Redistributive Taxation in a Partial Insurance Economy

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Workshop on Family Economics

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Redistributive Taxation

How progressive should taxes be?

Arguments in favor of progressivity:

1. Social insurance of privately-uninsurable shocks
2. Redistribution from high to low innate ability

Arguments against progressivity:

1. Distortion to distribution of labor supply
2. Distortion to human capital investment
3. Redistribution from low to high taste for leisure
Wanted: Theory of Taxation

Model should incorporate

1. endogenous skill investment \+ endogenous skill prices
2. differential “innate” (learning) ability
3. endogenous labor supply
4. idiosyncratic wage risk: self insurance and some private insurance (other assets, family, etc)
5. heterogeneity in preferences for leisure

Model should be consistent with salient facts

1. A plausible cross-sectional distribution of wages (upper tail is Pareto and the bulk of the distribution is log-normal)
2. The right cross-sectional dispersion and the right co-movement of consumption, hours, and wages.
3. Return to education should be roughly linear in investment
Ramsey Approach

Government/Planner takes policy instruments and market structure as given, and chooses the CE that yields the largest social welfare

- CE of an heterogeneous-agent, incomplete-market economy
- Nonlinear tax/transfer system
  - Public good provision also chosen by the government
- Various social welfare functions
- Tractable equilibrium framework clarifies economic forces shaping the optimal degree of progressivity
Demographics and preferences

- **Perpetual youth** demographics with constant survival probability $\delta$

- **Preferences** over consumption $(c)$, hours $(h)$, publicly-provided goods $(G)$, and skill-investment effort $(s)$:

  \[
  U_i = v_i(s_i) + \mathbb{E}_0 \sum_{t=0}^{\infty} (\beta \delta)^t u_i(c_{it}, h_{it}, G)
  \]

  \[
  v_i(s_i) = -\frac{1}{\kappa_i} \frac{s_i^2}{2\mu}
  \]

  \[
  u_i(c_{it}, h_{it}, G) = \log c_{it} - \exp(\varphi_i) \frac{h_{it}^{1+\sigma}}{1 + \sigma} + \chi \log G
  \]

  \[
  \kappa_i \sim \text{Exp}(\eta)
  \]

  \[
  \varphi_i \sim N\left(\frac{v_\varphi}{2}, v_\varphi\right)
  \]
Technology

• Output is CES aggregator over continuum of skill types:

\[ Y = \left[ \int_0^\infty N(s) \frac{\theta - 1}{\theta} ds \right]^{\frac{\theta}{\theta - 1}}, \quad \theta \in (1, \infty) \]

• Aggregate effective hours by skill type:

\[ N(s) = \int_0^1 I_{\{s_i = s\}} z_i h_i \, di \]

• Aggregate resource constraint:

\[ Y = \int_0^1 c_i \, di + G \]
Individual efficiency units of labor

\[
\log z_{it} = \alpha_{it} + \varepsilon_{it}
\]

- \( \alpha_{it} = \alpha_{i,t-1} + \omega_{it} \) with \( \omega_{it} \sim N \left( -\frac{v_\omega}{2}, v_\omega \right) \)
  \( \alpha_{i0} = 0 \) \( \forall i \)

- \( \varepsilon_{it} \) i.i.d. over time with \( \varepsilon_{it} \sim N \left( -\frac{v_\varepsilon}{2}, v_\varepsilon \right) \)

- \( \varphi \perp \kappa \perp \omega \perp \varepsilon \) cross-sectionally and longitudinally

- Pre-government earnings:
  
  \[
  y_{it} = p(s_i) \times \exp(\alpha_{it} + \varepsilon_{it}) \times h_{it}
  \]

  determined by skill, fortune, and diligence
Government

- Runs a two-parameter tax/transfer function to redistribute and finance publicly-provided goods $G$

- Disposable (post-government) earnings:

  $$\tilde{y}_i = \lambda y_i^{1-\tau}$$

- Government budget constraint (no government debt):

  $$G = \int_0^1 [y_i - \lambda y_i^{1-\tau}] \, di$$

Government chooses $(G, \tau)$, and $\lambda$ balances the budget residually
Our model of fiscal redistribution

- CPS 2005, $N_{obs} = 52,539$: $R^2 = 0.92$ and $\tau = 0.18$
Representative Agent Warm Up

\[
\max_{C,H} U = \log C - \frac{H^{1+\sigma}}{1 + \sigma} + \chi \log G
\]

s.t.
\[
C = \lambda H^{1-\tau}
\]

Market clearing \(C + G = H\)

Define \(g = G/H\)

Equilibrium allocations:
\[
\log C^{RA}(g, \tau) = \log(1 - g) + \frac{1}{(1 + \sigma)} \log(1 - \tau)
\]
\[
\log H^{RA}(g, \tau) = \frac{1}{(1 + \sigma)} \log(1 - \tau)
\]
Representative Agent Optimal Policy

- Welfare:

\[ W^{RA}(g, \tau) = \log(1 - g) + \chi \log g + (1 + \chi) \frac{\log(1 - \tau)}{1 + \sigma} - \frac{1 - \tau}{1 + \sigma} \]

- Welfare maximizing \((g, \tau)\) pair:

\[ g^* = \frac{\chi}{1 + \chi} \]
\[ \tau^* = -\chi \]

- Allocations are first best (same as with lump-sum taxes)
- Result for \(g^*\) will extend to heterogeneous agent setup

\[ W^{RA}(\tau) = \chi \log \chi - (1 + \chi) \log(1 + \chi) + (1 + \chi) \frac{\log(1 - \tau)}{1 + \sigma} - \frac{1 - \tau}{1 + \sigma} \]

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Markets

- Competitive good and labor markets
- Competitive asset markets (all assets in zero net supply)
  - Non state-contingent bond
Markets

• Competitive good and labor markets

• Competitive asset markets (all assets in zero net supply)
  
  ▶ Non state-contingent bond

  ▶ Full set of insurance claims against $\varepsilon$ shocks

  ■ If $v_\varepsilon = 0$, it is a bond economy

  ■ If $v_\omega = 0$, it is a full insurance economy

  ■ If $v_\omega = v_\varepsilon = v_\varphi = 0$ & $\theta = \infty$, it is a RA economy

• Perfect annuity against survival risk

Heathcote-Storesletten-Violante, “Redistributive Taxation in a Partial Insurance Economy”
Budget constraints

1. **Beginning of period**: innovation $\omega$ to $\alpha$ shock is realized

2. **Middle of period**: buy insurance against $\varepsilon$:

$$b = \int_E Q(\varepsilon) B(\varepsilon) d\varepsilon,$$

where $Q(\cdot)$ is the price of insurance and $B(\cdot)$ is the quantity

3. **End of period**: $\varepsilon$ realized, consumption and hours chosen:

$$c + \delta q b' = \lambda [p(s) \exp(\alpha + \varepsilon) h]^{1-\tau} + B(\varepsilon)$$
Given \((g, \tau)\), a stationary RCE is a value \(\lambda^*\), asset prices \(\{Q(\cdot), q\}\), skill prices \(p(s)\), decision rules \(s(\varphi, \kappa, 0)\), \(c(\alpha, \varepsilon, \varphi, s, b)\), \(h(\alpha, \varepsilon, \varphi, s, b)\), and aggregate quantities \(N(s)\) such that:

- households optimize
- markets clear
- the government budget constraint is balanced
Recursive stationary equilibrium

- Given \((g, \tau)\), a stationary RCE is a value \(\lambda^*\), asset prices \(\{Q(\cdot), q\}\), skill prices \(p(s)\), decision rules \(s(\varphi, \kappa, 0)\), \(c(\alpha, \varepsilon, \varphi, s, b)\), \(h(\alpha, \varepsilon, \varphi, s, b)\), and aggregate quantities \(N(s)\) such that:
  - households optimize
  - markets clear
  - the government budget constraint is balanced

- The equilibrium features **no bond-trading**
  - \(b = 0 \rightarrow\) allocations depend only on exogenous states
  - \(\alpha\) shocks remain uninsured, \(\varepsilon\) shocks fully insured
No bond-trade equilibrium

• Micro-foundations for Constantinides and Duffie (1996)
  ▶ CRRA, unit root shocks to log disposable income
  ▶ In equilibrium, no bond-trade \( c_t = \tilde{y}_t \)

• Unit root disposable income micro-founded in our model:
  1. Skill investment+shocks: \( \rightarrow \) wages
  2. Labor supply choice: wages \( \rightarrow \) pre-tax earnings
  3. Non-linear taxation: pre-tax earnings \( \rightarrow \) after-tax earnings
  4. Private risk sharing: after-tax earnings \( \rightarrow \) disp. income
  5. No bond trade: disposable income = consumption
Equilibrium skill choice and skill price

- FOC \[ \frac{s}{\kappa\mu} = (1 - \beta\delta) \frac{\partial U_0(\varphi, s)}{\partial s} = (1 - \tau) \frac{\partial \log p(s)}{\partial s} \]
Equilibrium skill choice and skill price

- FOC \[ \frac{s}{\kappa \mu} = (1 - \beta \delta) \frac{\partial U_0(\varphi, s)}{\partial s} = (1 - \tau) \frac{\partial \log p(s)}{\partial s} \]

- Skill price has Mincerian shape: \[ \log p(s) = \pi_0 + \pi_1 s \]

\[ \pi_1 = \frac{\eta}{\theta \mu (1 - \tau)} \] (return to skill)
Equilibrium skill choice and skill price

• **FOC** → \( \frac{s}{\kappa \mu} = (1 - \beta \delta) \frac{\partial U_0(\varphi, s)}{\partial s} = (1 - \tau) \frac{\partial \log p(s)}{\partial s} \)

• Skill price has **Mincerian shape**: \( \log p(s) = \pi_0 + \pi_1 s \)

\[ \pi_1 = \sqrt{\frac{\eta}{\theta \mu (1 - \tau)}} \]  

(return to skill)

\[ \text{var}(\log p(s)) = \frac{1}{\theta^2} \]

Offsetting effects of \( \tau \) on \( s \) and \( p(s) \) leave pre-tax inequality unchanged

• Distribution of skill prices (in level) is **Pareto with parameter** \( \theta \)

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Upper tail of wage distribution

Top 1pct of the Wage Distribution

Model Wage Distribution
Lognormal Wage Distribution

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Equilibrium consumption allocation

\[
\log c^*(\alpha, \varphi, s; g, \tau) = \log C^{RA}(g, \tau) + \underbrace{\mathcal{M}(v_\varepsilon)}_{\text{level effect from ins. variation}} + (1 - \tau) \log p(s; \tau) - (1 - \tau) \varphi + (1 - \tau) \alpha
\]

- Response to variation in \((p(s), \varphi, \alpha)\) mediated by progressivity
- Invariant to insurable shock \(\varepsilon\)
Equilibrium hours allocation

\[ \log h^*(\varepsilon, \varphi; g, \tau) = \log H^{RA}(g, \tau) - \frac{1}{\hat{\sigma}(1 - \tau)} \mathcal{M}(v_\varepsilon) \]

\[
= \underbrace{\log H^{RA}(g, \tau)}_{\text{level effect from ins. variation}} - \varphi + \frac{1}{\hat{\sigma}} \varepsilon
\]

- Response to \( \varepsilon \) mediated by \textit{tax-modified} Frisch elasticity \( \frac{1}{\hat{\sigma}} = \frac{1 - \tau}{\sigma + \tau} \)

- Invariant to skill price \( p(s) \) and uninsurable shock \( \alpha \)
Utilitarian Social Welfare Function

- Steady states with constant \((g, \tau)\)

\[
\mathcal{W}(g, \tau) \propto \sum_{k=-\infty}^{\infty} \mu_k \int_0^1 U_{i,k}(\cdot; g, \tau) \, di
\]

- Government sets weights: \(\mu_k = \beta^k \times \text{cohort size}\)
  - SWF becomes average period utility in the cross-section
  - Skill acquisition cost for those currently alive imputed to SWF proportionally to their remaining lifetime

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Exact expression for SWF

\[ \mathcal{W}(g, \tau) = \log(1 - g) + \chi \log g + (1 + \chi) \frac{\log(1 - \tau)}{(1 + \hat{\sigma})(1 - \tau)} - \frac{1}{(1 + \hat{\sigma})} \\
+ (1 + \chi) \left[ - \frac{1}{\theta - 1} \log \left( \sqrt{\frac{\eta \theta}{\mu (1 - \tau)}} \right) + \frac{\theta}{\theta - 1} \log \left( \frac{\theta}{\theta - 1} \right) \right] \\
- \frac{1}{2\theta} (1 - \tau) - \left[ - \log \left( 1 - \left( \frac{1 - \tau}{\theta} \right) \right) - \left( \frac{1 - \tau}{\theta} \right) \right] \\
- (1 - \tau)^2 \frac{\nu_\varphi}{2} \\
- \left[ (1 - \tau) \frac{\delta}{1 - \delta} \frac{\nu_\omega}{2} - \log \left( 1 - \delta \exp \left( - \frac{\tau (1 - \tau)}{2} \nu_\omega \right) \right) \right] \\
- (1 + \chi) \frac{1}{\hat{\sigma}^2} \frac{\nu_\varepsilon}{2} + (1 + \chi) \frac{1}{\hat{\sigma}} \nu_\varepsilon \]

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Representative Agent component

\[ \mathcal{W}(g, \tau) = \log(1 - g) + \chi \log g + (1 + \chi) \frac{\log(1 - \tau)}{(1 + \hat{\sigma})(1 - \tau)} - \frac{1}{(1 + \hat{\sigma})} \]

Representative Agent Welfare = \( \mathcal{W}^{RA}(g, \tau) \)

\[ + (1 + \chi) \left[ -\frac{1}{\theta - 1} \log \left( \sqrt{\frac{\eta \theta}{\mu(1 - \tau)}} \right) + \frac{\theta}{\theta - 1} \log \left( \frac{\theta}{\theta - 1} \right) \right] \]

\[ - \frac{1}{2\theta} (1 - \tau) - \left[ -\log \left( 1 - \left( \frac{1 - \tau}{\theta} \right) \right) - \left( \frac{1 - \tau}{\theta} \right) \right] \]

\[ - (1 - \tau)^2 \frac{v_\varphi}{2} \]

\[ - \left[ (1 - \tau) \frac{\delta}{1 - \delta} \frac{v_\omega}{2} - \log \left( \frac{1 - \delta \exp \left( \frac{-\tau(1 - \tau)}{2} v_\omega \right)}{1 - \delta} \right) \right] \]

\[ -(1 + \chi)\sigma \frac{1}{\hat{\sigma}^2} \frac{v_\varepsilon}{2} + (1 + \chi) \frac{1}{\hat{\sigma}} v_\varepsilon \]
Skill investment component

\[\mathcal{W}(\tau) = \mathcal{W}^{RA}(\tau)\]

\[+ (1 + \chi) \left[ -\frac{1}{\theta - 1} \log \left( \sqrt{\frac{\eta}{\mu (1 - \tau)}} \right) + \frac{\theta}{\theta - 1} \log \left( \frac{\theta}{\theta - 1} \right) \right]\]

productivity gain = \(\log \mathbb{E}[(p(s))] = \log \frac{Y}{N}\)

\[-\frac{1}{2\theta} (1 - \tau) - \left[ -\log \left( 1 - \left( \frac{1 - \tau}{\theta} \right) \right) - \left( \frac{1 - \tau}{\theta} \right) \right]\]

avg. education cost

\[-(1 - \tau)^2 \frac{\nu \varphi}{2}\]

consumption dispersion across skills

\[-\left[ (1 - \tau) \frac{\delta}{1 - \delta} \frac{\nu \omega}{2} - \log \left( \frac{1 - \delta \exp \left( \frac{-\tau (1 - \tau)}{2} \nu \omega \right)}{1 - \delta} \right) \right]\]

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Skill investment component

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Uninsurable component

\[ \mathcal{W}(\tau) = \mathcal{W}^{RA}(\tau) \]

\[ + (1 + \chi) \left[ \frac{-1}{\theta - 1} \log \left( \sqrt{\frac{\eta \theta}{\mu (1 - \tau)}} \right) + \frac{\theta}{\theta - 1} \log \left( \frac{\theta}{\theta - 1} \right) \right] \]

\[ - \frac{1}{2\theta} (1 - \tau) - \left[ \log \left( 1 - \left( \frac{1 - \tau}{\theta} \right) \right) - \left( \frac{1 - \tau}{\theta} \right) \right] \]

\[ - \left( 1 - \tau \right)^2 \frac{v_\varphi}{2} \]

cons. disp. due to prefs

\[ - \left[ (1 - \tau) \frac{\delta}{1 - \delta} \frac{v_\omega}{2} - \log \left( \frac{1 - \delta \exp \left( \frac{-(1 - \tau)}{2} v_\omega \right)}{1 - \delta} \right) \right] \]

consumption dispersion due to uninsurable shocks \( \approx \left( 1 - \tau \right)^2 \frac{v_\alpha}{2} \)

\[ -(1 + \chi) \sigma \frac{1}{\hat{\sigma}^2} \frac{v_\epsilon}{2} + (1 + \chi) \frac{1}{\hat{\sigma}} v_\epsilon \]

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Insurable component

\[ W(\tau) = W^{RA}(\tau) \]

\[ + (1 + \chi) \left[ \frac{-1}{\theta - 1} \log \left( \sqrt{\frac{\eta \theta}{\mu (1 - \tau)}} \right) + \frac{\theta}{\theta - 1} \log \left( \frac{\theta}{\theta - 1} \right) \right] \]

\[ - \frac{1}{2\theta} (1 - \tau) - \left[ - \log \left( 1 - \left( \frac{1 - \tau}{\theta} \right) \right) - \left( \frac{1 - \tau}{\theta} \right) \right] \]

\[ - (1 - \tau)^2 \frac{v_\varphi}{2} \]

\[ - \left[ (1 - \tau) \frac{\delta}{1 - \delta} \frac{v_\omega}{2} - \log \left( \frac{1 - \delta \exp \left( \frac{-\tau (1 - \tau) v_\omega}{2} \right)}{1 - \delta} \right) \right] \]

\[ -(1 + \chi) \sigma \frac{1}{\hat{\sigma}^2} \frac{v_\varepsilon}{2} + (1 + \chi) \frac{1}{\hat{\sigma}^2} v_\varepsilon \]

hours dispersion  prod. gain from ins. shock = \log(N/H)
Parameterization

- Parameter vector $\{\chi, \sigma, \delta, \theta, v_{\varphi}, v_{\omega}, v_{\varepsilon}\}$
Parameterization

- Parameter vector \( \{\chi, \sigma, \delta, \theta, v_\varphi, v_\omega, v_\varepsilon, \} \)

- To match \( G/Y = 0.20 \): \( \rightarrow \chi = 0.25 \)
Parameterization

- Parameter vector \( \{ \chi, \sigma, \delta, \theta, v_\varphi, v_\omega, v_\varepsilon, \} \)

- To match \( G/Y = 0.20 \):
  \[ \rightarrow \chi = 0.25 \]

- Frisch elasticity (micro-evidence):
  \[ \rightarrow \sigma = 2 \]
Parameterization

• Parameter vector \( \{\chi, \sigma, \delta, \theta, v_\phi, v_\omega, v_\varepsilon, \} \)

• To match \( G/Y = 0.20 \):
  \[ \rightarrow \chi = 0.25 \]

• Frisch elasticity (micro-evidence):
  \[ \rightarrow \sigma = 2 \]

\[
\begin{align*}
\text{cov}(\log h, \log w) & = \frac{1}{\hat{\sigma}} v_\varepsilon \\
\text{var}(\log h) & = v_\phi + \frac{1}{\hat{\sigma}^2} v_\varepsilon \\
\text{var}^0(\log c) & = (1 - \tau)^2 \left( v_\phi + \frac{1}{\theta^2} \right) \\
\Delta\text{var}(\log w) & = v_\omega
\end{align*}
\]
Parameterization

- Parameter vector \( \{\chi, \sigma, \delta, \theta, v_{\varphi}, v_{\omega}, v_{\varepsilon}\} \)

- To match \( G/Y = 0.20 \):
  \[ \chi = 0.25 \]

- Frisch elasticity (micro-evidence):
  \[ \sigma = 2 \]
  \[ cov(\log h, \log w) = \frac{1}{\hat{\sigma}} v_{\varepsilon} \rightarrow v_{\varepsilon} = 0.18 \]
  \[ var(\log h) = v_{\varphi} + \frac{1}{\hat{\sigma}^2} v_{\varepsilon} \rightarrow v_{\varphi} = 0.06 \]
  \[ var^0(\log c) = (1 - \tau)^2 \left( v_{\varphi} + \frac{1}{\hat{\theta}^2} \right) \rightarrow \theta = 3 \]
  \[ \Delta var(\log w) = v_{\omega} \rightarrow v_{\omega} = 0.005, \delta = 0.963 \]
Optimal progressivity

Social Welfare Function

Welfare gain = 0.82 pct

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Optimal progressivity: decomposition

Social Welfare Function

- Progressivity rate ($\tau$)
- Welfare change rel. to baseline optimum (% of cons.)

(1) Rep. Agent $\tau = -0.25$

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Optimal progressivity: decomposition

Social Welfare Function

(1) Rep. Agent $\tau = -0.25$

(2) + Skill Inv. $\tau = -0.066$

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Optimal progressivity: decomposition

Social Welfare Function

(1) Rep. Agent $\tau = -0.25$
(2) + Skill Inv. $\tau = -0.066$
(3) + Pref. Het. $\tau = 0.00$

Heathcote-Storesletten-Violante, “Redistributive Taxation in a Partial Insurance Economy”
Optimal progressivity: decomposition

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Actual and optimal progressivity

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Alternative SWF

Utilitarian SWF embeds desire to insure and to redistribute wrt $(\kappa, \varphi)$

Turn off desire to redistribute
Alternative SWF

Utilitarian SWF embeds desire to insure and to redistribute wrt \((\kappa, \varphi)\)

Turn off desire to redistribute

- Economy with heterogeneity in \((\kappa, \varphi)\), and \(\chi = v_\omega = \tau = 0\)
- Compute CE allocations
- Compute Negishii weights s.t. planner’s allocation = CE
- Use these weights in the SWF

Heathcote-Storesletten-Violante, “Redistributive Taxation in a Partial Insurance Economy”
Alternative SWF

<table>
<thead>
<tr>
<th></th>
<th>Utilitarian</th>
<th>$\kappa$-neutral</th>
<th>$\varphi$-neutral</th>
<th>Insurance-only</th>
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<tbody>
<tr>
<td>Redist. wrt $\kappa$</td>
<td>$Y$</td>
<td>$N$</td>
<td>$Y$</td>
<td>$N$</td>
</tr>
<tr>
<td>Redist. wrt $\varphi$</td>
<td>$Y$</td>
<td>$Y$</td>
<td>$N$</td>
<td>$N$</td>
</tr>
<tr>
<td>Insurance wrt $\omega$</td>
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<td>$Y$</td>
<td>$Y$</td>
<td>$Y$</td>
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<tr>
<td>$\tau^*$</td>
<td>0.087</td>
<td>0.046</td>
<td>0.030</td>
<td>-0.012</td>
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<tr>
<td>Welf. gain (pct of $c$)</td>
<td>0.82</td>
<td>1.33</td>
<td>1.66</td>
<td>2.67</td>
</tr>
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</table>
Optimal progressivity: alternative SWF

Heathcote-Storelletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Progressive consumption taxation

\[ c = \lambda \tilde{c}^{1-\tau} \]

where \( c \) are expenditures and \( \tilde{c} \) are units of final good

- Implement as a tax on total (labor plus asset) income less saving
- Consumption depends on \( \alpha \) but not on \( \varepsilon \)
- Can redistribute wrt. uninsurable shocks without distorting the efficient response of hours to insurable shocks
- Higher progressivity and higher welfare

Heathcote-Storesletten-Violante, "Redistributive Taxation in a Partial Insurance Economy"
Alternative assumptions on G

1. G endogenous and valued: $\chi = 0.25$, $G^* = \chi/(1 + \chi) = 0.2$
Alternative assumptions on G

1. G endogenous and valued: \( \chi = 0.25, \ G^* = \chi/(1 + \chi) = 0.2 \)

2. G endogenous but non valued: \( \chi = 0, \ G^* = 0 \)

3. G exogenous and proportional to \( Y \): \( G/Y = \bar{g} = 0.2 \)

4. G exogenous and fixed in level: \( G = \bar{G} = 0.2 \times Y^{US} \)
Alternative assumptions on G

1. G endogenous and valued: $\chi = 0.25$, $G^* = \frac{\chi}{1 + \chi} = 0.2$

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<th>G endogenous</th>
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<tr>
<td>G endogenous</td>
<td>$\chi = 0$</td>
<td>0.000</td>
<td>0.209</td>
<td>0.103</td>
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<tr>
<td>$g$ exogenous</td>
<td>$\bar{g} = 0.2$</td>
<td>0.200</td>
<td>0.209</td>
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<tr>
<td>$G$ exogenous</td>
<td>$\bar{G} = 0.2 \times Y^{US}$</td>
<td>0.188</td>
<td>0.095</td>
<td>0.002</td>
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Heathcote-Storesletten-Violante, “Redistributive Taxation in a Partial Insurance Economy”
Going forward

• Part of $G$ wasted

• Median voter choosing $(g, \tau)$ once and for all

• Skill-biased technical change

• Comparison with Mirlees solution

• Rent-extraction by top earners? (Piketty-Saez view)

• Endogenous growth?
Going forward

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