Wealth inequality over time

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Outline

1. Question/motivation
2. Model
3. Calibration
4. Transitions
5. Additional channels + observations

References:


Recent Trends in Inequality

Table: Share of Top 1%

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Q: What caused the upward trend in wealth inequality?
Recent Trends in Inequality

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Q: What caused the upward trend in wealth inequality?

- Higher Wage Inequality
- Top Income Tax Cuts
- Larger Government Transfers (Social security)
Motivation

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Q: What caused the upward trend in wealth inequality?

− Higher Wage Inequality
− Top Income Tax Cuts
− Larger Government Transfers (Social security)

Other channels (later):
− Heterogeneous investment returns
− Non-homothetic bequests

Poschke (2022)
**Corporate and estate taxes and top MTR declined, 1960-2010**

Sources: NIPA, Joulfaian (2013), IRS
Transfers/GDP and individual benefits increased strongly

Federal Benefits to Seniors/GDP

Real Average SS Benefit

Poschke (2022) Wealth inequality
Social security benefits

Replacement rates increase, more so for low earnings:

![Graph showing replacement rates for different multiples of average earnings. The graph compares 1960 and 2010 data.](image-url)

Replacement Rates

Poschke (2022) Wealth inequality
Which factors drove higher wealth concentration?

Strategy for answering the question:

- Build a quantitative model of an economy with large earnings and wealth inequality
- Calibrate the model economy to the U.S. economy in 1960
- Simulate the effects of observed
  - changes in transfers (social security)
  - changes in taxes
  - changes in wage inequality
- Evaluate the effect of each change on income and wealth inequality
  - steady states and
  - year-by-year transition
**Model**

Aiyagari-Bewley-Huggett with...
- Life-Cycle and Intergenerational Income Risk
- Some top earners (à la Castañeda et al., *JPE* 2003)

⇒ Matches income and wealth inequality well

**Institutions:**
- Social security
- Corporate, Estate, Income and Sales Taxation
- Exogenous government expenditures
Households

- value consumption $c$ and dislike working
- are perfectly altruistic towards their children
- have heterogeneous productivity $z$
- decide how much to consume, work and invest in capital
- take prices $w$, $r$, taxes and transfers as given
Households face risks

- workers ($R = 0$) retire with a constant probability $\mu_r$
- retirees
  - cannot work, but receive a pension
  - die with a constant probability $\mu_d$
  - leave a bequest upon death
- $z$ may change, for workers every period, for retirees upon death
  $\Rightarrow$ wage dynamics/imperfect transmission of human capital
  $\Rightarrow$ households differ in productivity and wealth ($\Gamma(k,z)$)
- three saving motives
  - life cycle (because of retirement)
  - bequest
  - precautionary (because $z$ can change within and between generations)
Household’s Problem

\[ V(k, z, \mathcal{R}) = \max_{c, x \geq 0, h \in [0,1]} \left\{ \frac{c^{1-\sigma}}{1 - \sigma} - \theta \frac{h^{1+\epsilon}}{1 + \epsilon} + \beta \mathbb{E}[V(k', z', \mathcal{R}')|z] \right\} \]

subject to

\[ c(1 + \tau_s) + x = y^d(wzh, rk, \omega(z, \mathcal{R})) + k, \]
\[ k' = x - E(x, \mathcal{R}, \mathcal{R}') \]
Tax System and Disposable Income

− Taxation of Corporate Income:

\[ \tau_c \max(rk - dc, 0) \]

− Adjusted Gross Income:

\[ y_{agi} = wz + \min(rk, dc) + \omega(z, R) \]

− Taxation of Personal Income:

\[ y_{agi} - \lambda \left[ \min(y_{agi}, y_b) \right]^{1-\tau_l} - (1 - \tau_{\max}) \max(y_{agi} - y_b, 0) \]

○ \( 0 \leq \tau_l \leq 1 \) measures the degree of progressivity.
○ Permits net transfers (e.g. EITC).
○ \( \tau_{\max} \) is the top MTR, applicable for \( y > y_b \).

− Taxation of Estates: \( E(x) \) piecewise linear as in the law.
### Social Security and Medicare

For now: compute using earnings of worker with same $(k, z)$

Changes over time:
- replacement rates up at all income levels
- cap up from 0.17 to ca. $0.6 \times \text{average wages}$
- increase in income-independent transfers (mimicking Medicare and pension assistance)
Demographics and Labor Productivity

\[
\Pi = \begin{bmatrix}
    z_W & z_R \\
    z_W & \Pi_{WW} & \Pi_{WR} \\
    z_R & \Pi_{RW} & \Pi_{RR}
\end{bmatrix}
\]
**Demographics and Labor Productivity**

\[
\Pi = \begin{bmatrix}
  z_W & z_R \\ z_W & \Pi_{WW} & \Pi_{WR} \\ z_R & \Pi_{RW} & \Pi_{RR}
\end{bmatrix}
\]

\[
\Pi_{WW} = \begin{pmatrix}
  f_L + a_L & f_L + a_H & f_H + a_L & f_H + a_H & z_{awel} & z_{aweh} \\
  f_L + a_L & A_{11} & A_{12} & 0 & 0 & \lambda_{in} & 0 \\
  f_L + a_H & A_{21} & A_{22} & 0 & 0 & \lambda_{in} & 0 \\
  f_H + a_L & 0 & 0 & A_{11} & A_{12} & \lambda_{in} & 0 \\
  f_H + a_H & 0 & 0 & A_{21} & A_{22} & \lambda_{in} & 0 \\
  z_{awel} & \lambda_{out} & \lambda_{out} & \lambda_{out} & \lambda_{out} & \lambda_{ll} & \lambda_{lh} \\
  z_{aweh} & 0 & 0 & 0 & 0 & \lambda_{hl} & \lambda_{hh}
\end{pmatrix}
\]
Closing the Model

Firms

\[ r = F_K(K, N) - \delta \]
\[ w = F_N(K, N) \]

Markets Clear

Government budget constraint holds at all times:

Corporate Tax + Income Tax + Estate Tax + Sales Tax
= Transfers + G
Calibration

**Quantitative Exercise**

- Calibrate the model to match the 1960 economy.
- Introduce observed expansion of transfers, tax cuts and path of wage inequality.
- Transition analysis.
- Steady-state decomposition exercise.
## Calibration: Preset Parameters

<table>
<thead>
<tr>
<th>General:</th>
<th></th>
<th>Risk Aversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\sigma$</td>
<td>1.1</td>
<td>Frisch elasticity of 0.6</td>
</tr>
<tr>
<td>$\epsilon$</td>
<td>1.67</td>
<td>Capital Income Share</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>0.36</td>
<td>$K/Y = 3.0$</td>
</tr>
<tr>
<td>$\delta$</td>
<td>0.079</td>
<td></td>
</tr>
<tr>
<td>$\mu_r$</td>
<td>0.022</td>
<td>Average Career Length of 45 yrs.</td>
</tr>
<tr>
<td>$\mu_d$</td>
<td>0.067</td>
<td>Average Retirement Length of 15 yrs.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Productivity Process:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$\rho_{ig}$</td>
<td>0.30</td>
<td>Solon (1992)</td>
</tr>
<tr>
<td>$\sigma_a$</td>
<td>0.46×0.38</td>
<td>variance of log earnings in 1960 = 0.5</td>
</tr>
<tr>
<td>$\sigma_f$</td>
<td>0.46×0.62</td>
<td>share of fixed effects = 0.62</td>
</tr>
</tbody>
</table>
Calibration: Jointly Calibrated Parameters

**General:**
- $\beta = 0.958$ Interest Rate 0.041
- $\theta = 12$ mean hours 0.34
- $d_c/r = 0.44 \times K$ Corporate tax revenue/GDP 0.038

**Productivity Process:**
- $z_{awe_1}$ top 1% income share
- $z_{awe_h}$ top 0.5% income share
- $\lambda_{in}$ income Gini (workers)
- $\lambda_{lh}$ wealth Gini
- $\lambda_{ll}$ top 1% wealth share
- $\lambda_{hh}$ top 0.5% wealth share

Poschke (2022) Wealth inequality
Tax Parameters

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<tr>
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<tr>
<td>$\tau_l$</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td>$\tau_{\text{max}}$</td>
<td>0.91</td>
<td>0.35</td>
</tr>
<tr>
<td>$\tau_c$</td>
<td>0.42</td>
<td>0.236</td>
</tr>
<tr>
<td>$E(\cdot)$</td>
<td></td>
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<tr>
<td>$\gamma$</td>
<td>0.108</td>
<td>0.108</td>
</tr>
<tr>
<td>$\lambda$</td>
<td>endogenous</td>
<td>GBC</td>
</tr>
</tbody>
</table>
Results: Income Process

<table>
<thead>
<tr>
<th>$z_W \backslash z_W$</th>
<th>6.7</th>
<th>19.2</th>
<th>20.5</th>
<th>58.4</th>
<th>61.4</th>
<th>1222</th>
</tr>
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<td>6.7</td>
<td>0.967</td>
<td>0.009</td>
<td>0</td>
<td>0</td>
<td>0.002</td>
<td>0</td>
</tr>
<tr>
<td>19.2</td>
<td>0.006</td>
<td>0.970</td>
<td>0</td>
<td>0</td>
<td>0.002</td>
<td>0</td>
</tr>
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<td>0.002</td>
<td>0</td>
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<tr>
<td>61.4</td>
<td>0.034</td>
<td>0.034</td>
<td>0.034</td>
<td>0.034</td>
<td>0.826</td>
<td>0.014</td>
</tr>
<tr>
<td>1222</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.205</td>
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$\Pi_{WW}$:

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Top 1% earnings dynamics:

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<tr>
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<th>model</th>
<th>data</th>
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<tbody>
<tr>
<td>persistence</td>
<td>0.73</td>
<td>ca. 0.75</td>
</tr>
<tr>
<td>std. dev. of log earnings growth</td>
<td>0.76</td>
<td>1.1</td>
</tr>
<tr>
<td>skewness of log earnings growth</td>
<td>-1.72</td>
<td>-1.26</td>
</tr>
<tr>
<td>kurtosis of log earnings growth</td>
<td>14</td>
<td>18</td>
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## Calibration Results: Inequality in 1960

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<tr>
<th></th>
<th>Top Percentile</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>0.5%</td>
<td>1%</td>
<td>5%</td>
<td>10%</td>
<td>20%</td>
<td>40%</td>
<td>60%</td>
<td>Gini</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wealth Share (Data)</td>
<td>0.21</td>
<td>0.28</td>
<td>n/a</td>
<td>0.71</td>
<td>0.81</td>
<td>0.95</td>
<td>1.00</td>
<td>0.80</td>
<td></td>
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<td></td>
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<td>Wealth Share (Model)</td>
<td>0.22</td>
<td>0.26</td>
<td>0.45</td>
<td>0.62</td>
<td>0.79</td>
<td>0.91</td>
<td>0.98</td>
<td>0.74</td>
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<tr>
<td>Income Share (Data)</td>
<td>0.07</td>
<td>0.10</td>
<td>0.23</td>
<td>0.33</td>
<td>0.49</td>
<td>0.73</td>
<td>0.89</td>
<td>0.34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Income Share (Model)</td>
<td>0.09</td>
<td>0.11</td>
<td>0.18</td>
<td>0.41</td>
<td>0.54</td>
<td>0.75</td>
<td>0.89</td>
<td>0.34</td>
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<td>Earnings Share (Data)</td>
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<td>0.54</td>
<td>0.75</td>
<td>0.89</td>
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Poschke (2022)
## Calibration Results: Taxes in 1960

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<tr>
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<th>Corporate Tax</th>
<th>Estate Tax</th>
<th>Income Tax</th>
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<tbody>
<tr>
<td></td>
<td>1%</td>
<td>99%</td>
<td>R/Y</td>
</tr>
<tr>
<td>Data</td>
<td>14.4</td>
<td>5.1</td>
<td>3.8</td>
</tr>
<tr>
<td>Model</td>
<td>17.2</td>
<td>5.5</td>
<td>5.0</td>
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Transition analysis
Transition analysis

Series of data inputs for the transition:
- Social Security and Medicare
- Tax Cuts (corporate and estate taxes and top MTR)
- Earnings Inequality

Notes:
- everything constant after 2010.
- expectations: perfect foresight.
Transition inputs: Some social security PIA formulas
Transition inputs: Social security replacement rates

![Graph showing the trend of Social security replacement rates from 1959 to 2010. The graph includes lines for 0.3 x Av. Earnings, 1 x Av. Earnings, 3 x Av. Earnings, and Medicare/GDP (right axis).]
Transition inputs: Wages

\[ z_{it} = \exp \left( \mu_z - \kappa_t + \zeta_t \bar{z}_i + \nu_{5/6t} \right) \]
Transition analysis: approach

− The environment changes

⇒ behavior and equilibrium variables will change over the transition

⇒ cannot consider a stationary equilibrium, but need to solve for an equilibrium path:
   Need to find sequence of equilibrium objects \( \{r_t, \lambda_t, K_t\}_{t=1}^T \), not just single SS value.

Approach, in short:

− Guess a sequence.
− Solve problems.
− Check market clearing.

Similar to approach for stationary equilibrium, but with a higher-dimensional equilibrium object.
Transition analysis: algorithm (1/3)

1. Solve final steady state.
2. Fix
   - a length of the transition, $T$, and
   - criteria for convergence for $r$, $\lambda$ and $K$: $\varepsilon_r$, $\varepsilon_\lambda$ and $\varepsilon_K$.
3. Guess a sequence $\{r_t, \lambda_t, K_t\}_{t=1}^T$.

Computed implied values:
   - $r_t \Rightarrow K_t/N_t \Rightarrow w_t$ from firm’s FOC
   - $K_t, K_t/N_t \Rightarrow N_t \Rightarrow Y_t \Rightarrow$ transfer amounts (which in our model are indexed to GDP)
Solve the **household problem for each transition year** $t$ using the sequences of price and environment inputs and the final steady state, *backwards* (starting with year $T+1$, then $T$...):

$$V_t(k, z, R) = \max_{c, x \geq 0, h \in [0, 1]} \left\{ \frac{c^{1-\sigma}}{1 - \sigma} - \theta \frac{h^{1+\epsilon}}{1 + \epsilon} + \beta \mathbb{E}[V_{t+1}(k', z', R') | z] \right\}$$

s.t. constraints

where $V_t$ is the year $t$ value function, and $V_{T+1} = V_{SS2}$.

From this, obtain the **policy functions** $c_t(\cdot), k'_t(\cdot)$ and $h_t(\cdot)$.

Note: value function and policy functions indexed by $t$. 

---

**Notes:**
- $\beta$: discount factor
- $\sigma$: coefficient of relative risk aversion
- $\epsilon$: elasticity of intertemporal substitution
- $\theta$: intertemporal elasticity of substitution
- $\mathbb{E}$: expected value
- $V_{SS2}$: final steady state
5. Compute the distribution of assets $\Gamma_{t+1}(\cdot)$ for each $t$, using $\Gamma_t(\cdot)$ and the policy functions $k'_t(\cdot)$, starting from $\Gamma_{SS1}$.

6. Compute aggregate asset supply $K^S_t$ and aggregate labor supply $N^S_t$ for each $t$ by integrating over the policy functions using $\Gamma_t(\cdot)$.

7. Check market clearing:
   1. Compute implied $\tilde{r}_t$ for each $t$ using $K^S_t$ and $N^S_t$ in the firm’s FOC:
      $$\tilde{r}_t = \alpha \left( K^S_t / N^S_t \right)^{\alpha-1} - \delta$$
   2. Compute implied $\tilde{\lambda}_t$ that clears the government budget constraint, given policy functions and $\Gamma_t(\cdot)$.
   3. Compute largest deviation $dx = \max(\tilde{x}_t - x_t)$ for $x = r, \lambda, K$.

8. If $dx < \varepsilon_x$ for $x = r, \lambda, K$: done.
   Otherwise, return to step 3 and update sequences $\{r_t, \lambda_t, K_t\}_{t=1}^T$:
   $$r_{t}^{\text{new}} = .6 r_t + .4 \tilde{r}_t, \quad \lambda_{t}^{\text{new}} = .6 \lambda_t + .4 \tilde{\lambda}_t, \quad K_{t}^{\text{new}} = K^S_t.$$
Results: transition analysis

**Model fit: The evolution of top incomes**

![Chart showing the evolution of top incomes with model fit and data comparison over years from 1960 to 2025. The chart includes lines for Model Income Gini, Data Income Gini, Model 1% Income Share, Data 1% Income Share, Model 1% Labor Share, and Data 1% Labor Share. The y-axis represents the Gini coefficients ranging from 0.00 to 0.90. The x-axis represents the years from 1960 to 2025. The chart demonstrates the comparison between model predictions and data observations.]

Poschke (2022) Wealth inequality
Model fit: The evolution of the top 1% wealth share

![Graph showing the evolution of the top 1% wealth share.](graph)

- **Data** (light blue line)
- **All factors** (black line)

Source: Poschke (2022) Wealth inequality
Transition analysis: decompositions

Benchmark:
  – Social security, taxes, wages all change.

Decomposition:
  – Some inputs change.
  – Others remain as in the 1960 steady state.

Compute equilibrium transition path for this configuration of inputs.
The evolution of the top 1% wealth share: Decomposition

- **data**
- **all taxes**
- **wage dispersion**
- **only social security**
- **all factors**
Remarks on the transition

- Model matches the increase in the data from 1980 to 2010 almost exactly.
  Overstates increase since 1960.
- Increase in wage inequality stops in 2003 in the model.
  Convergence of the top wealth share not completed then.
- Model top wealth share continues to rise for another 50 years, and 10 percentage points.
- Speed of the transition:

<table>
<thead>
<tr>
<th>Completion Level</th>
<th>Time (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>36</td>
</tr>
<tr>
<td>3/4</td>
<td>56</td>
</tr>
<tr>
<td>9/10</td>
<td>76</td>
</tr>
<tr>
<td>99/100</td>
<td>106</td>
</tr>
</tbody>
</table>
Higher inequality reduces $r$ by almost 1.5 percentage points.
Additional channels + observations
What determines wealth concentration, revisited

- A recent, mostly theoretical literature stresses the importance of heterogeneous investment returns for wealth concentration (see in particular Benhabib, Bisin and Zhu 2011).
- Life cycle was very stylized in JME paper.

Richer approach: Model as above, plus:
- Life cycle
- Heterogeneous investment returns
- Non-homothetic warm glow bequest motive
Results: transition analysis

**Consumption-Savings Problem**

**Workers ($j < J_R - 1$)**

$$V_j^W(k, z, \kappa) = \max_{c, k' \geq 0, h \in [0,1]} \left\{ \frac{c^{1-\sigma_c}}{1-\sigma_c} - \theta \frac{h^{1+\sigma_l}}{1+\sigma_l} + \beta s_j \mathbb{E}[V_{j+1}^W(k', z', \kappa') | z, \kappa] \right\}$$

subject to

$$(1 + \tau_s)c + k' = y^d(z \varepsilon_j hw, r \kappa k) + k + Tr,$$

$$\phi(k) = \phi_1[(k + \phi_2)^{1-\sigma_c} - 1]$$

**Retirees ($j \geq J_R$)**

receive social security benefits $b$ instead of labor earnings $z w \varepsilon_j h$
Results: transition analysis

Calibration

- Larger model, more parameters – need more calibration targets.
- New here: match the joint distribution of income, earnings and net worth.
- Key moments:
  - Labor income share of top 1% income earners: 59%.
    (55% for top 1% of wealth.)
  - Relative saving returns of top 1%: 3.2 times those of bottom 90%.

Poschke (2022) Wealth inequality
Rates of return

Data: group rates of return from SCF, implied by group’s earning share, wealth share, and labor income share.
Results: transition analysis

Life-Cycle Patterns: Averages

DATA vs MODEL

(a) earnings
(b) income
(c) wealth

Poschke (2022)
Results: transition analysis

Life-Cycle Patterns: Dispersion

Age profile of wealth and earning gini

SCF 2010 and 2016 (wealth)
Model (wealth)
SCF 2010 and 2016 (earning)
Model (earning)

Poschke (2022) Wealth inequality
Decomposition: determinants of wealth concentration

Compare benchmark economy to counterfactual stationary equilibrium with

- equal bequests and/or
- no top earners ($z_8 = z_7 = z_6$)
- common asset returns.

We compute the marginal effect of each channel, in each possible configuration. (4 marginal effects per channel.)
Results: transition analysis

Accounting for Wealth Concentration

Note.— Percent contribution to top wealth shares. The whiskers represent the range of values obtained by permuting the order of decomposition. The column height represents the average value.

(d) Top 1% Wealth Share

(e) Top 0.1% Wealth Share
Some interesting issues

1. Benchmark results versus those with a single mechanism: The role of LIS
2. Entrepreneurs
3. Why do heterogeneous returns have little impact?
4. The timing of bequests
An economy without superearners

Counterfactual: eliminate superearners and match top 0.1% wealth share with rate of return differences alone

Results:

<table>
<thead>
<tr>
<th>Top 1% earnings</th>
<th>labor income share of top 1% by income</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>data</td>
<td>0.17</td>
<td>0.59</td>
</tr>
<tr>
<td>benchmark</td>
<td>0.18</td>
<td>0.61</td>
</tr>
<tr>
<td>simulation</td>
<td>0.04</td>
<td>0.31</td>
</tr>
</tbody>
</table>
Entrepreneurs

Calibrate model for non-entrepreneurs:

(f) Marginal distributions

(g) Top 1% wealth share decomposition
Results: transition analysis

Why do heterogeneous returns have little impact?

Figure: Path of assets if $z$ always $z_6$, return fixed
Why do heterogeneous returns have little impact?

Figure: Path of assets if \( z \) always \( z_6 \), return fixed

Answer: because life is too short.

Reaching the top 0.1% takes 35 years at the top return of 25.3%.
Results: transition analysis

The timing of bequests

Receive bequests at age 20 instead of age 50:

- Top 1% wealth share rises 3ppts.
- Somewhat greater role of return heterogeneity.
Summary
Summary

- We saw different ways of modeling wealth concentration,
- how to calibrate models with such channels,
- how to compute deterministic transitions in heterogeneous agent models.

- My substantive takeaway: top income earners have a lot of labor income

⇒ top earners play a large role for wealth concentration.

- A note on measurement/interpretation: Top earners here include those with high wages and salaries (CEOs, finance...) but also high-earning entrepreneurs.
Wealth Concentration in the United States

Top 1% Wealth Shares: Comparing Estimates

Source: Saez and Zucman (2014)
Income Concentration in the United States

Source: Saez and Zucman (2014)
Wealth Share of Top Income Groups: 1%

\[ S_{w,1\%} = \frac{S_{y,1\%} f_{K,1\%}}{rK / (Y - \delta K)} \]

Source: Author’s calculations based on Piketty and Saez (AER, 2006)
Corporate and estate taxes and top MTR declined, 1960-2010

Appendix

Sources: NIPA, Joulfaian (2013), IRS
Poschke (2022) Wealth inequality
Appendix

The schedule of marginal estate tax rates, 1960 and 2010 – closeup

![Graph showing the schedule of marginal estate tax rates, 1960 and 2010. The graph plots taxable estate (multiples of average household wealth) on the x-axis and marginal estate tax rate on the y-axis. The graph includes lines for 1960 and 2010, as well as thresholds for 1% and 10%.]

Poschke (2022) Wealth inequality
Demographics

\[ \Pi = \begin{bmatrix} z_W & z_R \\ z_W & \Pi_{WW} & \Pi_{WR} \\ z_R & \Pi_{RW} & \Pi_{RR} \end{bmatrix} \]

- \( \Pi_{WR} \): constant retirement probability \( \mu_r \)
- \( \Pi_{RR} \): constant survival probability \( 1 - \mu_d \)
Appendix

Income Process: Intergenerational

\[
\Pi = \begin{bmatrix}
z_W & z_R \\
z_W & \Pi_{WW} & \Pi_{WR} \\
z_R & \Pi_{RW} & \Pi_{RR}
\end{bmatrix}
\]

\[
\Pi_{RW} = \begin{pmatrix}
f_L + a_L & f_L + a_H & f_H + a_L & f_H + a_H & z_{awe_l} & z_{awe_h} \\
F_{11} & 0 & F_{12} & 0 & \phi_{in} & 0 \\
F_{11} & 0 & F_{12} & 0 & \phi_{in} & 0 \\
F_{21} & 0 & F_{22} & 0 & \phi_{in} & 0 \\
F_{21} & 0 & F_{22} & 0 & \phi_{in} & 0 \\
z_{awe_l} & 0 & \phi_{out_2} & 0 & \phi_{ff} & 0 \\
z_{awe_h} & 0 & \phi_{out_2} & 0 & \phi_{ff} & 0
\end{pmatrix}
\]

Later: \(\phi_{in} = \phi_{ff} = 0, \ \phi_{out_1} = F_{21}, \ \phi_{out_2} = F_{22}\)
## Results: Income Process

\[ \Pi = \begin{bmatrix} \begin{array}{c|cc} \cdot & z_W & z_R \\ \hline z_W & \Pi_{WW} & \Pi_{WR} \\ z_R & \Pi_{RW} & \Pi_{RR} \end{array} \end{bmatrix} \]

<table>
<thead>
<tr>
<th>( z_R \backslash z_W )</th>
<th>6.7</th>
<th>19.2</th>
<th>20.5</th>
<th>58.4</th>
<th>61.4</th>
<th>1222</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.043</td>
<td>0</td>
<td>0.023</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.0</td>
<td>0.043</td>
<td>0</td>
<td>0.023</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.0</td>
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<td>0.043</td>
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<tr>
<td>0.0</td>
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<td>0</td>
<td>0.043</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
## Calibration Results: Taxes in 1960

<table>
<thead>
<tr>
<th></th>
<th>Corporate Tax</th>
<th>Estate Tax</th>
<th>Income Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1% 99% R/Y</td>
<td>1% 99% R/Y</td>
<td>1% 99% R/Y</td>
</tr>
<tr>
<td>Data</td>
<td>14.4 5.1 3.8</td>
<td>6.0 0.0 0.3</td>
<td>24.0 13.8 10.6</td>
</tr>
<tr>
<td>Model</td>
<td>14.4 4.6 4.6</td>
<td>3.1 0.1 0.3</td>
<td>22.6 10.6 9.6</td>
</tr>
</tbody>
</table>

Poschke (2022)  Wealth inequality
Expanding social security and saving behavior

More generous SS crowds out saving:

![Graph showing the relationship between changes in saving before social security and changes in replacement rate. The graph indicates that as social security benefits increase, there is a decrease in saving behavior.]
Estate taxes and saving behavior

The top 10% face the largest change in estate taxes, and react most:

-30%  -20%  -10%  0%  10%  20%  30%
-0.6%  -0.4%  -0.2%  0.0%  0.2%  0.4%  0.6%
80-60%  60-40%  40-20%  20-10%  10-5%  5-1%  1-0.5%  0.5-0.1%  top 0.1%

Change in saving propensity \( k'/(k+yd) \) (left axis)

Change in the average marginal estate tax rate (right axis)
Corporate taxes and saving behavior

Lower corporate taxes raise gross saving rates for $k > \frac{d_c}{r}$ (ca. median):

- Change in saving propensity $k'/(k+yd)$ (left axis)
- Change in average marginal corporate income tax rate (right axis)
Drivers of the top wealth share

1960s  Anticipation of SS expansion.

1970s  Social security expansion.

Note: in the data, wealth-destroying events take place which are outside the model.

1980s  Lingering effects of SS expansion, wage inequality increase

1990s- Wage inequality
Appendix

Aggregates

Poschke (2022) Wealth inequality 68