Wealth distribution and social mobility: A quantitative analysis of U.S. data

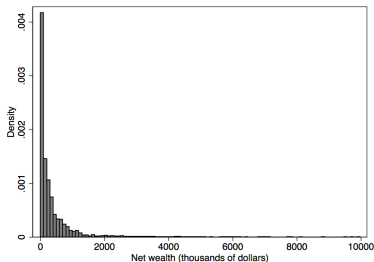Jess Benhabib[1]   Alberto Bisin[1]   Mi Luo[1]

[1]New York University

Giornate nFA - Fiesole
June 2015

The wealth distribution debate

Which factors drive quantitatively the cross-sectional distribution of wealth?

Which factors drive, most notably, its skewed, thick, right tail (in the U.S. as well as essentially everywhere)?

The wealth distribution debate - cont.ed

A few possible driving factors include:

Skewed/persistent earnings,

differential savings, non-homogeneous bequests, the infamous $r > g$

(persistent) capital income risk, stochastic discount rates,

. . .

The wealth distribution debate - cont.ed

Which factors drive the recent increase in inequality?

Is the distribution losing stationarity?

Figure: Trend in top 1% wealth share
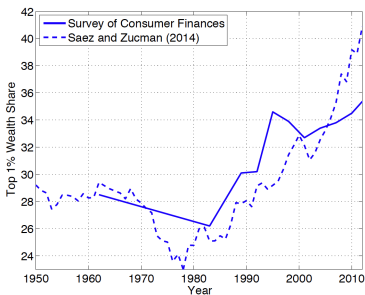
Not quite ready to tackle this, yet!

Literature: A few historical notes on Pareto's Law

Vilfredo Pareto

introduced in the *Cours d'Economie Politique* (1897) the distribution
which takes his name

$$f(w) \sim w^{-\beta}, \quad x \geq \underline{w} > 0$$

to represent empirical wealth distributions, characterized by thick
right tails:

$$\lim_{w \longrightarrow \infty} e^{\lambda w} Pr(W > w) = \infty, \text{ for all } \lambda > 0$$

Literature: A few historical notes on Pareto's Law - cont.ed

"Pareto's Law," enunciated e.g., by Samuelson (1965):

> *In all places and all times, the distribution of income remains the same. Neither institutional change nor egalitarian taxation can alter this fundamental constant of social sciences.*

Literature: From the "Law" to stable empirical regularities

Distributions of income and wealth which are very concentrated with thick right tails have been well documented over time and across countries:

- U.K.- Atkinson (2001),
- Japan - Moriguchi-Saez (2005),
- France - Piketty (2001),
- U.S. - Piketty-Saez (2003),
- Canada - Saez-Veall (2003),
- Italy - Clementi-Gallegati (2004),
- Norway - Dagsvik-Vatne (1999)

Literature: Dynamic models of Pareto distributions

- Stochastic processes driving wealth accumulation differentially for low and high wealth ranges: Kalecki (1945), Champernowne (1953), Rutherford (1955), Simon (1955), Wold-Whittle (1957), Mantegna-Stanley, 2000, Gabaix-Gopikrishnan-Plerou-Stanley 2003), Levy (2003).

- Stochastic processes in which the rate of return on wealth accumulation is interdependent across different groups of individuals (Generalized Lotka-Volterra models): Solomon (1999) and Malcai et. al. (2002), Das-Yargaladda (2003), Fujihara-Ohtsuki-Yamamoto (2004), Souma-Fujiwara-Aoyama (2001).

- More general power laws and Pareto-Levy distributions: Mandelbrot (1960), Reed-Jorgensen (2003).

Literature: From dynamic to dynamic economic models

- The characteristic feature of the previous literature is that the stochastic processes which generate power laws are essentially exogenous.

- The same can be said for the large recent literature on this topic in Econophysics.

Wealth dynamics

$$w_{t+1} = (1+r)w_t + y_{t+1}$$

w_t is wealth at t

$1 + r$ is capita income - risky if stochastic

y_{t+1} is earnings minus consumption

Explanatory factors

What does it take to fit the distribution of wealth (that is, to obtain Pareto tails) in a standard macro model (that is, micro-founded):

- Factor 1: Skewed/persistent distribution of earnings - Kindermann and Krueger (2014).
- Factor 2: Stochastic length of life/dynasty - Diaz Gimenez, Quadrini, and Rios Rull (1997); Benhabib and Bisin (2006).
- Factor 3: Differential saving rates across wealth levels - Piketty (2014); Non-homogeneous bequests - Cagetti and Denardi (2006).
- Factor 4: Capital income risk - Benhabib, Bisin, Zhu (2012); Entrepreneurship - Quadrini (2000); Stochastic discount - Krusell and Smith (1988).

Explanatory factors - cont.ed

We shall argue that

- Factor 1 - earnings - is empirically insufficient by itself.
- Factor 2 - length of life - amounts to demographic absurdity.
- Factor 3 - saving rates across wealth levels is empirically insufficient by itself (and it leads to empirically untenable non-stationarities when interpreted a' la Piketty) .
- Factor 4 - capital income - is necessary and does well especially when combined with 1 and 3.

Capital income risk - what is it?

Two components of capital income are particularly subject to idiosyncratic risk: ownership of principal residence and private business equity, which account for, respectively, 28.2% and 27% of household wealth in the United States according to the 2001 Survey of Consumer Finances (SCF).

- Case and Shiller (1989) documented a 15% standard deviation of yearly capital gains or losses on owner-occupied housing; Flavin and Yamashita (2002) find a14% standard deviation of the return on housing, at the level of individual houses, from the 1968-92 waves of the Panel Study of Income Dynamics.

- In the 1989 SCF studied by Moskowitz and Vissing-Jorgensen (2002), both the capital gains and earnings on private equity exhibit very substantial variation, as does excess returns to private over public equity investment, even conditional on survival (private equity is highly concentrated: 75% owned by households for which it constitutes at least 50% of their total net worth).

To be explained as well: Social mobility

- Most studies of the wealth distribution center on the tail - hence on measures of inequality in the cross sectional distribution.

- But an advantage of working with formal macro models is that - once we allow for an explicit demographic structure - we obtain implications for social mobility.

Output data

- Cross-sectional wealth distribution: shares in bottom 20%, 20-40%, 40-60%, 60-80%, 80-90%, 90-95%, 95-99%, and top 1% of net worth holdings in the 2007 SCF.

- Wealth transition across generations: six-year transition matrix (1983-1989) in Kennickell and Starr-McCluer (1997) with the SCF (states are bottom 25%, 25-49%, 50-74%, 75-89%, 90-94%, top 2-5%, and top 1%; then raised to the power of 5.

Social mobility

Wealth Transition Matrix

$$T_{30} = \begin{bmatrix} \mathbf{0.341} & 0.286 & 0.211 & 0.107 & 0.032 & 0.020 & 0.003 \\ 0.285 & \mathbf{0.269} & 0.236 & 0.132 & 0.042 & 0.029 & 0.005 \\ 0.212 & 0.239 & \mathbf{0.271} & 0.169 & 0.056 & 0.042 & 0.009 \\ 0.176 & 0.221 & 0.285 & \mathbf{0.187} & 0.065 & 0.064 & 0.013 \\ 0.156 & 0.207 & 0.284 & 0.192 & \mathbf{0.072} & 0.068 & 0.023 \\ 0.123 & 0.180 & 0.273 & 0.193 & 0.082 & \mathbf{0.098} & 0.051 \\ 0.084 & 0.142 & 0.237 & 0.180 & 0.092 & 0.149 & \mathbf{0.118} \end{bmatrix}$$

Estimates

Table: Parameter estimates

(1) Preferences	Markov Chain				
	σ	μ	A	β	T
	[2]	1.4563	0.3591	[0.97]	[30]
(2) Rate of return					
r grid (six-year)	0.0118	0.1060	0.1866	0.3775	
prob. grid	0.2848	0.2540	0.2361	0.2250	
Stationary distr.	0.2846	0.2537	0.2365	0.2253	

Notes: *r* is real, post-tax, detrended for growth. Annual mean is 2.5%, standard deviation 31.2%. Consistent with earlier estimates by Campbell and Vissing-Jørgensen.

Cross-sectional distribution of wealth

Table: Wealth quintiles

Moments									
Share of wealth	0-20	20-40	40-60	60-80	80-90	90-95	95-99	99-100	Gini
Data									
SCF 2007	-0.002	0.001	0.045	0.112	0.120	0.111	0.267	0.336	0.816
Simulation	0.011	0.039	0.083	0.132	0.115	0.121	0.166	0.333	0.799

Savings rates

Data

Figure: Synthetic saving rates by wealth group - Data

Saving rates by wealth class (decennial averages)
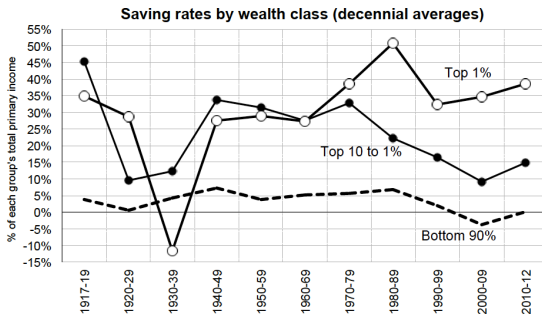
Synthetic saving rates: $s_t^p = \dfrac{W_{t+1}^p - W_t^p}{Y_t^p}$, p-th fractile

Earnings are not enough; Kindermann and Krueger (2014)

Estimate earning process and its transition to match the moments of the wealth distribution:

Table 7: Wealth Distribution in Benchmark Economy

	Share of total sample (in %)								
	Quintiles					Top (%)			
	1st	2nd	3rd	4th	5th	90-95	95-99	99-100	Gini
Model	0.0	0.8	4.1	11.6	83.6	14.6	23.3	31.8	0.810
US Data	-0.2	1.1	4.5	11.2	83.4	11.1	26.7	33.6	0.816

Great fit!

Earnings are not enough; Kindermann and Krueger (2014) - cont.ed

But earning process is way way off, empirically:

>> Seven states - first five are roughly from data, top two are estimated to fit wealth distribution
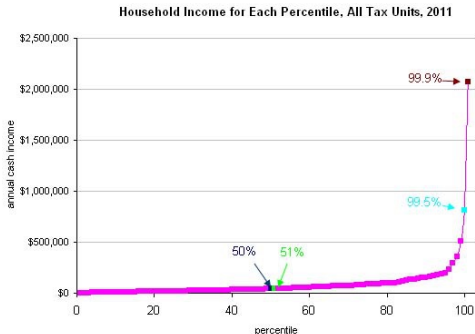
Earnings categories, median= 1	0.1159	0.3405	1.0000	2.9369	8.6255	15.8180	1284.3139

>> Top state has ratio to the median = 1284 (or at least $400 - 500$ depending on interpretation); and

>> At the stationary distribution, the top state has 0.25% of population.

Earnings are not enough; Kindermann and Krueger (2014) - cont.ed

Household Income for Each Percentile, All Tax Units, 2011

On average top .1% in U.S. makes about 2 mil; and the median earnings is about 40K; that is, top .1% has ratio to the median about 50 and top .25% even smaller.

Conclusion I: Results

Capital income risk and differential savings are fundamental factors in explaining wealth distribution and social mobility (in the U.S.)

Earnings by themselves are not enough

Capital income risk estimates are roughly consistent with observations regarding return on real estate and private business equity

Estimate of inter-generational correlation on returns on wealth is about zero

To do:

more on the mechanisms associated to different factors,

estimate without requiring stationarity

Conclusion II: The re-birth of socialism