Larger transfers financed with more progressive taxes? On the optimal design of taxes and transfers

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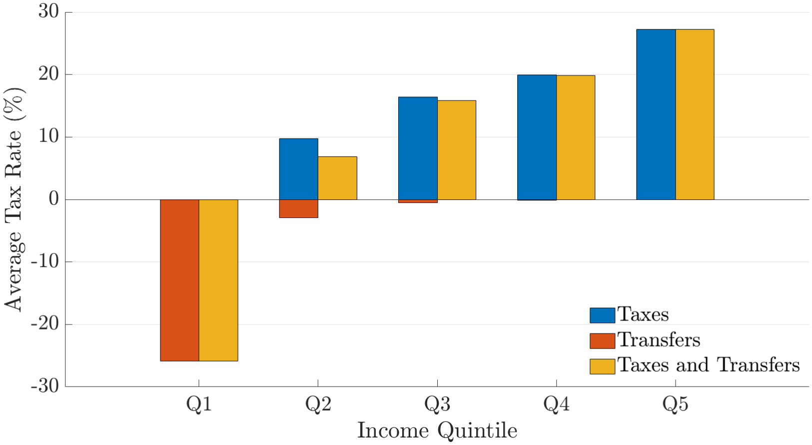
Redistribution in the U.S.

- Taxes and transfers are two key components in the U.S. fiscal system



- Working-age households ranked by income quintiles (CBO, 2013) ▸ Data

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- How should a government design a **tax-and-transfer system** to reduce inequality while preserving efficiency?

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  - Analytical: How should tax progressivity change with more generous transfers?
  - Quantitative: How generous should transfers be? How progressive should taxes be?

Theoretical analysis

- Simple model with progressive income tax scheme & a transfer
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$\Rightarrow$ **Optimal** fiscal plan features large **average** but low **marginal** progressivity

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=> Large welfare gains!

Literature

- Evolution of inequality and taxation in the US

  Piketty and Saez (2003), Piketty and Saez (2007), Piketty, Saez, and Zucman (2017), Splinter (2020)

- Parametric tax functions: Empirical estimates

  Gouveia and Strauss (1994), Guner, Kaygusuz, and Ventura (2014), Feenberg, Ferriere, and Navarro (2020)

- Analytical frameworks to evaluate optimal tax progressivity

  Heathcote, Storesletten, and Violante (2014, 2017)

- Quantitative frameworks to evaluate optimal tax progressivity

  Bakış, Kaymak, and Poschke (2015), Guner, Lopez-Daneri, and Ventura (2016), Krueger and Ludwig (2016), Peterman (2016), Kindermann and Krueger (2021), Boar and Midrigan (2021), Guner, Kaygusuz and Ventura (2021)

- Intersection of Ramsey (1927) and Mirrlees (1971) traditions

  Findeisen and Sachs (2017), Heathcote and Tsujiyama (2021)

An Analytical Model

A tractable environment Static Bewley-Hugett economy

- No capital, representative **firm** with linear production in labor

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- A utilitarian **government**
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- A continuum of infinitely-lived **workers**
  - Wages AR(1): $\log z_{it} = \rho_z \log z_{it-1} + \omega_{it}$, with $\omega_{it} \sim \mathcal{N}\left(-\frac{v_\omega}{2(1+\rho_z)}, v_\omega\right)$

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⇒ Next: 1) RA case $v_\omega = 0$, 2) HA with $T = 0$, and 3) HA with $T \neq 0$

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$\Rightarrow$ **Negative** relationship between τ and T due to **efficiency** concerns

  - Efficiency gains of T are **decreasing** in τ

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- Two **efficiency** terms
  - Size term $\downarrow$ with τ; Labor disutility term $\uparrow$ with τ

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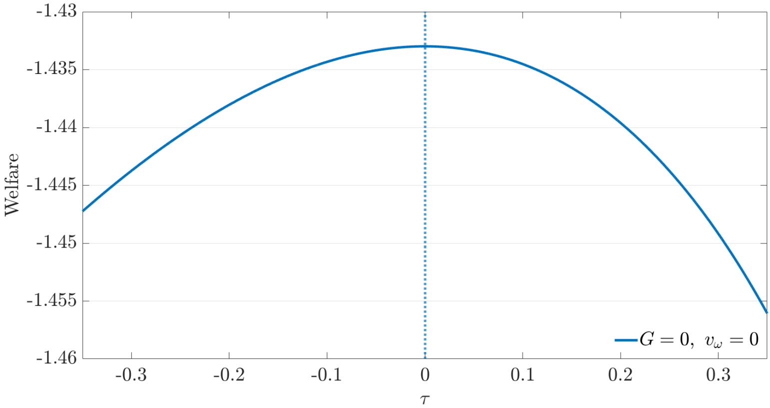
- **Redistribution** term $\uparrow$ with τ

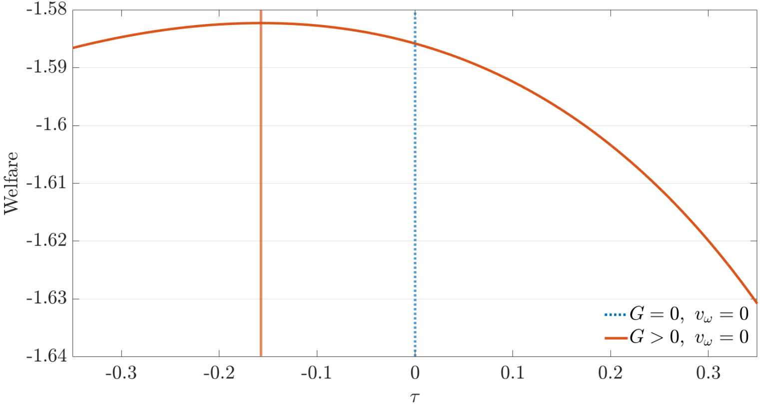
Welfare without transfers **Optimal τ**

- No spending, no heterogeneity: $\tau = 0$ ▸ Calibration



Welfare without transfers **Optimal τ**

- Positive spending, no heterogeneity: $\tau < 0$



Welfare without transfers Optimal τ

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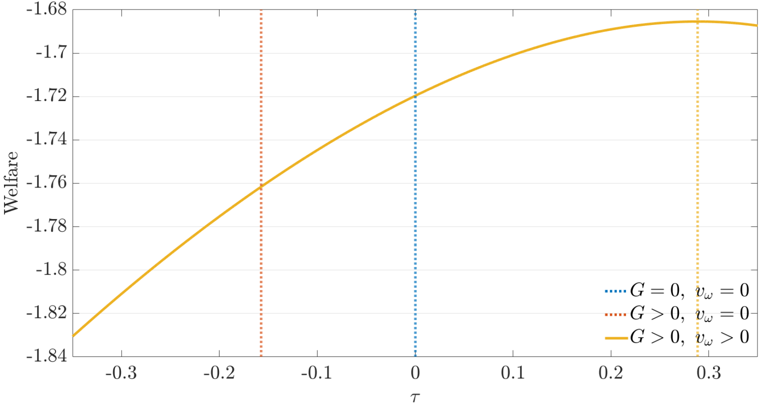

Transfers Welfare: Heterogeneous agents

- Implicit function theorem: approximation of the FOC

$$\hat{n}_{it} \approx n_0(\tau) - \frac{T}{1+\varphi}\frac{n_0(\tau)}{n_0(\tau)-G}\exp\left(-\tau(1-\tau)\frac{v_\omega}{1-\rho_z^2}\right) z_{it}^{-(1-\tau)}$$

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- Approximated formula with heterogeneity $v_\omega > 0$

$$W(\tau, T) = W(\tau, 0) + T\left[\Omega^e(\tau, v_\omega) + \Omega^r(\tau, v_\omega)\right],$$

where the two terms capture

- Efficiency concerns
- Redistribution concerns ($\Omega^r(\tau, v_\omega) = 0$ when $v_\omega = 0$)

Transfers **Welfare: Efficiency**

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- Additional efficiency Ω_e^{ha} term with heterogeneous agents ... numerically small

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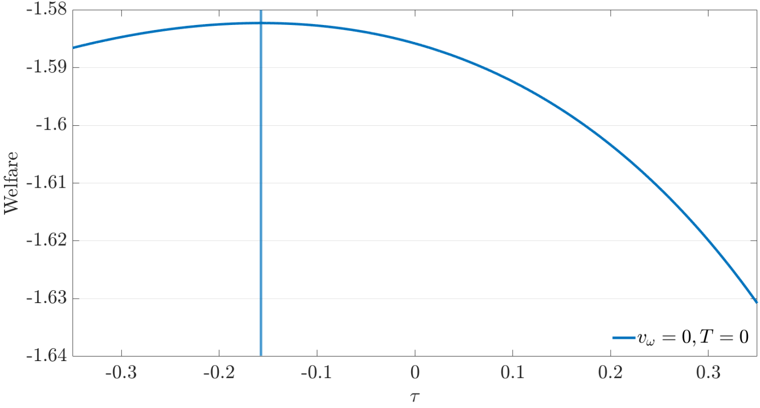

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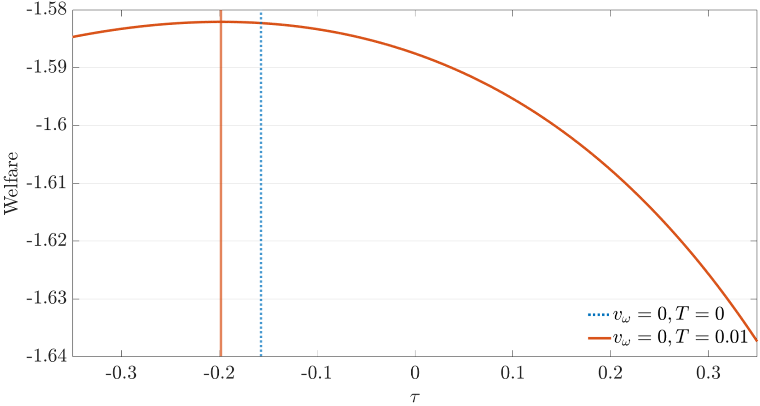
- Spending, no heterogeneity, $T > 0 \Rightarrow$ lower τ



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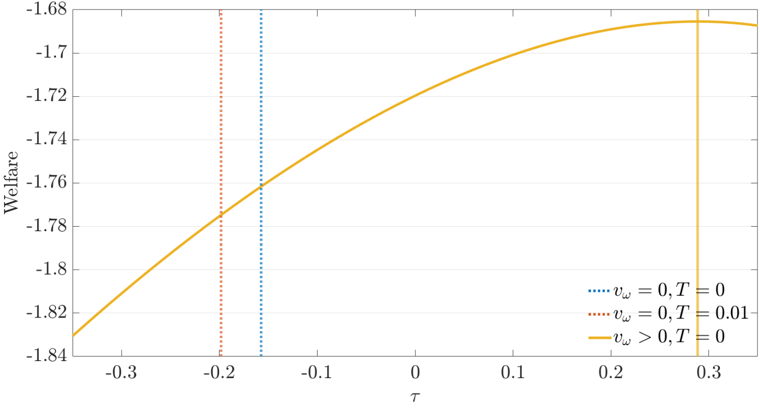

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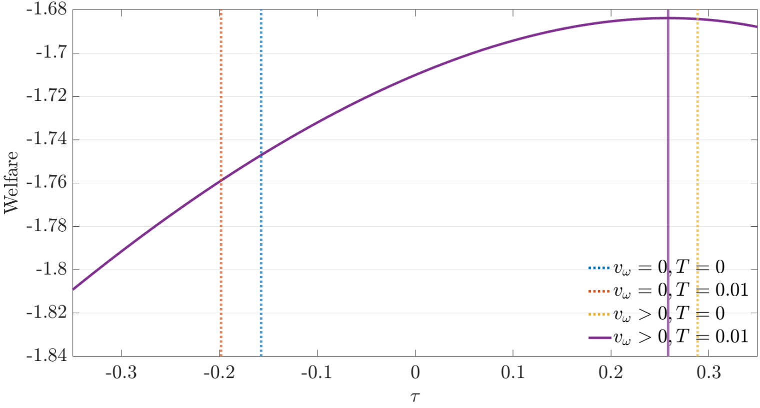
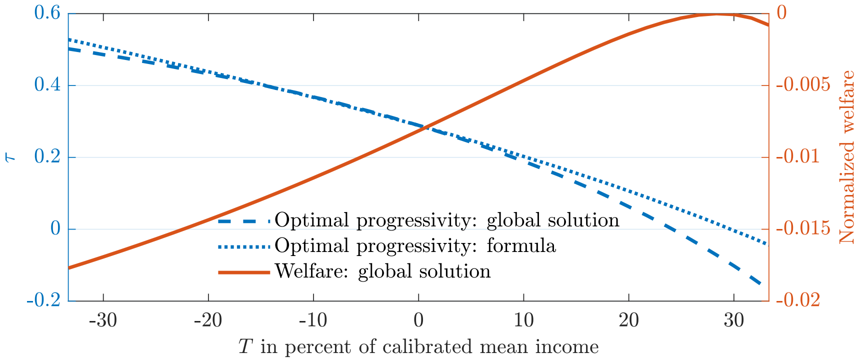


Transfers Heterogeneous agents

- A **negative** relationship between τ and T



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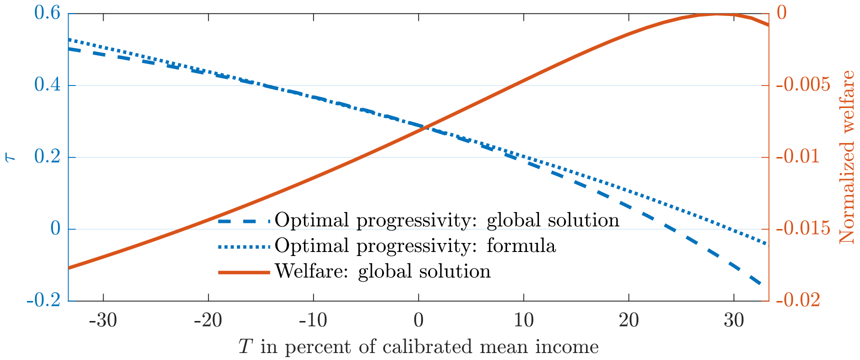

- Formula: a good approximation!

Optimal plan with transfers Global solution of the static model

- Generous transfers: $T = 0.3$, regressive income taxes: $\tau = -0.08$

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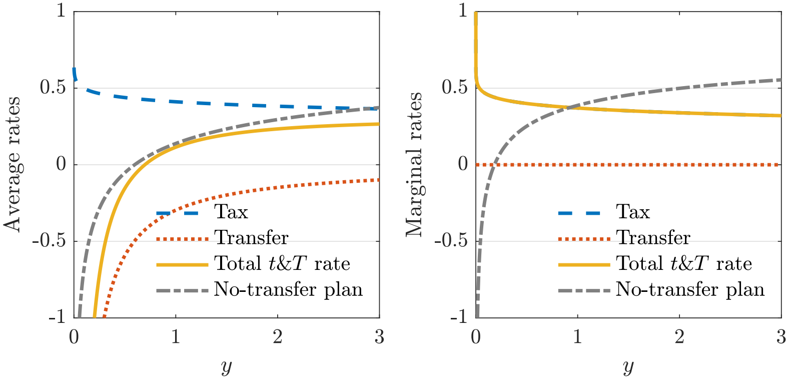

- Average taxes are increasing, marginal taxes are decreasing

Taking stock

- Optimal negative relationship between progressivity and transfers
  - Due to both efficiency and redistribution
- The optimal plan looks very different when allowing for transfers
  - Break the link between average and marginal $t\&T$ rates

A Quantitative Model

Overview

- Rich quantitative model
  - **Benchmark** economy: standard Aiyagari with
    + Realistic income risk: Gaussian mixture autoregressive (GMAR)
    + Income concentration: Pareto tail
  - Extension: heterogeneous discount factors
- Calibration to the U.S.
- Optimize on the fiscal system parameters
  - Global algorithm: TikTak
  - Taking into account **transitions**

Households, firm, government

- Household's value function with productivity z and assets a:

$$V(a,z) = \max_{c,a',n} \left\{ \frac{c^{1-\sigma}}{1-\sigma} - B\frac{n^{1+\varphi}}{1+\varphi} + \beta \mathbb{E}_{z'} \left[V(a',z') \,|z \right] \right\}$$

s.t.

$$c + a' \leq wzn + (1+r)a - \mathcal{T}(wzn, ra), \quad a' \geq 0$$

- Productivity z follows a stochastic process

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- Government's budget constraint:

$$G + (1+r)D = D + \int \mathcal{T}(wzn, ra)\, d\mu(a,z)$$

Fiscal system Taxes

- Flat capital tax: $\tau_k y_k$, with $\tau_k = 35\%$

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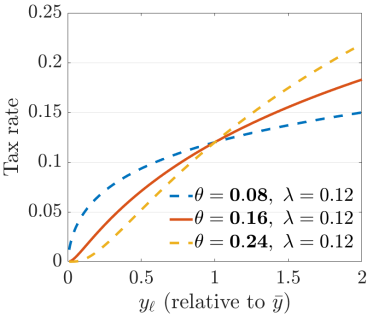
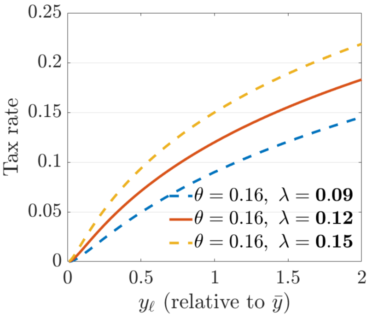
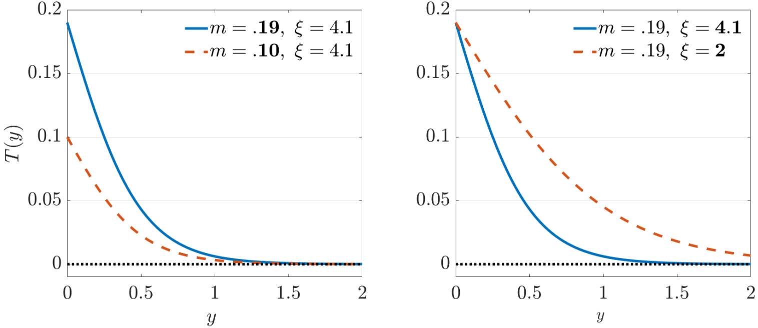




  - Interpretation: θ and τ on a roughly similar scale ▸ Graph

Fiscal system Transfers

- New targeted-transfers function: $m\bar{y}\frac{2\exp\left\{-\xi\left(\frac{y}{\bar{y}}\right)\right\}}{1+\exp\left\{-\xi\left(\frac{y}{\bar{y}}\right)\right\}}$
  - m is the level at $y = 0$, ξ is the speed of phasing-out



Calibration Income process

- Log-productivity follows a Gaussian Mixture Autoregressive Process

$$\log z_t = \rho \log z_{t-1} + \eta_t,$$

$$\eta_t \sim \begin{cases} \mathcal{N}\left(\mu_1, \sigma_1^2\right) & \text{with probability } p_1, \\ \mathcal{N}\left(\mu_2, \sigma_2^2\right) & \text{with probability } 1 - p_1 \end{cases}$$

Guvenen, Karahan, Ozkan, and Song (2021)

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- 5 parameters: $(\rho, p_1, \mu_1, \sigma_1, \sigma_2)$
  - Restriction: $\mu_2 = -\frac{p_1}{1-p_1}\mu_1 \Leftarrow \mathbb{E}\left(\eta_t\right) = 0$

Calibration

- Income process to match household income risk
  - Annual earnings growth distribution from PSID (1978-1992)
  + Std deviation: 0.35, Skewness: -0.45, Kurtosis: 12, P9010: 0.64
  - And top-10 labor income share: 38%

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- Fiscal parameters to match taxes and transfers per quintile
  - Taxes: $\theta = 0.16$, $\lambda = 0.12$
  - Transfers: $m = 0.19$, $\xi = 4.1$
  - Debt: $D/Y = 60\%$, residual $G/Y \approx 14\%$

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- Preferences: $\sigma = 2$, $\varphi^{-1} = 0.4$; β to match $r = 2\%$

More

Calibration Distributions

Income and Wealth Distributions

Data	Q1	Q2	Q3	Q4	Q5	Top 10
Labor income	4%	9%	14%	21%	52%	38%
Net worth	-1%	1%	3%	9%	88%	71%
Baseline	Q1	Q2	Q3	Q4	Q5	Top 10
Labor income	4%	9%	14%	20%	52%	38%
Net worth	0%	2%	8%	18%	72%	52%

Notes: Labor income shares by labor-income quintiles and wealth shares by wealth quintile, households aged 25-60. Data: SCF 2013.

- Labor elasticity at the top-1%: 0.20

Calibration Fiscal system

Average Tax and Transfer Rates

Data	Q1	Q2	Q3	Q4	Q5
Tax rate	0%	10%	16%	20%	27%
Transfer rate	26%	3%	1%	0%	0%
Model	Q1	Q2	Q3	Q4	Q5
Tax rate	8%	11%	14%	17%	28%
Transfer rate	24%	4%	1%	0%	0%

Notes: Average tax rates paid and transfer rates received per income quintile. Data: CBO 2013, working-age households. Model: tax parameters: $\theta = 0.16$, $\lambda = 0.12$; transfer parameters: $m = 0.19$, $\xi = 4.1$.

Graph

Optimal tax-and-transfer plan

- The **optimal plan** features

Optimal tax-and-transfer plan

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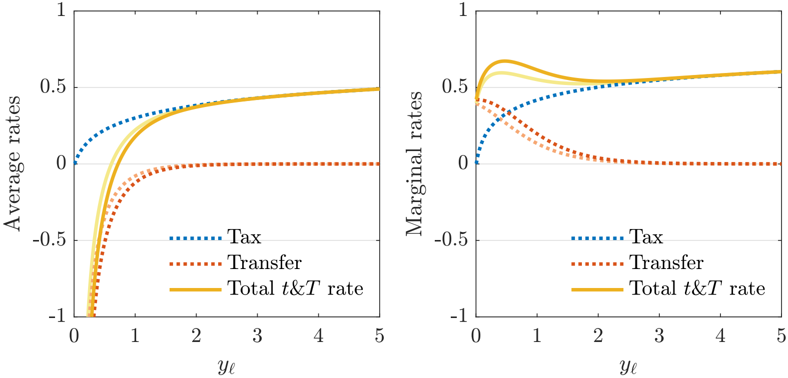
Optimal tax-and-transfer plan

- The **optimal plan** features
  - Large transfers $m = 0.46$, with a slow phase-out $\xi = 1.94$
  - Moderate tax progressivity, close to the calibrated value $\theta = 0.17$



  - Graph for $y_k = 0$ and y_ℓ normalized by $\bar{y}$

Optimal plan Average and marginal rates

Data	Q1	Q2	Q3	Q4	Q5
Tax rate	0%	10%	16%	20%	27%
Transfer rate	26%	3%	1%	0%	0%

Optimal	Q1	Q2	Q3	Q4	Q5
Tax rate	15%	21%	27%	31%	44%
Transfer rate	170%	58%	21%	6%	0%

- Transfer $\$26k$ for lowest income hh, and $\$7.4k$ for median.
- Much larger redistribution overall . . .

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Data	Q1	Q2	Q3	Q4	Q5
Tax rate	0%	10%	16%	20%	27%
Transfer rate	26%	3%	1%	0%	0%
Total avg rate	-26%	-7%	15%	20%	27%

Optimal	Q1	Q2	Q3	Q4	Q5
Tax rate	15%	21%	27%	31%	44%
Transfer rate	170%	58%	21%	6%	0%
Total avg rate	-155%	-37%	6%	25%	44%

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Total avg rate	-155%	-37%	6%	25%	44%
Marginal rate	62%	66%	62%	53%	51%

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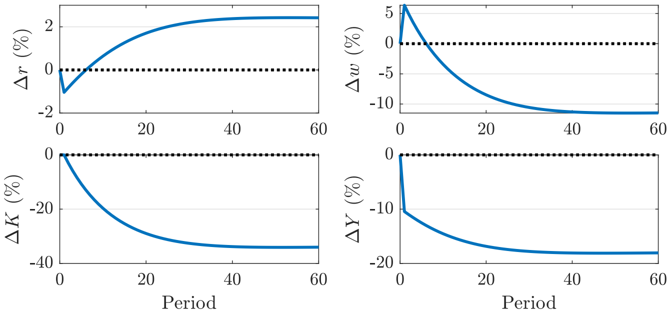
Optimal plan Transitions and Welfare



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  - Output, labor supply, and capital fall
  - Wages decline and interest rates increase
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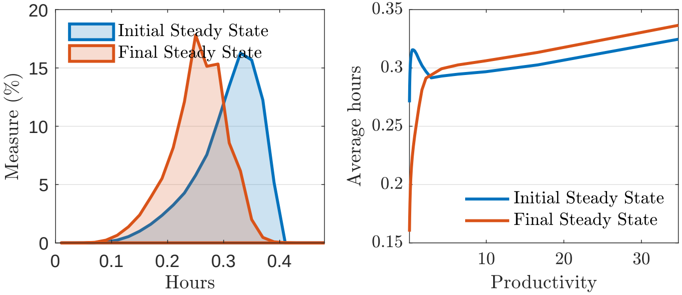

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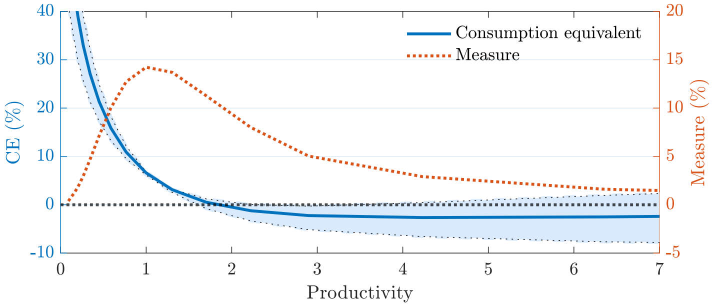

- The economy shrinks. . .
  - Output, labor supply, and capital fall
  - Wages decline and interest rates increase
  - A better allocation of hours worked
- Welfare gains in CE terms: +9.64%!
  - Larger welfare gains for the poor
  - Decomposition: 70% insurance, 22% redistribution, 8% efficiency

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- Optimal plan with lump-sum transfers ($\xi = 0$)
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Lump-sum	Q1	Q2	Q3	Q4	Q5
Tax rate	56%	56%	57%	55%	58%
Transfer rate	181%	85%	53%	35%	13%

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  $\Rightarrow$ Friedman was right!

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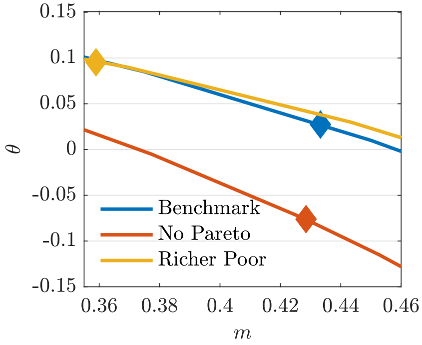
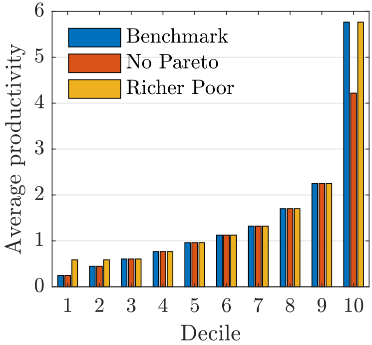
  ⇒ Friedman was right!...but marginal tax rates $> 60\%$!

Trading-off transfers vs. tax progressivity

Trading-off transfers vs. tax progressivity

- Larger transfers are associated with lower progressivity





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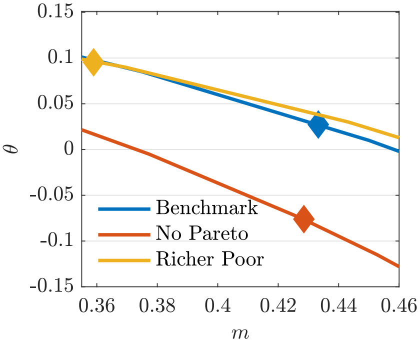

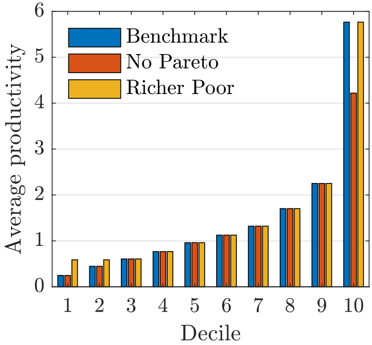

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- Going further: risk + and wealth +

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- This paper: optimal design of the tax-and-transfer system

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Thank you!

Appendix

References

Aoki, Shuhei and Makoto Nirei (2017). "Zipf's Law, Pareto's Law, and the Evolution of Top Incomes in the United States". American Economic Journal: Macroeconomics 9.3, pp. 36–71.

Bakış, Ozan, Barış Kaymak, and Markus Poschke (2015). "Transitional dynamics and the optimal progressivity of income redistribution". Review of Economic Dynamics 18.3, pp. 679–693.

Boar, Corina and Virgiliu Midrigan (2021). "Efficient Redistribution". Working Paper.

Feenberg, Daniel, Axelle Ferriere, and Gaston Navarro (2020). "Evolution of Tax Progressivity in the United States: New Estimates and Welfare Implications". Working Paper.

Findeisen, Sebastian and Dominik Sachs (2017). "Redistribution and insurance with simple tax instruments". Journal of Public Economics 146, pp. 58–78.

Gouveia, Miguel and Robert P. Strauss (1994). "Effective federal individual income tax functions: An exploratory empirical analysis". National Tax Journal, pp. 317–339.

Guner, Nezih, Remzi Kaygusuz, and Gustavo Ventura (2014). "Income taxation of US households: Facts and parametric estimates". Review of Economic Dynamics 17.4, pp. 559–581.

Guner, Nezih, Martin Lopez-Daneri, and Gustavo Ventura (2016). "Heterogeneity and Government revenues: Higher taxes at the top?" Journal of Monetary Economics 80, pp. 69–85.

References (cont.)

Guvenen, Fatih, Fatih Karahan, Serdar Ozkan, and Jae Song (2021). "What Do Data on Millions of US Workers Reveal about Life-Cycle Earnings Risk?" Forthcoming in Econometrica.

Heathcote, Jonathan, Kjetil Storesletten, and Giovanni L. Violante (2014). "Consumption and labor supply with partial insurance: An analytical framework". The American Economic Review 104.7, pp. 2075–2126.

— (2017). "Optimal tax progressivity: An analytical framework". The Quarterly Journal of Economics 132.4, pp. 1693–1754.

Heathcote, Jonathan and Hitoshi Tsujiyama (2021). "Optimal income taxation: Mirrlees meets Ramsey". Forthcoming in the Journal of Political Economy.

Hubmer, Joachim, Per Krusell, and Anthony A. Smith (2020). "Sources of US wealth inequality: Past, present, and future". NBER Macroeconomics Annual 2020, Volume 35. University of Chicago Press.

Kindermann, Fabian and Dirk Krueger (2021). "High Marginal Tax Rates on the Top 1%? Lessons from a Life Cycle Model with Idiosyncratic Income Risk". Forthcoming in the American Economic Journal: Macroeconomics.

References (cont.)

Krueger, Dirk and Alexander Ludwig (2016). "On the optimal provision of social insurance: Progressive taxation versus education subsidies in general equilibrium". Journal of Monetary Economics 77, pp. 72–98.

Krusell, Per and Anthony A. Smith Jr. (1998). "Income and wealth heterogeneity in the macroeconomy". Journal of Political Economy 106.5, pp. 867–896.

Mirrlees, James A. (1971). "An exploration in the theory of optimum income taxation". The Review of Economic Studies 38.2, pp. 175–208.

Peterman, William B. (2016). "The effect of endogenous human capital accumulation on optimal taxation". Review of Economic Dynamics 21, pp. 46–71.

Piketty, Thomas and Emmanuel Saez (2003). "Income inequality in the United States, 1913–1998". The Quarterly Journal of Economics 118.1, pp. 1–41.

— (2007). "How progressive is the US federal tax system? A historical and international perspective". Journal of Economic Perspectives 21.1, pp. 3–24.

Piketty, Thomas, Emmanuel Saez, and Gabriel Zucman (2017). "Distributional national accounts: methods and estimates for the United States". The Quarterly Journal of Economics 133.2, pp. 553–609.

References (cont.)

Ramsey, Frank P. (1927). "A Contribution to the Theory of Taxation". The Economic Journal 37.145, pp. 47–61.

Splinter, David (2020). "US Tax Progressivity and Redistribution". National Tax Journal 73.4, pp. 1005–1024.

CBO Data: Components of Taxes and Transfers

- Broad measure of market income for non-elderly households
  - Labor and capital income
  - Includes all corporate and payroll taxes

- Taxes
  - Individual income tax (including tax credits) and payroll taxes
  - Corporate income tax and excise taxes

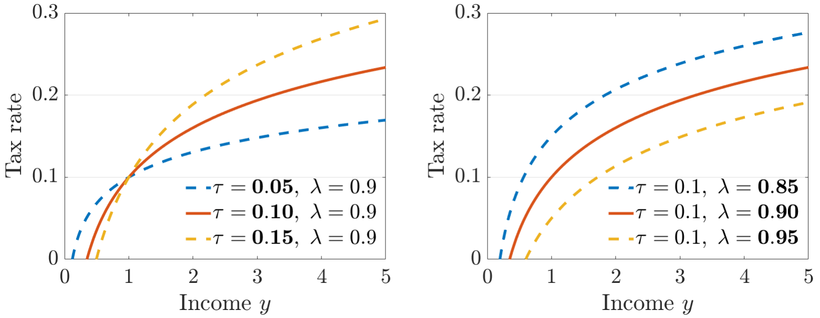
- Transfers
  - SNAP and other means-tested transfers (TANF, etc.)
  - Excluding SSI and Medicaid

Back

Loglinear tax function Description

◂ Back

- A loglinear tax scheme: $\mathcal{T}(y) = y - \lambda y^{1-\tau}$
- Tax progressivity is captured by τ and level by λ



A tractable environment Calibration

Back

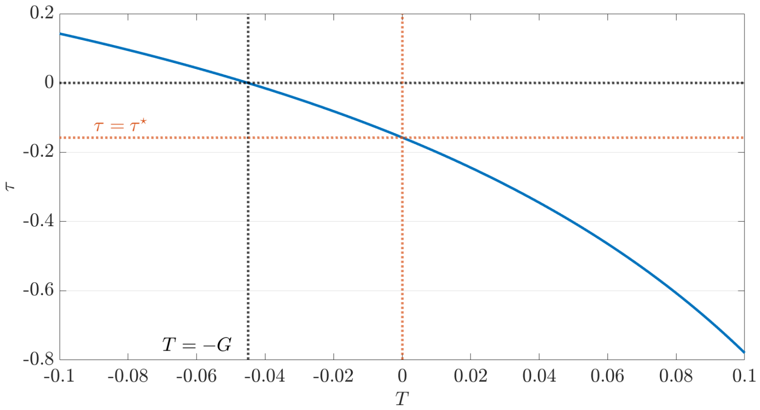
- Preference parameters: $\varphi^{-1} = 0.4$, B to match $n_0 = 0.3$

- Fiscal parameters: $\tau = 0.18$, $G/Y = 0.15$

- Idiosyncratic risk: $\rho_z = 0.935$, v_ω to match $\mathbb{V}[\log c]$

Transfers First-best

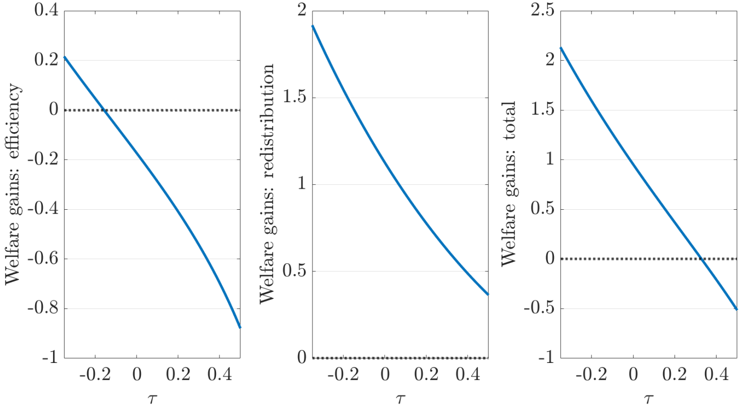
- Negative optimal relationship between T and τ



Back

Transfers Heterogeneous agents

- Negative optimal relationship between T and τ



Back

Equilibrium Definition

A stationary recursive competitive equilibrium is given by

- Households' value functions $\{V\}$ and policies $\{c, a', n\}$. Firm's policies $\{L, K\}$.
- Government's policies $\{G, D, \lambda, \theta, m, \xi\}$
- A measure μ

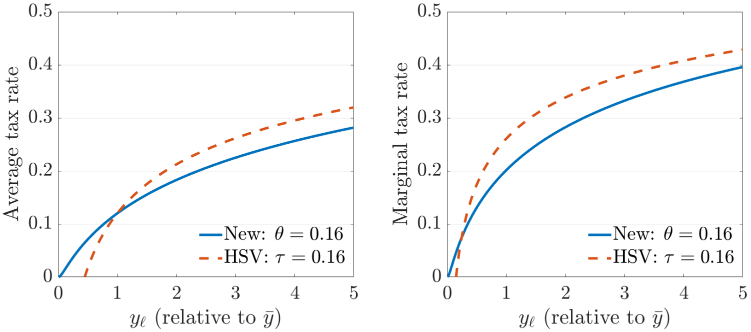
such that given prices $\{r, w\}$

- Households and the firm solve their respective problems.
- The government's budget constraint holds.
- Markets clear
  - Capital market clears: $K + D = \int_{\mathcal{B}} a'(a, z) d\mu(a, z)$
  - Labor market clears: $L = \int_{\mathcal{B}} zn(a, z) d\mu(a, z)$
  - Goods market clears: $Y = \int_{\mathcal{B}} c(a, z) d\mu(a, z) + \delta K + G$
- Measure μ is stationary

$$\mu(a', z') = \int \mathbb{I}\{a'(a, z) = a'\} \pi_z(z'|z) d\mu(a, z)$$

Fiscal system Taxes

- New progressive labor tax resembles HSV except at the bottom



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Calibration

- Income process to match household income risk
  - Annual earnings growth distribution from PSID (1978-1992)
  + Std deviation: 0.35, Skewness: -0.45, Kurtosis: 12, P9010: 0.64
  - $p_1 = 0.85$, $\mu_1 = 0.016$ ($\mu_2 = -0.091$), $\sigma_1 = 0.15$, $\sigma_2 = 0.63$
  - Persistence ρ=0.935 to match the top-10 labor income share

- Fiscal parameters to match taxes and transfers per quintile
  - Taxes: $\theta = 0.16$, $\lambda = 0.12$
  - Transfers: $m = 0.19$, $\xi = 4.1$

- Preferences: $\sigma = 2$, $\varphi^{-1} = 0.4$; Production: $\alpha = 0.64$, $\delta = 0.08$

- Calibrate ($\beta = 0.962, B = 85, D = 0.59$) to match $r = 2\%$, $\bar{h} = 0.3$, $D/Y = 60\%$ ($\Rightarrow G/Y \approx 14\%$)

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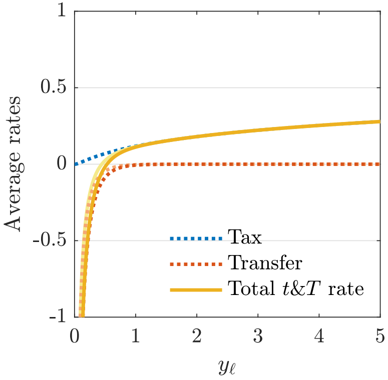
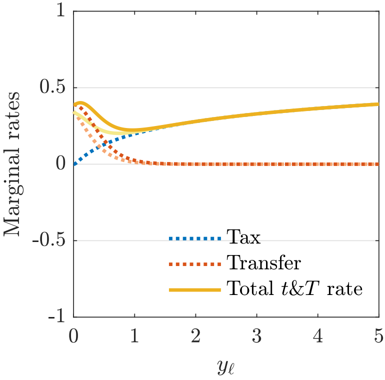
Calibration Fiscal system





- Marginal rates by quintile: 33%, 24%, 21%, 23%, 31%

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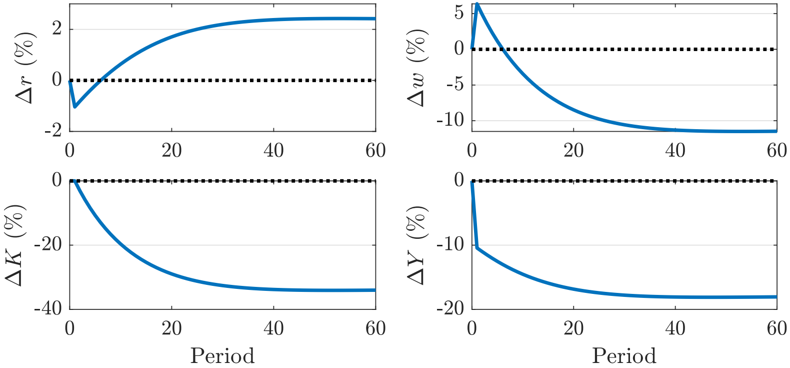
Transition to the optimal system



- Convergence achieved after ≈ 40 years

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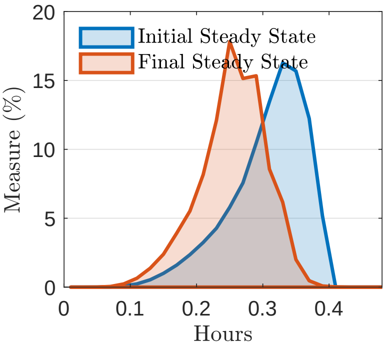
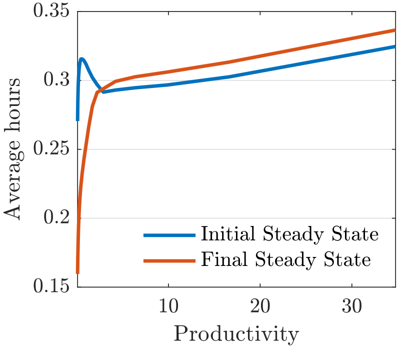
Transition to the optimal system





- The distribution of hours shift to the left

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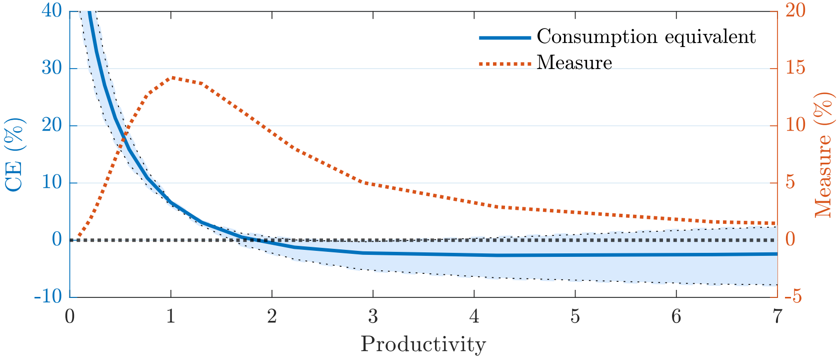
Optimal tax-and-transfer system CE

- Welfare gains: +9.62%, 79% households would benefit



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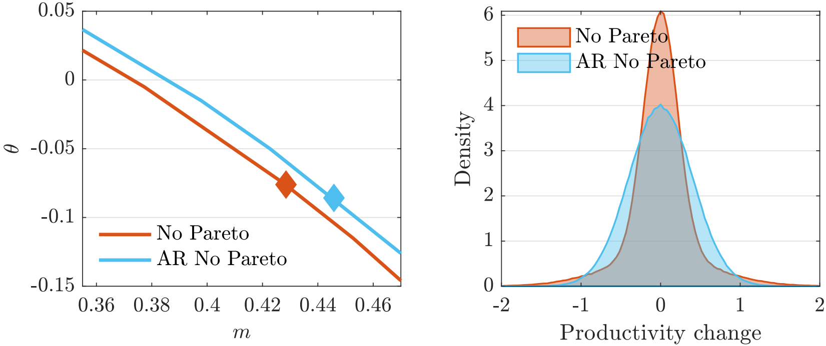
How important are departures from normality?

- The optimal system is more generous with AR(1) shocks!...



- Roughly similar progressivity.

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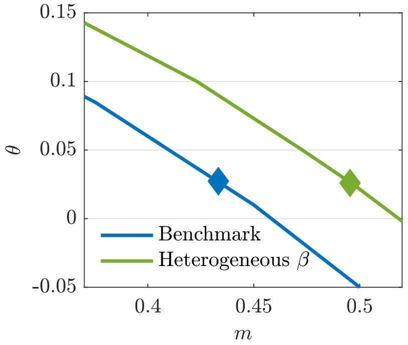
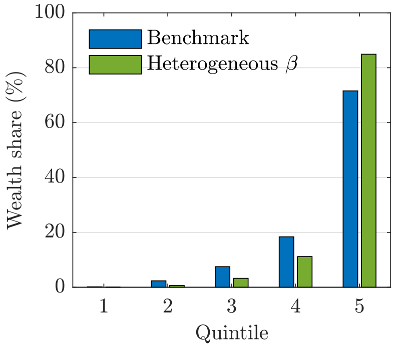
Heterogeneous Beta

- Recalibration with heterogeneous stochastic discount factors

  Krusell and Smith (1998)





- Larger transfers, robust m-θ relationship

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Optimal loglinear plan

- Steady state: $\tau = 0.40$, with transitions: $\tau = 0.49$
- Consumption equivalent: $+5.08\%$

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Steady-state **Benchmark calibration**

- Optimal plan without transition:
  - $\theta = 0.03$, $m = 0.36$, $\xi = 0$

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