Wealth Distribution

Prof. Lutz Hendricks

Econ 721

February 16, 2026

Motivation

Wealth and income are very unevenly distributed.

How can we understand where this inequality comes from?

We follow the literature from its start.

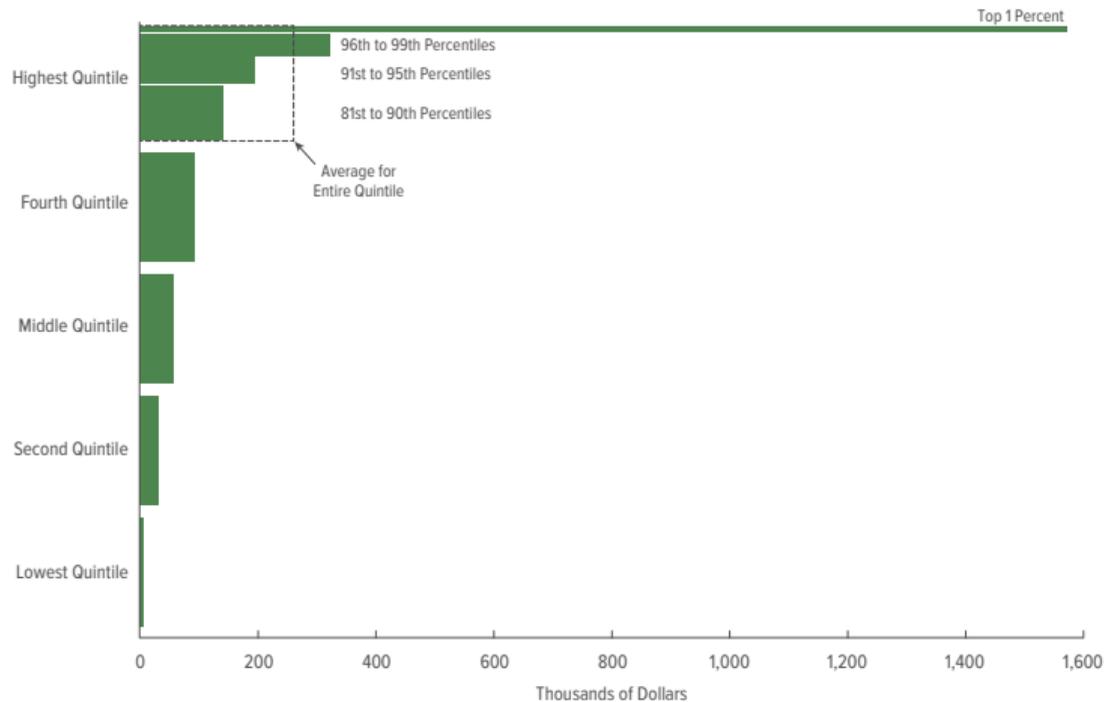We try to understand how research is implemented.

- ▶ What makes a good paper?

Income Levels

Figure 3.   Return to Reference

Average Market Income, by Market Income Group, 2013

Source: Congressional Budget Office.

Source: Congressional Budget Office (2016)

Inequality Facts

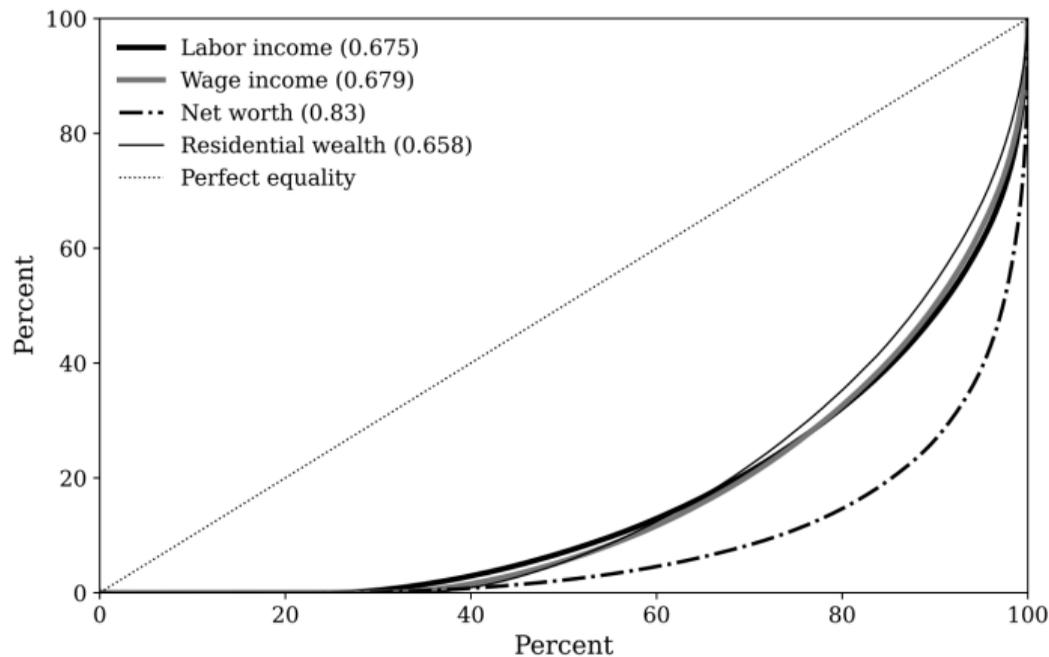
Figure 21.3: Lorenz curves of labor earnings, residential wealth, and net worth. Source: Azzimonti et al., Macroeconomics (2025)

Interpretation: The bottom 80 pct of households hold 15 pct of wealth.

Inequality Facts

Table 21.1: 2022 Per household shares of selected groups sorted by each variable.

	Bottom			Quintiles					Top		
	0-1	1-5	5-10	0-20	20-40	40-60	60-80	80-100	90-95	95-99	99-100
Earnings	−0.00	0.00	0.00	−0.16	0.50	10	0.96	3.39	2.5	4.88	19.4
Income	0.00	0.08	0.12	0.14	0.30	0.50	0.82	3.24	2.5	4.45	22.4
Wealth	−0.2	−0.02	0	−0.01	0.05	0.19	0.50	4.70	2.48	6.48	35.1
Consumption				0.44	0.66	0.84	1.12	1.93			
Hours worked								Source: Azzimonti et al., Macroeconomics (2025)			
per household	0.07	1.05	2.25	9.31	12.64	16.84	23.54	37.66	8.18	8.04	7.65
per person	0.09	1.28	2.65	11.65	19.89	20.57	20.97	26.91	6.67	6.27	2.07

The top 1 pct are rich!

Wealth distribution is most unequal.
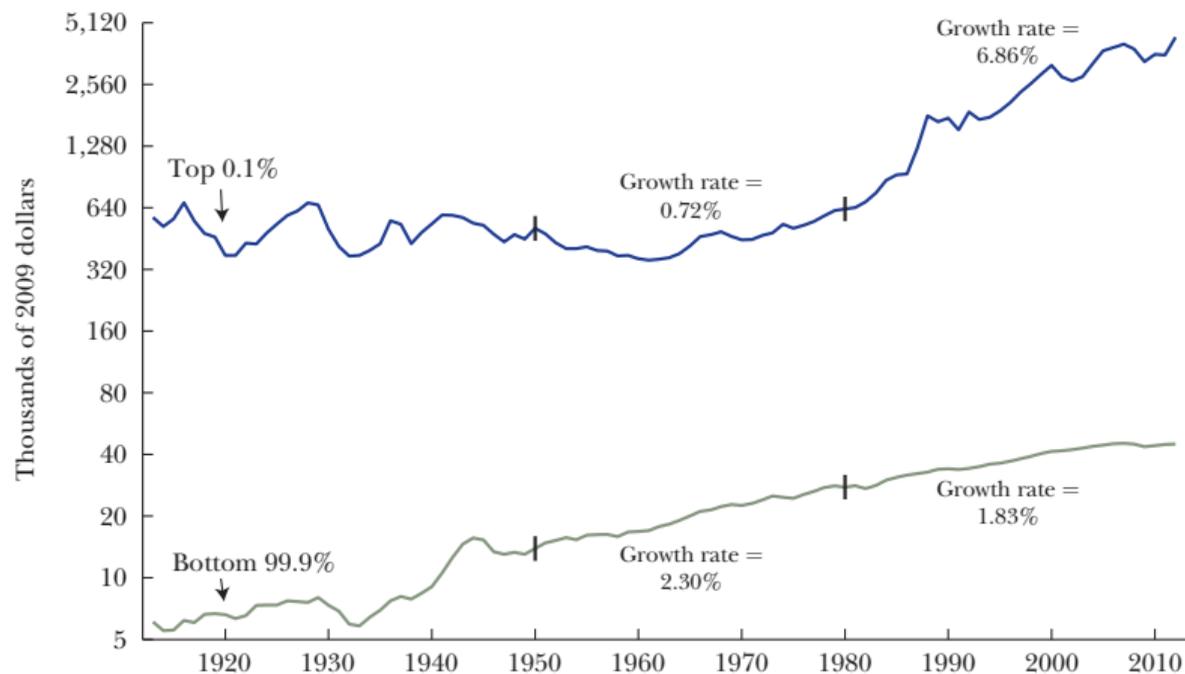
Age is Important
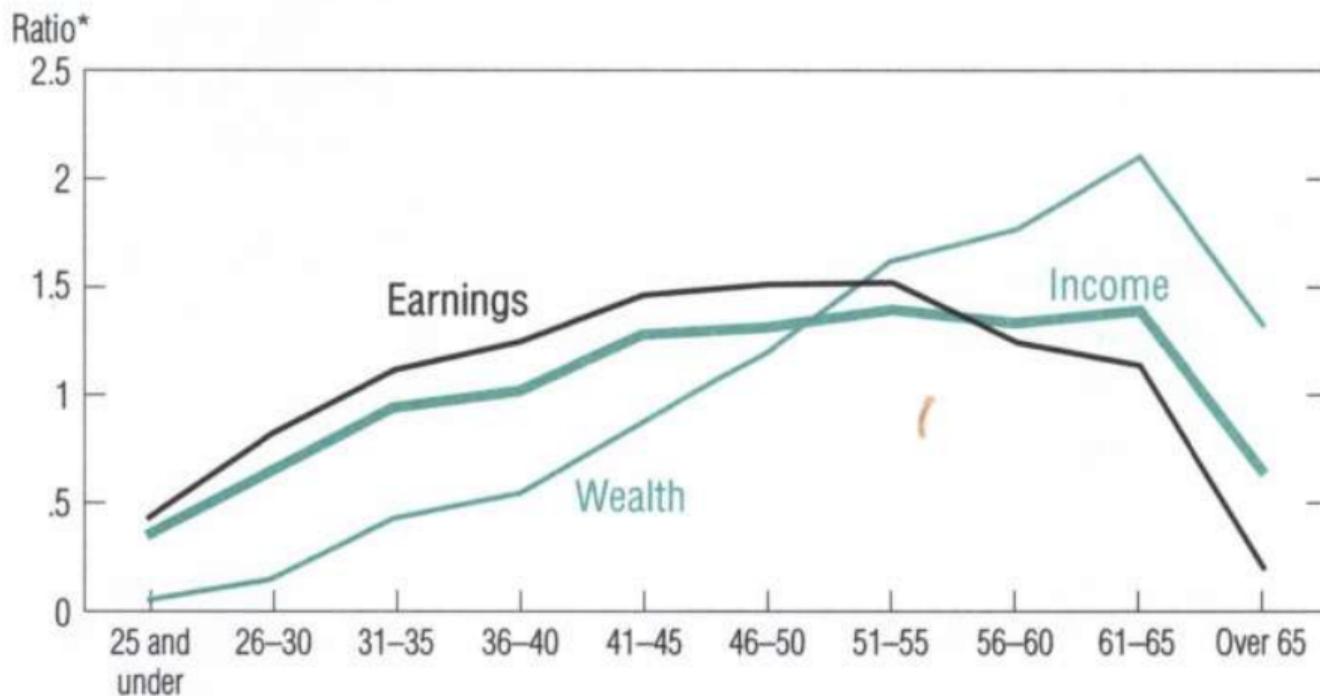
Source: Rodríguez et al. (2002)

Wealth peaks much later than earnings.

Growing Inequality over Time

Figure 1
GDP per Person, Top 0.1 Percent and Bottom 99.9 Percent

Source: Jones (2015)

How to Study Inequality?

Suppose there were no literature on wealth inequality.

Your task is to get one started.

How would you proceed?

A benchmark model

Can the standard life-cycle model account for wealth concentration?

Starting point: Huggett (1996)

Purpose:

▶ Explore implications of the simplest, reasonable models

▶ What is hard to get?

The Model's Story

A model is a story in math.

The Huggett story:

- ▶ Households differ in earnings
  (we can observe that)
- ▶ High earners save a lot
  (consumption smoothing)
- ▶ That's an important reason why some have high wealth.

What Kind of Model?

What model should we write down to tell that story?

We need:

- ▶ Households work and then retire.
  That's why they save.
  Also capture that young households are poor.
- ▶ Households differ in earnings.
  Exogenous shocks.

The rest is vanilla consumption-saving choice.

Complications

Aren't we missing important features of the data?

▶ Rich households often run businesses.

▶ Some inherit their wealth.

▶ Households make choices that affect earnings
  (occupations, education, work hard, ...)

Model Features

Demographics:

- ▶ In each period, $1/a_D$ identical households are born.
- ▶ Each lives for a_D periods (years).
- ▶ Age of retirement is fixed (a_R).

Preferences:

$$\mathbb{E} \sum_{a=1}^{a_D} \beta^a u(c_a) \tag{1}$$

Model Features

Technology:

$$F(K,L) = (1-\delta)K + C + G + K' \qquad (2)$$

Endowments:

- ▶ Working agents are endowed with labor efficiency $\eta_a e_a$
- ▶ η_a: age-efficiency profile (deterministic; exogenous)
- ▶ e_a: labor efficiency (wage) shock; Markov chain

e_a shocks are the model's key source of inequality.

Model Features

Government:

- ▶ Taxes labor income: $T = \tau_w w L$
- ▶ Eats G
- ▶ Pays transfers X to retired households (annuitized income in the data)
- ▶ Balanced budget: $G + X = T$

Markets:

- ▶ Labor: wage w
- ▶ Capital rental: r
- ▶ Goods: numeraire.

Why These Model Features?

Finite lifetimes

- ▶ Generates young people without wealth.
- ▶ A good part of wealth inequality is due to age.

Taxes and transfers

- ▶ Without social security, workers save too much.

General equilibrium

- ▶ No good reason

Household problem

Exogenous state variables $s = (a, e)$ are

- age a
- labor endowment e.

Endogenous state variable: wealth k.

Borrowing constraint: $k \geq 0$.

Household Dynamic Program

$$V(k,s) = \max u\left(y(k,s) - k'\right) + \beta \mathbb{E}V\left(k',s'\right) \qquad (3)$$

with

$$y(k,s) = Rk + w\left(1 - \tau_w\right)\eta_a e + \varpi\left(s\right) \qquad (4)$$

subject to $k' \geq 0$ (or a fixed borrowing limit).

Euler equation:

$$u'(c) \geq \beta R \mathbb{E}u'(c') \qquad (5)$$

with equality if $k' > 0$.

Solution is a consumption function $y(k,s)$

Stationary equilibrium: objects

- $\Gamma(k, s)$: distribution of households over states
- Household policy function $c(k, s)$ and value function $V(k, s)$.
- Aggregate quantities: K, L, X.
- Price functions: $r(K, L), w(K, L)$.

Equilibrium conditions

Household policy and value functions are optimal.

Prices equal marginal products:

- $r = F_K(K, L), w = F_L(K, L)$.

Goods market clears: $Y = C + I + G$.

Labor market clears: $L = \sum_s e(s) \eta(s) \Lambda(s)$.

- Labor supply is exogenous.

Capital market clears: $K = \sum_s \int_k \Gamma(k, s) k \, dk$.

Distribution of households is stationary.

3. Calibration

How to Choose Model Parameters?

Estimation

- ▶ Add shocks to the model
  until it can generate all data with positive probability
- ▶ Use standard statistical methods
  such as Maximum Likelihood
- ▶ Treats the model as the true data generating process.

How to Choose Model Parameters?

Calibration

- ▶ Take some parameters from outside evidence
  E.g., risk aversion or labor supply elasticity
- ▶ Other parameters match selected data moments
  E.g., mean wealth, average hours worked
  Explain why these are "good" moments to match.
- ▶ Minimize "distance" between model and data moments
  E.g., mean wealth model vs. mean wealth data
- ▶ Arbitrary measure of distance.

Target moments should not directly relate to question!

Estimate or Calibrate?

No clear winner.

Trade-offs ...

Discipline

▶ Calibration: Target moments and distance measure are arbitrary.
  But sometimes that's also true for estimation (method of moments).

Focus on **relevant data moments**

▶ The flip-side of discipline.
▶ With MLE, the model must match all observed behavior.
▶ What moments drive estimates? Are those useful?

Transparency

▶ Calibration: clear mapping from moments → parameters → results

The Deeper Question

What do models do?

Applied micro:

▶ Models are "realistic" representations of reality.

▶ If it happens in the data, it must happen in the model.

▶ Reasonable to treat the model as the true data generating process.

▶ Always estimate.

Macro:

▶ Models are stories in math.

▶ Realism is not a goal.

▶ Focus on the story's core mechanism.

▶ Usually calibrate or use method of moments.

Old vs New Calibration

Original calibration

- ▶ exactly identified
- ▶ N parameters / N data moments
- ▶ that's what Huggett does

More recent calibration

- ▶ over-identified
- ▶ more data moments than parameters

"Modern" calibration is very similar to estimation via Simulated Method of Moments.

Calibration vs estimation is not black-and-white.

Reference: Macroeconomics, ch. 8

Calibration: Huggett (1996)

"Standard" functional forms

- ▶ e.g., Cobb Douglas technology, CRRA preferences
- ▶ What does "standard" mean?

Directly from the data:

- ▶ age profile $e(a) \rightarrow$ observed age-wage profile
- ▶ stochastic process for wages:
  AR(1) that is estimated from panel data (PSID).

Calibrated Parameters

Calibration idea:

- ▶ discount rate $\beta \to K/Y$
- ▶ depreciation rate $\delta \to R$
- ▶ productivity $A \to w = 1$ (normalization)

Results

Main question:

What features of the wealth distribution can the model (not) get?

Main result: the top 1% are not rich enough.

Results

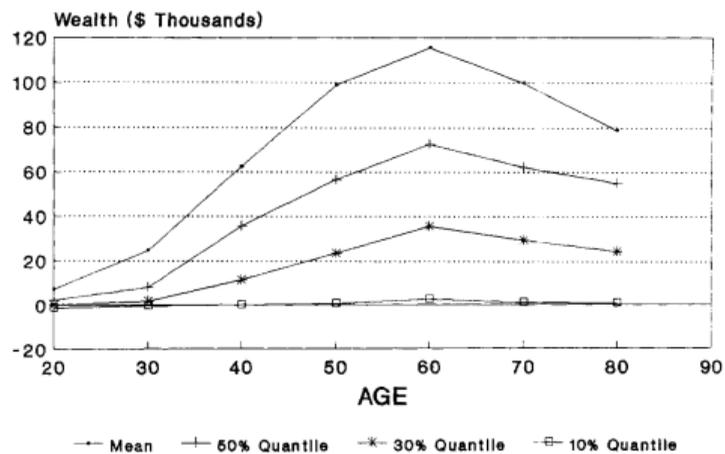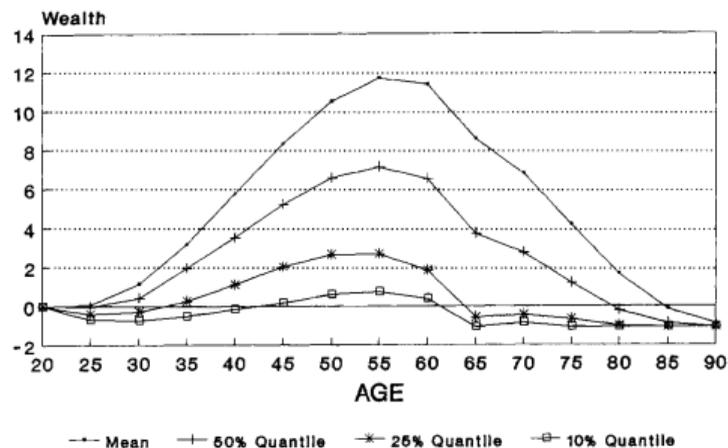| Fraction held by top	1%	5%	20%	Gini	Fraction neg. wealth
Huggett (1996)	10.8	32.4	68.9	0.70	19%
U.S. data	**34.7**	57.8	81.7	0.80	11%

The model has too many households without wealth.

Still, the wealth Gini is lower than in the data.

The key failure: the top 1%

The literature has been preoccupied with matching the top 1% ever since.

Age profiles

Wealth

- - - Mean   —+— 50% Quantile   —*— 25% Quantile   —☐— 10% Quantile

Wealth ($ Thousands)

- - - Mean   —+— 50% Quantile   —*— 30% Quantile   —☐— 10% Quantile
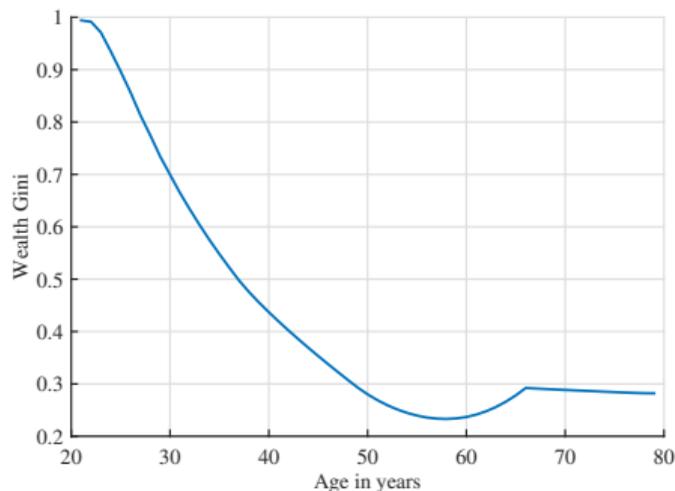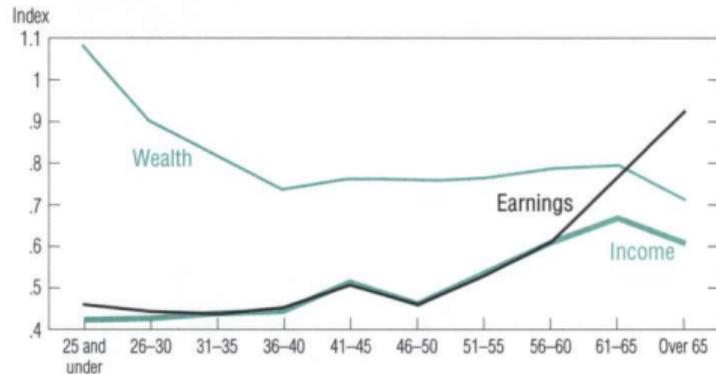
US Economy

The old dissave much too fast.

This is from a model with borrowing.
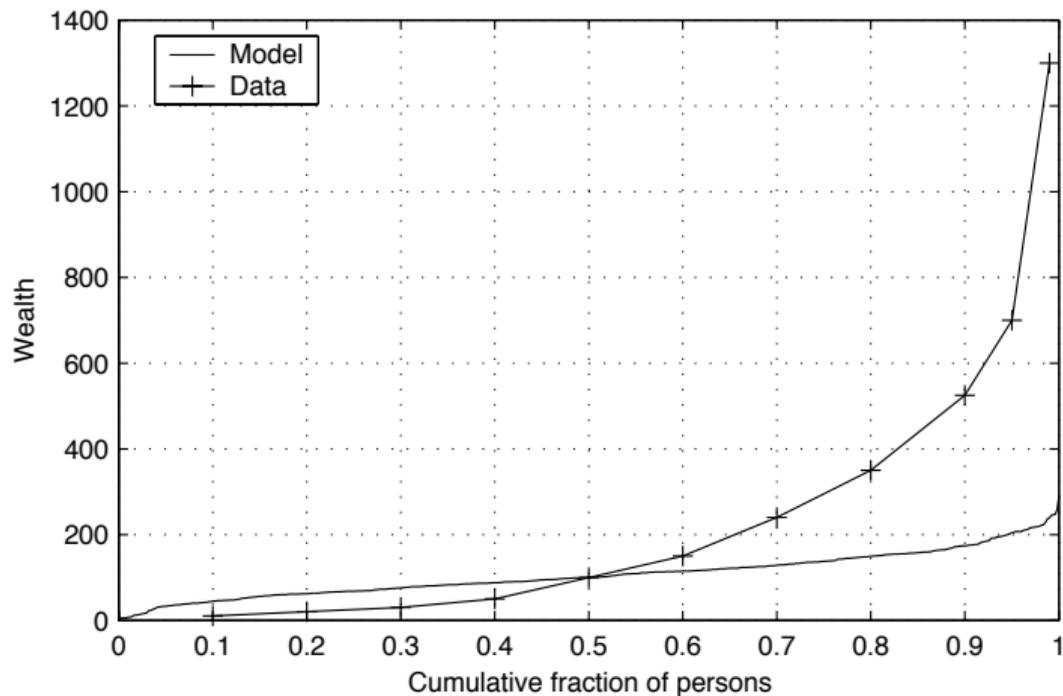
Age matters too much

Too little inequality among the old.

Source: Rodríguez et al. (2002) and my calculations.

Wealth and earnings

Wealth and lifetime earnings are too strongly correlated.

Life-cycle model versus Venti and Wise (2000) data (5th lifetime income decile)

The Top 1 Percent

How to get the top 1% to hold enough wealth?

▶ A major preoccupation of the literature for decades.

What goes wrong in Huggett's model?

1. The income-rich are not rich enough.
   There are no billion dollar incomes.
   The only income source is labor earnings.

2. The rich don't save enough.
   Households eat all their wealth by the time they die.

An accounting problem

Given the estimated earnings process, it is not feasible for Huggett's households to accumulate the highest SCF wealth observations.

- ▶ The earnings process is estimated from the PSID.
- ▶ Wealth is estimated from the SCF.
- ▶ The SCF over-samples the rich; the PSID does not.

The model cannot account for the highest wealth observations *by construction*.

- ▶ The highest PSID incomes are simply not large enough.

Problem: There is no publicly available U.S. dataset from which an untruncated earnings process could be estimated.

Possible solutions

One solution: Castaneda et al. (2003)

▶ Invent an earnings process that is consistent with the cross-sectional distribution of earnings from the SCF

Use administrative data: De Nardi et al. (2018)

How to Get the Rich to Save?

1. Bequests - leave your wealth to your children.
   Problem: most wealth is not inherited.

2. High rates of return.
   ... but why?

3. Entrepreneurship
   Generates high returns and incentives to save.

Conclusion

Huggett's model goes a long way towards accounting for wealth inequality.

Main discrepancies:

▶ Model misses the very top of the distribution.

This may be due to the truncated earnings process.

▶ Wealth is decumulated too slowly at old age.
▶ The model only accounts for the cross-sectional distribution
   How does it do with respect to other moments?

Reading

Macroeconomics, ch. 8

Surveys

▶ De Nardi and Fella (2017)
▶ Benhabib and Bisin (2018)

References I

Benhabib, J., Bisin, A., 2018. Skewed Wealth Distributions: Theory and Empirics. Journal of Economic Literature 56, 1261–1291. URL: http://www.aeaweb.org/articles?id=10.1257/jel.20161390, doi:10.1257/jel.20161390.

Castaneda, A., Diaz-Gimenez, J., Rios-Rull, J.V., 2003. Accounting for the US earnings and wealth inequality. Journal of political economy 111, 818–857. URL: https://www.jstor.org/stable/10.1086/375382.

Congressional Budget Office, 2016. The Distribution of Household Income and Federal Taxes, 2013. Technical Report. Washington, D.C.

De Nardi, M., Fella, G., 2017. Saving and wealth inequality. Review of Economic Dynamics 26, 280–300. URL: http://www.sciencedirect.com/science/article/pii/S1094202517300546, doi:10.1016/j.red.2017.06.002.

References II

De Nardi, M., Fella, G., Pardo, G.P., 2018. Nonlinear Household Earnings Dynamics, Self-insurance, and Welfare. Technical Report w24326. National Bureau of Economic Research. Cambridge, MA. URL: http://www.nber.org/papers/w24326.pdf, doi:10.3386/w24326.

Huggett, M., 1996. Wealth distribution in life-cycle economies. Journal of Monetary Economics 38, 469–494. doi:10.1016/S0304-3932(96)01291-3.

Jones, C.I., 2015. Pareto and piketty: The macroeconomics of top income and wealth inequality. The Journal of Economic Perspectives 29, 29–46.

Rodríguez, S.B., Díaz-Giménez, J., Quadrini, V., Ríos-Rull, J.V., 2002. Updated facts on the us distributions of earnings, income, and wealth. Federal Reserve Bank of Minneapolis Quarterly Review 26, 2–35.

Venti, S.F., Wise, D.A., 2000. Choice, Chance, and Wealth Dispersion at Retirement. Working Paper 7521. National Bureau of Economic Research. URL: http://www.nber.org/papers/w7521.