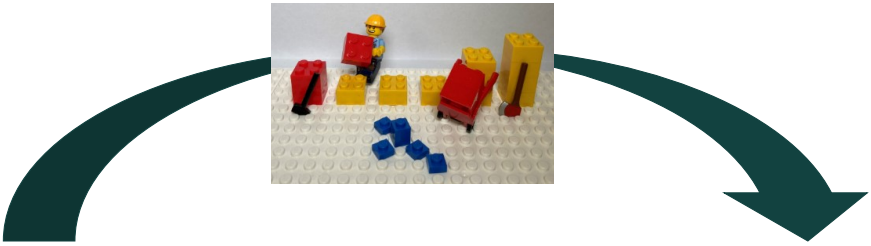


Figure: Self-perceptions of income deciles from a survey for German respondents in the International Social Survey Program (left panel) and as simulation outcomes (right panel).

Modelling Redistribution



Taxable Income and Tax Efficiency

- Y is total income before taxes
- Tax base decreases with taxation according to constant elasticity of taxable income ϵ with respect to the net of tax rate $(1-t)$
  - $\Rightarrow$ Microfoundations from a labour-leisure trade-off with isoelastic utility
- Lump sum transfer to all individuals with rate t is therefore

$$\begin{aligned} T &= (1/N) \cdot t \cdot (1-t)^{\epsilon}\ Y \quad \text{or} \\ &= t \cdot (1-t)^{\epsilon}\ \bar{y}, \end{aligned}$$

  with $\bar{y}$ as the mean pre-tax income.
  - $\Rightarrow$ Gives rise to a Laffer curve as model closure.

Laffer Curves for Different ϵ

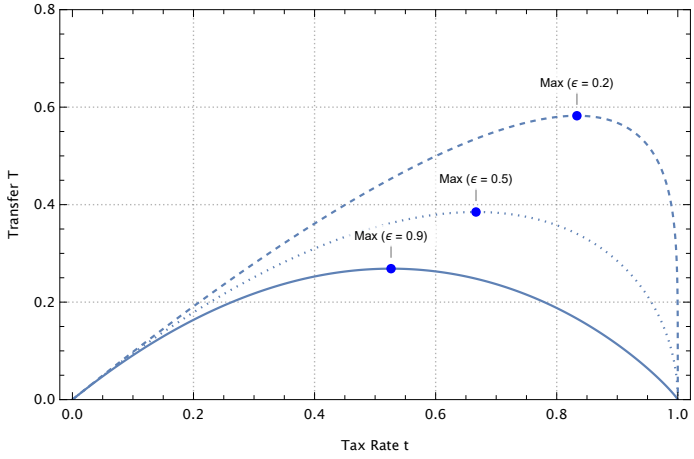


Figure: Laffer curves for different degrees of taxation inefficiency with respective maximum revenue points.

Voting Decisions

Individual Voting Decision of Agent i:

$$V_i = \begin{cases} 1 & \text{if } t \cdot (1-t)^{\epsilon} \cdot \bar{y}_i > t \cdot y_i \\ 0 & \text{if } t \cdot (1-t)^{\epsilon} \cdot \bar{y}_i = t \cdot y_i \\ -1 & \text{if } t \cdot (1-t)^{\epsilon} \cdot \bar{y}_i < t \cdot y_i \end{cases}$$

Agents form beliefs about the mean income $\bar{y}_i$ according to

$$\hat{y}_i = a \cdot \bar{y} + (1-a) l_i,$$

with $\bar{y}$ as the true mean income, l_i as the locally perceived mean income and $0 \leq a \leq 1$ as the weight on the true, global mean income.
The tax rate $0 < t < 1$ has a majority, if $V > 0$:

$$V(t, \epsilon, a, \bar{y}, \vec{l}, \vec{y}) = \sum_{i=1}^{N} V_i = \sum_{i=1}^{N} \mathbf{sign}[t \cdot (1-t)^{\epsilon} \cdot \hat{y}_i - t \cdot y_i]$$

Initial Bias and Redistribution

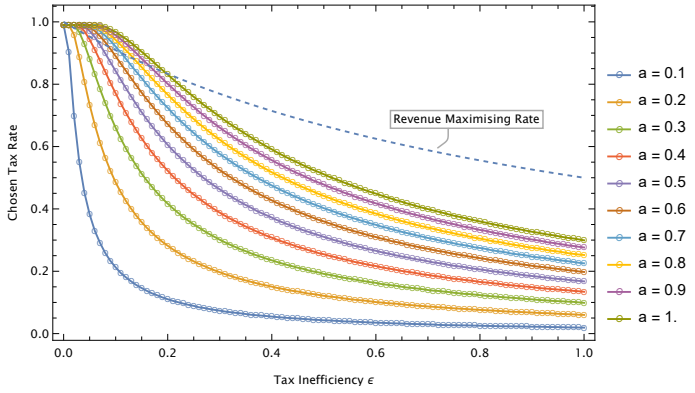


Figure: Implemented tax rates for different weights for the global signal $a \in [0; 1]$ and for varying the elasticity of taxable income $\epsilon \in [0, 1]$ with constant homophily $\rho = 8$.

Segregation and Redistribution

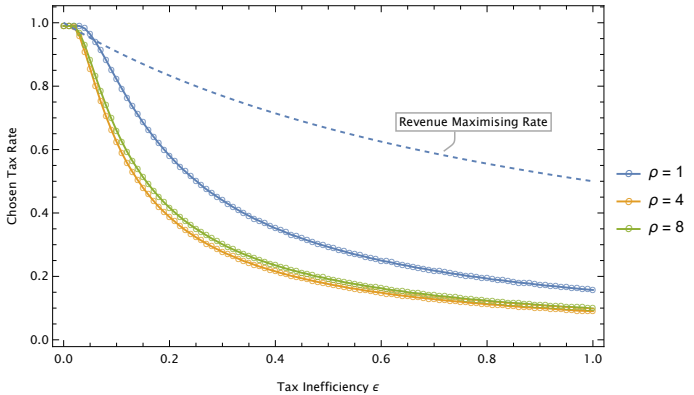


Figure: Implemented tax rates for varying the elasticity of taxable income $\epsilon \in [0, 1]$ with constant weight of the global signal at $a = 0.3$, Homophily strength varies in the range $\rho \in \{1; 4; 8\}$.

Changing Inequality and Redistribution

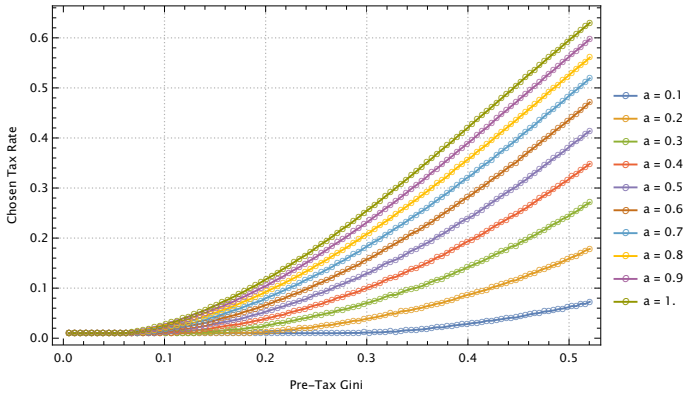


Figure: Implemented tax rates for different weights for the global signal $a \in [0; 1]$ and for varying the Gini coefficient of the pre-tax income distribution that is initialised as a log-normal distribution and constant $\rho = 8$.

Discussion

Main Findings

- Simulation results and empirical preferences consistent with individual perceptions consisting of a localised component and a global signal.
- Distortion of localised perception because of individuals typically occupying a middle income rank in their ego network
  - ⇒ No appreciation of own benefit from tax.
- Learning about mean income leads to different conclusion than updating about efficiency (▸ Dynamic Extension)
  - ⇒ Increasing updating strength is stabilising in the former but destabilising in the latter case

Implications

Discussion

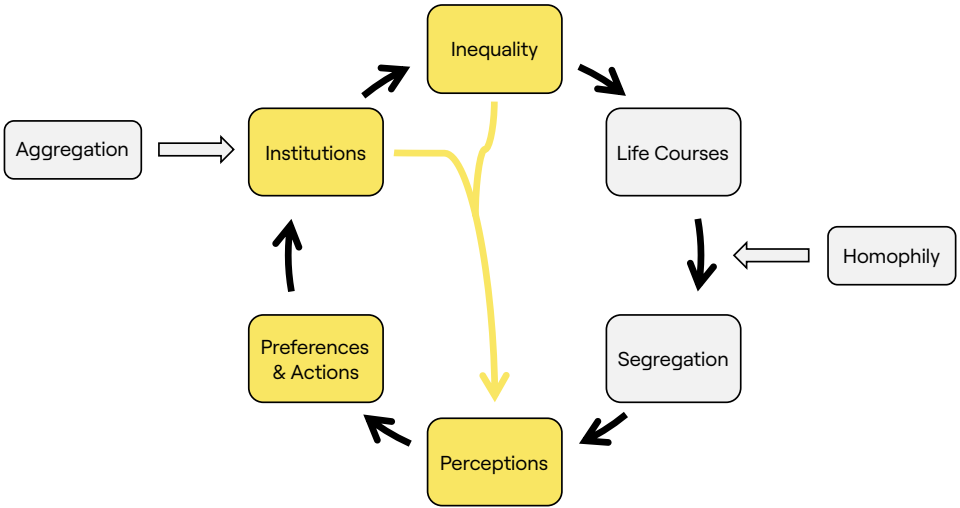
Main Findings

Implications

- Account for lack of connection between actual inequality and redistribution preferences
- Potential countermeasures:
  a) Promote knowledge about actual mean income
  b) Counteract segregation of social contacts

Thank you for listening!

The Nexus of (Income) Inequality, Its Perception, and Perpetuation



back

Adaptive Beliefs and Dynamic Voting

Agents form adaptive beliefs about taxation efficiency at time τ

$$\epsilon^e_{i,\tau} = \epsilon^e_{i,\tau-1} + \lambda(\epsilon_{i,\tau-1} - \epsilon^e_{i,\tau-1}),$$

with λ as the error correction parameter and with $\lambda = 1$ implying naive beliefs, i.e., $\epsilon^e_{i,\tau} = \epsilon_{i,\tau-1}$.
These beliefs can be expressed as a function of the realized previous-period transfer $T_{\tau-1}$ by

$$\epsilon^e_{i,\tau} = \lambda \cdot \frac{\log\left(\frac{t_{\tau-1}y_i + T_{\tau-1}}{t_{\tau-1}(a\cdot\bar{y} + (1-a)l_i)}\right)}{\log(1-t_{\tau-1})} + (1-\lambda)\cdot\epsilon^e_{i,\tau-1}$$

Endogenous Opinion Polarisation

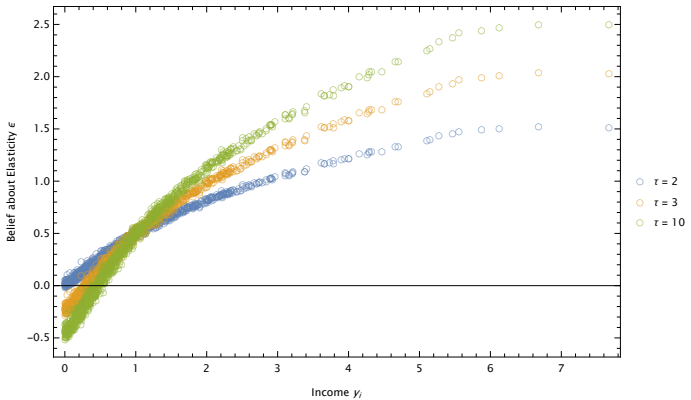


Figure: Agents' beliefs about the elasticity of taxable income ϵ against their pre-tax incomes y_i for $\rho = 8$, $a = 0.5$, $\lambda = 0.25$ and the true $\epsilon = 0.5$.

Dynamic Patterns of (Non-) Convergence and Oscillation

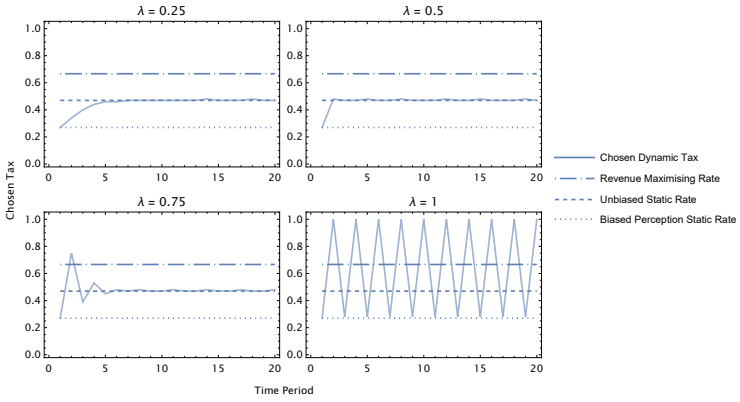


Figure: Chosen tax rates for the dynamical updating process with different error-adjustment parameters $\lambda \in \{0.25; 0.5; 0.75; 1\}$. Simulations for $a = 0.5$, $\rho = 8$ and a true $\epsilon = 0.5$.

Oscillations Without Convergence for High Initial Bias

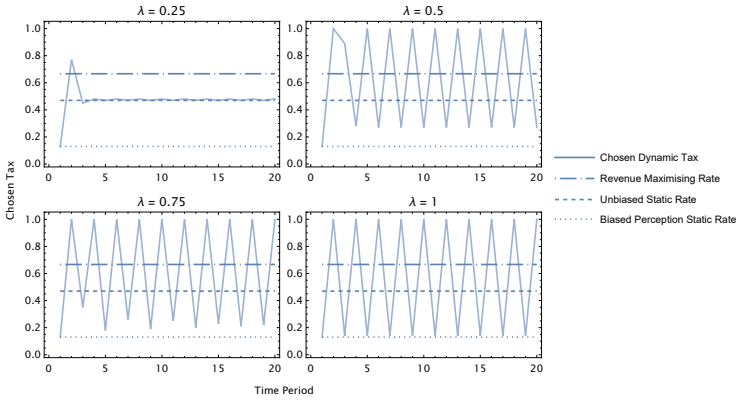


Figure: Chosen tax rates for the dynamical updating process with different error-adjustment parameters $\lambda \in \{0.25; 0.5; 0.75; 1\}$. All simulations are conducted for $a = 0.25$, $\rho = 8$ and a true $\epsilon = 0.5$.

Almost Instantaneous Convergence for Low Initial Bias

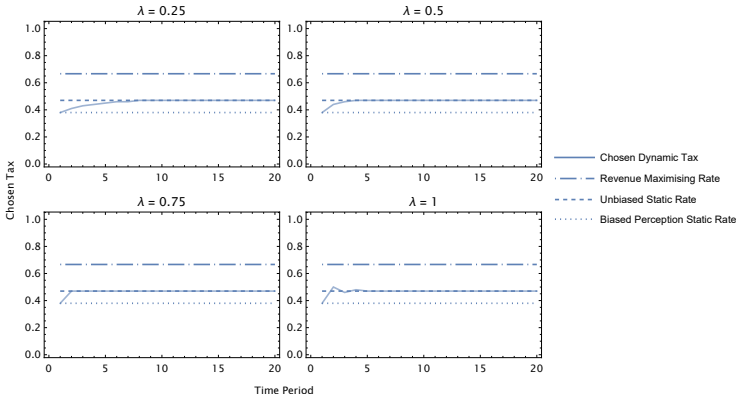


Figure: Chosen tax rates for the dynamical updating process with different error-adjustment parameters $\lambda \in \{0.25; 0.5; 0.75; 1\}$. All simulations are conducted for $a = 0.75$, $\rho = 8$ and a true $\epsilon = 0.5$.

Adaptive Beliefs and Dynamic Voting

Similarly, agents could also form adaptive beliefss about the local income they perceive at time τ

$$I^e_{i,\tau} = I^e_{i,\tau-1} + \lambda(I_{i,\tau-1} - I^e_{i,\tau-1}),$$

with λ as the error correction parameter and with $\lambda = 1$ implying naive beliefs, i.e., $\epsilon^e_{i,\tau} = \epsilon_{i,\tau-1}$.
These beliefs can be expressed as a function of the realized previous-period transfer $T_{\tau-1}$ by

$$I^e_{i,\tau} = \lambda \cdot \frac{a\bar{y} - \frac{(1-t_{\tau-1})^{-\epsilon}(ty_i + T_{\tau-1})}{t_{\tau-1}}}{a-1} + (1-\lambda)I^e_{i,\tau-1}.$$

Updating I Leads to Monotonous Convergence

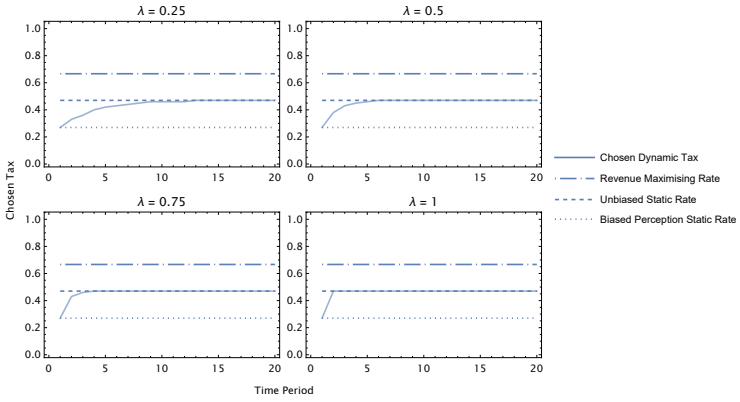


Figure: Chosen tax rates for the dynamic updating process with different error-adjustment parameters $\lambda \in \{0.25; 0.5; 0.75; 1\}$ for the updating of I. All simulations are conducted for $a = 0.5$, $\rho = 8$ and $\epsilon = 0.5$.