Accounting for wealth concentration in the US

Barış Kaymak  
FRB Cleveland, Université de Montréal and CIREQ

David Leung  
National Taiwan University

Markus Poschke  
McGill University and CIREQ

Atelier sur les enjeux économiques des inégalités démographiques
Montréal, Oct 13-14, 2022
What determines wealth concentration?

- US wealth distribution is highly concentrated: top 1% share ~35%
- Theories:
  - earnings based:  
    ... superearners (*Castañeda, Díaz-Gimenez and Ríos-Rull* 2003)
  - asset based:
    ... returns (*e.g. Quadrini* 2000, *Benhabib, Bisin and Zhu* 2011)
    ... bequests (*de Nardi* 2004)
    ... preferences (*e.g. Krusell and Smith, 1998*)
- Implications:
  - Tax Policy
  - Distributional Consequences
  - Self-Insurance
Our contribution

Use the joint distribution of income, earnings and net worth to measure the empirical relevance of each theory.

Intuition:

– If the earnings channel dominates, top income earners should have significant labor income.

– If the asset channel dominates, top income earners should have mostly capital income.
Our contribution

Use the joint distribution of income, earnings and net worth to measure the empirical relevance of each theory.

Steps:

1. Document
   - the labor income share of top income and wealth groups
   - average returns of top income and wealth groups

2. Structurally measure the importance of each channel
   - heterogeneous-agent, life-cycle model with incomplete markets and all three potential determinants of wealth concentration.
Our contribution

Use the **joint distribution of income, earnings and net worth** to measure the empirical relevance of each theory.

Key Result:

- Earnings concentration main driver of top 1% wealth share.
- Asset returns matter almost as much as earnings for top 0.1% wealth share.
- Modest contributions from bequests.
- Scenarios with larger role for return heterogeneity generate strongly counterfactual joint distributions and earnings distributions.
DATA
Data: Survey of Consumer Finances: 2001 - 2019

Net worth: financial + non-financial assets - debt: liquid assets, bonds, stocks, mutual funds, retirement accounts, vehicles, real estate, businesses

Market Income:
+ wage and salary income (L)
+ active business and farm income (K+L)
+ interest and dividend income, private pension withdrawals (K)
± capital gains (K)
— e.g. social security income, transfer income etc.
Data: Survey of Consumer Finances: 2001 - 2019

Net worth: financial + non-financial assets - debt: liquid assets, bonds, stocks, mutual funds, retirement accounts, vehicles, real estate, businesses

Market Income:

+ wage and salary income (L)

+ active business and farm income (K+L)
  ○ (impute earnings only if none is reported)

+ interest and dividend income, private pension withdrawals (K)

± capital gains (K)
  ○ (report w and w/o)

- e.g. social security income, transfer income etc.

- Key empirical patterns similar

(Kaymak - Leung - Poschke)
Top earners are wealthy

Data

(Kaymak - Leung - Poschke) Wealth Accounting 5
Top earners are wealthy
Sources of Top Incomes

Top 1% shares:
- by inc.: 59%
- by wealth: 53%

IRS data:
- wage: 53%

Data

Sources of capital, labor

Top 1% shares:
- by inc.: 59%
- by wealth: 53%

IRS data:
- wage: 53%

(Kaymak - Leung - Poschke)

Wealth Accounting
Rates of return on assets

Group $p$ labor income share:

$$LIS_p = \frac{E_p}{E_p + r_p W_p}$$

LIS ratio of groups $p$ and 0:

$$\frac{LIS_p}{LIS_0} = \frac{E_p}{E_0} \cdot \frac{E_0 + r_0 W_0}{E_p + r_p W_p}$$

Relative rates of return for groups $p$ and 0:

$$\frac{r_p}{r_0} = \frac{E_p/E_0}{W_p/W_0} \cdot \frac{1/LIS_p - 1}{1/LIS_0 - 1}.$$
Rates of return on assets

Relative rates of return for groups $p$ and 0:

$$\frac{r_p}{r_0} = \frac{E_p/E_0}{W_p/W_0} \cdot \frac{1/LIS_p - 1}{1/LIS_0 - 1}.$$ 

Note.– Synthetic rate of return on assets implied by the labor share in income assuming an annual average rate of return of 3.9%. Source: SCF.

(Kaymak - Leung - Poschke)
Data: key patterns

1. Top earners are wealthy.

2. Labor income main source of income except for top 0.1%.
   - 59% for top 1% of income
   - 53% for top 1% of wealth

3. High income groups earn higher asset returns.
   Modest variation in returns by wealth.
MODEL
Model Economy

Extend a standard general equilibrium, life-cycle model with incomplete markets (Imrohoroglu et al. 1995, Huggett 1996) to incorporate

... idiosyncratic labor income risk with superearners
... idiosyncratic capital income risk
... non-homothetic bequests
... fiscal policy
Assumptions

- Demographics
  - life: ages 20 to 100 in 5-year periods
  - survival: age-dependent
  - retirement age: 65

- Household Preferences
  - (+) consumption (+) bequests (-) work

- Production
  - Representative Firm (Cobb-Douglas)

- Government
  - Tax and Transfer System
  - Social Security System
  - Expenses

- Stationary Equilibrium
  - Rational Agents, Competitive Markets, Fiscal Balance
Risks, saving motives, and wealth inequality

Households face risks:
- survival risk
- productivity shocks
- rate of return shocks

Multiple saving motives:
- intertemporal
- retirement
- bequest
- precautionary

All these vary with the state variables age, wealth, productivity, saving return.
Risks, saving motives, and wealth inequality

Multiple saving motives:
- intertemporal
- retirement
- bequest
- precautionary

All these vary with the state variables age, wealth, productivity, saving return.

Multiple factors promoting wealth concentration:
- heterogeneous saving motives by productivity
- heterogeneous rates of return
- bequest motive
Consumption-Savings Problem

Workers ($j < J_R - 1$)

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

subject to

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

Retirees ($j \geq J_R$)

receive social security benefits $b$ instead of labor earnings $zw\varepsilon_jh$
Closing the model

Representative firm:
- \( Y = K^\alpha N^{1-\alpha} \)
- \( Y \) can be consumed or invested
- rents capital and labor, taking prices \( w \) and \( r \) as given

Government:
- expenditure: exogenous expenditure \( G \), social security, medicare, and universal transfer
- revenue: taxes on household income, corporate income, and consumption.

Focus on a stationary equilibrium.
CALIBRATION
Calibration strategy

Target moments on ...
- earnings distribution and dynamics
- factor composition
- wealth concentration
- returns by income
- bequest distribution
- intergenerational wealth transitions

... to identify:
- earnings process
- rate of return process
- bequest motives
Fiscal Policy

Social security:
- piecewise linear as in the law
- caps on contributions and on benefits
- total social security and medicare spending as in national accounts

Government spending as in national accounts.

Taxes:
- linear taxes on corporate income ($\tau_c$)
- progressive taxes on household income ($\tau_l, \tau_{\text{max}}$)
- average taxes endogenous, so that the government budget is balanced.
Labor Productivity Process

\[ z \times \varepsilon_j \times h \times w \]

- Deterministic age profile
- Wage
- Idiosyncratic shock
- Hours
## Labor Productivity Process

### Shock ($z$) Dynamics

\[ \Pi_Z = \begin{pmatrix} f_L + a & f_H + a & z_{awel} & z_{aweh} \\ f_L + a & A & 0 & \lambda_{in} & 0 \\ f_H + a & 0 & A & \lambda_{in} & 0 \\ z_{awel} & \lambda_{out} & \lambda_{out} & \lambda_{ll} & \lambda_{lh} \\ z_{aweh} & 0 & 0 & \lambda_{hl} & \lambda_{hh} \end{pmatrix} \]
Labour Productivity Process

Shock ($z$) Dynamics

$$\Pi_Z = \begin{pmatrix}
    f_L + a & f_H + a & z_{awel} & z_{aweh} \\
    f_L + a & A & 0 & \lambda_{in} & 0 \\
    f_H + a & 0 & A & \lambda_{in} & 0 \\
    z_{awe_l} & \lambda_{out} & \lambda_{out} & \lambda_{ll} & \lambda_{lh} \\
    z_{awe_h} & 0 & 0 & \lambda_{hl} & \lambda_{hh}
\end{pmatrix}$$

Estimate:
- PSID
Calibration

Labor Productivity Process

Shock ($z$) Dynamics

\[
\Pi_Z = \begin{pmatrix}
   f_L + a & f_H + a & z_{awel} & z_{aweh} \\
   f_L + a & A & 0 & \lambda_{in} & 0 \\
   f_H + a & 0 & A & \lambda_{in} & 0 \\
   z_{awe_l} & \lambda_{out} & \lambda_{out} & \lambda_{ll} & \lambda_{lh} \\
   z_{awe_h} & 0 & 0 & \lambda_{hl} & \lambda_{hh}
\end{pmatrix}
\]

Calibrate:
- earnings concentration
- top persistence
- top LIS

(Kaymak - Leung - Poschke) Wealth Accounting
Rate of Return Process

idiosyncratic rate of return

Capital Income

\[ r \times \kappa \times k \]

interest rate assets
## Rate of Return Process

### Idiosyncratic Dynamics

$$ \Pi_\kappa(z) = \begin{pmatrix} \kappa_L & \kappa_H & \kappa_{\text{top}} \\ \kappa_L & \pi_{ll} & 1 - \pi_{ll} - \pi_{\text{in}}(z) \\ \kappa_H & 1 - \pi_{hh} - \pi_{\text{in}}(z) & \pi_{hh} \\ \kappa_{\text{top}} & 0 & 1 - \pi_{\text{top,top}} \end{pmatrix} $$

**Calibrate:**

- top wealth shares
- intergenerational persistence of top wealth status
- relative returns by income group
**Bequests**

**Utility value**

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

Households receive a bequest at age 50 (mean age receiving bequest)...

... drawn randomly from the assets of the deceased with (high / low) (productivity / return).

... weights are disciplined by intergenerational correlations of earnings and wealth.
Non-targeted moments

- joint distribution of income, earnings and wealth (except top labor income shares)
- life cycle patterns (averages and dispersion)
- age composition of top wealth groups
Fit: Marginal distributions of wealth, earnings and income
## Fit: Share of income from labor

<table>
<thead>
<tr>
<th></th>
<th>All 0-100</th>
<th>99.9-100</th>
<th>Top(%)</th>
<th>99-100</th>
<th>95-99</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td>0.82</td>
<td>0.49</td>
<td>0.59</td>
<td>0.77</td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>0.80</td>
<td>0.47</td>
<td>0.61</td>
<td>0.85</td>
<td></td>
</tr>
</tbody>
</table>
## Parameters: Rates of return

Transition matrix (probabilities in %):  

<table>
<thead>
<tr>
<th></th>
<th>( r^\kappa_L )</th>
<th>( r^\kappa_H )</th>
<th>( r^\kappa_{\text{top}} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1%</td>
<td>96</td>
<td>4 - ( \pi_{\text{in}}(z) )</td>
<td>( \pi_{\text{in}}(z) )</td>
</tr>
<tr>
<td>5.5%</td>
<td>6 - ( \pi_{\text{in}}(z) )</td>
<td>94</td>
<td>( \pi_{\text{in}}(z) )</td>
</tr>
<tr>
<td>25.3%</td>
<td>0</td>
<td>10</td>
<td>90</td>
</tr>
</tbody>
</table>

| pop. share | 60 | 39.9 | 0.1 |

\[
p_{\text{in}}(z_{1-6}): 0.025\% \\
p_{\text{in}}(z_7): 2 \cdot p_{\text{in}}(z_{1-6}) \\
p_{\text{in}}(z_8): 15 \cdot p_{\text{in}}(z_{1-6})
\]
## Rates of return for top income groups (%)

<table>
<thead>
<tr>
<th></th>
<th>top 0.1%</th>
<th>top 1%</th>
<th>bottom 90%</th>
</tr>
</thead>
<tbody>
<tr>
<td>data (imputed)</td>
<td>9.7</td>
<td>6.8</td>
<td>2.2</td>
</tr>
<tr>
<td>model</td>
<td>10.5</td>
<td>6.3</td>
<td>2.5</td>
</tr>
</tbody>
</table>

For an average return of 3.9%.
Top incomes

*Top relative to mean earnings:*

<table>
<thead>
<tr>
<th></th>
<th>0.01%</th>
<th>0.1%</th>
<th>0.5%</th>
<th>1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>data</td>
<td>&gt;170</td>
<td>60</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>model</td>
<td>163</td>
<td>54</td>
<td>29</td>
<td>18</td>
</tr>
</tbody>
</table>

*Top earning dynamics:*

<table>
<thead>
<tr>
<th></th>
<th>Prob. stay in top 1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>data</td>
<td>0.62</td>
</tr>
<tr>
<td>model</td>
<td>0.62</td>
</tr>
</tbody>
</table>
Distribution of Wealth by Income and Earnings

Wealth by income:  
- data
- model

Wealth by earnings:  
- data
- model
Life-Cycle Patterns: Averages

DATA vs MODEL

(a) earnings
(b) income
(c) wealth
Life-Cycle Patterns: Dispersion

![Graph showing Life-Cycle Patterns: Dispersion]

- **Wealth:**
  - Data (blue dashes)
  - Model (red circles)

- **Earnings:**
  - Data (light blue dashes)
  - Model (black squares)

**Axes:**
- **Gini Coefficient**
- **Age**

**Legend:**
- Wealth:
  - Data: Blue dashes
  - Model: Red circles
- Earnings:
  - Data: Light blue dashes
  - Model: Black squares

*Reference: Kaymak - Leung - Poschke, Wealth Accounting*
## Additional moments: Mean age in top 1% groups

<table>
<thead>
<tr>
<th></th>
<th>Wealth</th>
<th>Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>data</td>
<td>60</td>
<td>55</td>
</tr>
<tr>
<td>model</td>
<td>62</td>
<td>56</td>
</tr>
</tbody>
</table>
DECOMPOSITION

Sources of Wealth Concentration
Accounting for Wealth Concentration

(d) Top 1% Wealth Share

(e) Top 0.1% Wealth Share

Note.– Percent contribution to top wealth shares.

– Top earners account for half of top wealth shares.
– Asset returns matter for the top 0.1% share.
Alternative calibrations 1: single channels

Recalibrate the model to maintain top 0.1% wealth share.

1. No top earners (higher $\kappa_{top}$)

<table>
<thead>
<tr>
<th></th>
<th>top earnings shares</th>
<th>top 1% LIS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.1%</td>
<td>1%</td>
</tr>
<tr>
<td>data</td>
<td>6%</td>
<td>17%</td>
</tr>
<tr>
<td>model (here)</td>
<td>0.5%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Completely misses importance of earnings among the wealthy.
Typical statistics for papers with this channel only.

2. Common return (much higher $z_8$)

- top 0.1% earnings share rises to 8% (data: 6%)
- LIS for top 1% incomes rises to 79% (data: 59%)

Overstates importance of earnings.
Alternative calibrations 2: no entrepreneurs

Are entrepreneurs different? To find out, repeat for non-entrepreneurs.

Data:

- Top entrepreneurs are wealthier,
- but strong concentration among non-entrepreneurs, too.
Alternative calibrations 2: no entrepreneurs

Are entrepreneurs different? To find out, repeat for non-entrepreneurs.

Results:

– Results for top 1% hardly change.
– Slightly larger role for returns for top 0.1%.
How is this possible?

Stachurski and Toda (2019):

if (i) agents are infinitely-lived,  
(ii) saving is risk-free, and  
(iii) agents have constant discount factors,  
then the wealth distribution inherits the tail behavior of income shocks (e.g., light-tailedness or the Pareto exponent).

Reason: $\beta R < 1$.

Is the large role of earnings for wealth concentration impossible?
How is this possible?

Stachurski and Toda (2019):

if (i) agents are infinitely-lived, (ii) saving is risk-free, and (iii) agents have constant discount factors, then the wealth distribution inherits the tail behavior of income shocks (e.g., light-tailedness or the Pareto exponent).

Reason: $\beta R < 1$.

Is the large role of earnings for wealth concentration impossible?

No. This does not apply to life cycle models.
How is this possible?

Sargent, Wang and Yang (2021) show:

The tail of the wealth distribution can be thicker than that of earnings in a life cycle model if agents start their life with a low level of wealth, even with a common return on capital and a common discount factor.
How is this possible?

Sargent, Wang and Yang (2021) show:

The tail of the wealth distribution can be thicker than that of earnings in a life cycle model if agents start their life with a low level of wealth, even with a common return on capital and a common discount factor.

Illustration: bequest timing
Why do returns matter so little?

**Answer: because life is too short.**
Reaching the top 0.1% takes 35 years at the top return of 25%.

Bequests and intergenerational return correlation help, but only up to a point.

Complementarity between unequal bequests and return heterogeneity in generating wealth concentration.
Conclusion

- Model replicates
  - joint distribution of income and wealth
  - top income composition
  - relative returns
  and life cycle dynamics of earnings, income and wealth
    - levels
    - inequality.
- Realistic earnings concentration main reason for high wealth concentration in the US.
- Top 0.1% share also due to return heterogeneity.
- Models that only rely on rate of return heterogeneity cannot match the high levels of earnings at the top of the income and wealth distributions.
Thank you!
Appendix
Data and Definitions

- Survey of Consumer Finances 2010 - 2016
- Market Income
  - wage and salary income (L)
  - business and farm income (K+L)
  - interest and dividend income (K)
  - private pension withdrawals (K)
  - capital gains (K)
  - e.g. social security income, transfer income etc.
- Business Income: K or L?
  - solution: If no wage is reported for active business, we impute it.
- Capital gains
  - solution: Report both with and without capital gains and calibrate the average.
## Cross-Sectional Distributions of Income, Earnings and Wealth

<table>
<thead>
<tr>
<th>Top Percentile</th>
<th>0.1%</th>
<th>0.5%</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>20%</th>
<th>40%</th>
<th>Gini</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wealth share</td>
<td>0.13</td>
<td>0.26</td>
<td>0.35</td>
<td>0.62</td>
<td>0.74</td>
<td>0.86</td>
<td>0.96</td>
<td>0.84</td>
</tr>
<tr>
<td>Income share</td>
<td>0.08</td>
<td>0.17</td>
<td>0.22</td>
<td>0.40</td>
<td>0.51</td>
<td>0.66</td>
<td>0.85</td>
<td>0.66</td>
</tr>
<tr>
<td>Earnings share</td>
<td>0.06</td>
<td>0.12</td>
<td>0.17</td>
<td>0.33</td>
<td>0.46</td>
<td>0.63</td>
<td>0.85</td>
<td>0.64†</td>
</tr>
</tbody>
</table>

Source.— Survey of Consumer Finances, 2001 to 2019. All households. Cumulative shares. Income includes capital gains. Patterns are similar when excluding capital gains.

†The earnings gini for working age households is 0.56.
The Joint Distribution of Wealth, Income and Earnings

**Shares of Net Worth by Income and Earnings:**

<table>
<thead>
<tr>
<th>sorted by...</th>
<th>0.5%</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>20%</th>
<th>40%</th>
</tr>
</thead>
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<td>... net worth</td>
<td>0.26</td>
<td>0.35</td>
<td>0.62</td>
<td>0.74</td>
<td>0.86</td>
<td>0.96</td>
</tr>
<tr>
<td>... income</td>
<td>0.19</td>
<td>0.27</td>
<td>0.50</td>
<td>0.60</td>
<td>0.70</td>
<td>0.81</td>
</tr>
<tr>
<td>... earnings</td>
<td>0.12</td>
<td>0.19</td>
<td>0.37</td>
<td>0.46</td>
<td>0.57</td>
<td>0.67</td>
</tr>
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Source.– Survey of Consumer Finances, 2001 to 2019. All households. Income includes capital gains. Figures excluding capital gains are similar.
## Cross-Sectional Distributions of Income, Earnings and Wealth

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<th>10%</th>
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<td>0.51</td>
<td>0.66</td>
<td>0.85</td>
<td>0.66</td>
</tr>
<tr>
<td>Income share (w/o KG)</td>
<td>0.07</td>
<td>0.14</td>
<td>0.20</td>
<td>0.37</td>
<td>0.49</td>
<td>0.65</td>
<td>0.85</td>
<td>0.64</td>
</tr>
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<td>0.63</td>
<td>0.85</td>
<td>0.64</td>
</tr>
</tbody>
</table>


† The earnings gini for working age households is 0.58.
The share of income from labor

\[
\text{Income} = \text{Wage income + Business income} + \text{Interest, dividends (+capital gains)}
\]

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Wage income</th>
<th>Labor Income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All 0-100</td>
<td>Top Income Groups</td>
</tr>
<tr>
<td></td>
<td>90-95</td>
<td>95-99</td>
</tr>
<tr>
<td>Wage income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>with capital gains</td>
<td>74</td>
<td>84</td>
</tr>
<tr>
<td>without capital gains</td>
<td>78</td>
<td>86</td>
</tr>
<tr>
<td>Labor Income</td>
<td>80</td>
<td>88</td>
</tr>
<tr>
<td>with capital gains</td>
<td>84</td>
<td>90</td>
</tr>
</tbody>
</table>

- Labor income is the major income source for the top 1% in the SCF.
- It accounts for 53% of income even in the top 1% of wealth.
# The share of income from labor – top fractiles from IRS data

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>w/o capital gains:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wage</td>
<td>56</td>
<td>73</td>
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<td>Business</td>
<td>30</td>
<td>20</td>
<td>29</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>Int. + Div.</td>
<td>14</td>
<td>7</td>
<td>10</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td><strong>w/ capital gains:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wage</td>
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<td>68</td>
<td>54</td>
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<tr>
<td>Business</td>
<td>27</td>
<td>19</td>
<td>26</td>
<td>32</td>
<td>30</td>
</tr>
<tr>
<td>Int., Div., KG</td>
<td>24</td>
<td>13</td>
<td>19</td>
<td>28</td>
<td>42</td>
</tr>
</tbody>
</table>


- Labor income is the major income source for the top 1% in the SCF.
- IRS agrees: wage income is the main source except for the top 0.1%.
Rates of return on assets

Group $p$ labor income share:

$$LIS_p = \frac{E_p}{E_p + RoR_p W_p}$$

LIS ratio of groups $p$ and 0:

$$\frac{LIS_p}{LIS_0} = \frac{E_p}{E_0} \cdot \frac{E_0 + RoR_0 W_0}{E_p + RoR_p W_p}$$

Relative rates of return for groups $p$ and 0:

$$\frac{RoR_p}{RoR_0} = \frac{E_p/E_0}{W_p/W_0} \cdot \frac{1/LS_p}{1/LS_0} - 1.$$
Stationary Equilibrium

Let \( s = \{j, k, z, \kappa\} \in S \) be the state vector.

1. Functions \( V(s), c(s), k'(s) \) and \( h(s) \) solve the households’ problem.
2. Firms maximize profits.
3. Factor markets clear:
   \[ K = \int k'(s)d\Gamma(s) \quad \text{and} \quad N = \int_{j<J_r} z\varepsilon_j h(s)d\Gamma(s) \]
4. The government’s budget is balanced:
   \[ G + Tr + \int b(s)d\Gamma(s) = \tau_s \int c(s)d\Gamma(s) + \int [y(s) - y^d(s)]d\Gamma(s) \]
5. \( \Gamma(s) \) is consistent with the policy functions, and is stationary.
Tax System and Disposable Income \( y^d \)

\[
y^d = \lambda \min\{y_f, y_b\}^{1-\tau_l} + (1 - \tau_{max}) \max\{0, y_f - y_b\} \\
+ (1 - \tau_c) \max(r\kappa k - d_c, 0)
\]

- Taxable household income: \( y_f = wz\varepsilon_j h + \min(r\kappa k, d_c) + b(j, z) \)
- Taxation of household income: progressive up to \( y_b \), constant MTR above
  \[
  \lambda \min\{y_f, y_b\}^{1-\tau_l} + (1 - \tau_{max}) \max\{0, y_f - y_b\}
  \]
  ○ \( 0 \leq \tau_l \leq 1 \) measures the degree of progressivity of the tax system.
  ○ Permits net transfers (e.g. Welfare-to-work (Workfare) and EITC)
- Taxation of Corporate Income:
  \[
  (1 - \tau_c) \max(r\kappa k - d_c, 0)
  \]
- Social Security: piecewise linear as in the law
## Calibration of the Model: Preset Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$J$</td>
<td>Maximum life span</td>
<td>16</td>
</tr>
<tr>
<td>$j_R$</td>
<td>Mandatory retirement age</td>
<td>10</td>
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<td>$s_0, s_1, s_2$</td>
<td>Survival probability by age</td>
<td>Halliday (2015)</td>
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**Production**

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<thead>
<tr>
<th>Parameter</th>
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<tbody>
<tr>
<td>$\alpha$</td>
<td>Share of capital</td>
<td>0.27</td>
</tr>
<tr>
<td>$\delta$</td>
<td>Depreciation</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

**Preferences**

<table>
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<tr>
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<tr>
<td>$\sigma_c$</td>
<td>Risk aversion</td>
<td>1.5</td>
</tr>
<tr>
<td>$\sigma_l$</td>
<td>Inverse frisch elasticity</td>
<td>1.22</td>
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(Blundell et al. 2016)
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<tr>
<td>( { \varepsilon_j }_{j=1}^{j=1} )</td>
<td>Age-efficiency profile</td>
<td>own estimate</td>
<td></td>
</tr>
<tr>
<td>( { z_1, \ldots, z_6 } )</td>
<td>Ordinary productivity states</td>
<td>own estimate</td>
<td></td>
</tr>
<tr>
<td>( A_{ij} )</td>
<td>Transition rates of ordinary productivity</td>
<td>own estimate</td>
<td></td>
</tr>
<tr>
<td>( \tau_c )</td>
<td>Marginal corporate tax rate</td>
<td>0.236</td>
<td>Gravelle (2014)</td>
</tr>
<tr>
<td>( \tau_s )</td>
<td>Consumption tax rate</td>
<td>0.05</td>
<td>Kindermann and Krueger (2016)</td>
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<tr>
<td>( Tr )</td>
<td>Government transfers / GDP</td>
<td>0.027</td>
<td>NIPA</td>
</tr>
<tr>
<td>( G/Y )</td>
<td>Expenditures / GDP</td>
<td>0.155</td>
<td>NIPA</td>
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### Labor Productivity

### Taxes and Transfers
## Calibration of the Model: Jointly Calibrated Parameters

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<tr>
<td>$\beta$</td>
<td>Discount rate</td>
<td>0.979</td>
</tr>
<tr>
<td>$\theta$</td>
<td>Labor disutility</td>
<td>5.5</td>
</tr>
<tr>
<td>$\lambda_{in}, \lambda_{ll}, \lambda_{lh}, \lambda_{hh}$</td>
<td>Transition rates</td>
<td>...</td>
</tr>
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</tr>
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<td>...</td>
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<tr>
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<td>Bequest utility</td>
<td>-0.42, 0.19</td>
</tr>
<tr>
<td>$\tau_l$</td>
<td>Tax progressivity</td>
<td>18%</td>
</tr>
<tr>
<td>$d_c$</td>
<td>Corporate asset threshold/mean assets</td>
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Demographics

Production

Preferences
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Distribution of Earnings Growth for the Top 1% of Earners

<table>
<thead>
<tr>
<th>Moment</th>
<th>std. dev.</th>
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<th>kurtosis</th>
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Note.— Data moments come from Guvenen, Karahan, Ozkan & Song (2021) and are based on Social Security Administration data.
Appendix

**Alternative calibration: low LIS**

Recalibrate to target *top 1% wage income share of 49%.*

Slightly lower contribution of top earners and larger contribution of returns.
Alternative calibrations 3: low earnings inequality

Recalibrate to a setting with low earnings concentration (Gini 0.41), like Huggett (1996) and de Nardi et al (2020).

⇒ top 1% wealth share drops to 19% (data: 35%), plus:
  top 1% earnings share drops to 6% (data: 17%)

In this setting, naturally, top earners matter little for wealth, and other channels are required.
Appendix

Why do returns matter so little?

Figure: Path of assets if $z$ always $z_6$, return fixed
Why do returns matter so little?

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%.