Income Distribution and Policy
Part 2

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Contents

Inequality Over Time and Across Countries

Questions:

1. Why does wage inequality differ across countries?
2. Why has it been rising over time?

On the rise over time, there is a large **reduced form literature**

- Skill-biased technical change explains the rising college premium (Katz and Murphy, 1992).
- Taxation could be important for the rising incomes at the top (Piketty and Saez, 2003, 2007)

There is little quantitative theoretical work (an opportunity).

There is not even an accepted model to account for the earnings distribution at a point in time.

Inequality Over Time: Guvenen and Kuruscu (2010)

Goal: A structural model that accounts for changes in wage distribution since the 1970s.
Key facts:

1. Rising overall wage inequality, starting in 1970s
2. Rising college premium, starting in 1980s

The idea:

- SBTC accelerates in 1970s
- Skilled wage growth rises
- Skilled workers invest more in human capital
- Initially skilled wages fall, then they rise
- Within group wage inequality then rises as well

Model

Demographics:

- Overlapping generations
- lifespan S

Preferences:

$$\sum_{s=1}^{S} \beta^{s-1} u\left(c_s, 1-n_s\right) \tag{1}$$

Endowments:

- A^j: human capital productivity
- $h_0 = 0$: human capital at age 0
- l: raw labor
- 1 unit of time in each period that can be split between work, leisure, studying

Technologies

Human capital is produced from time only:

$$h_{t+1} = h_t + A([\theta_{L,t} l + \theta_{H,t} h_t] i_t)^{\alpha} \tag{2}$$

Output is produced from skilled and unskilled labor:

$$Y_t = Z_t \left([\theta_{L,t} L_t]^{\rho} + [\theta_{H,t} H_t]^{\rho} \right)^{1/\rho} \tag{3}$$

L, H: total efficiency units of labor provided by each skill type.
Note: θ's are the same in both technologies (why?)
We set $\rho = 1$ (perfect substitutes), so that $Z\theta_L$ is the unskilled wage.
Skill weights drift up (H) or down (L) by κ in each period (SBTC)

Individual Problem

Maximize lifetime earnings:

$$V(h) = \max_{i} \left[Z\left(\theta_L l + \theta_H h\right) \right] (1 - i) + (1 + r)^{-1} V(h') \tag{4}$$

subject to

$$h' = h + A\left[\left(\theta_L l + \theta_H h\right) i\right]^{\alpha} \tag{5}$$

with terminal value $V_{S+1} = 0$

Thought Experiment

Start in steady state

Then skill weights drift for T periods

After that, converge to new steady state

The period of rising skill weights starts in 1970 and ends in 1995 (data picking)

Compare model implication with data on wage distribution, skill premium, ...

Calibration

A lot of standard choices.

Important choices:

$\alpha = 0.8$

- curvature of h technology
- key for amplification

Endowment distribution

- $h_0 = 0$
- A uniform
- l uniform

The model has only 4 calibrated params:

- mean ability; var ability;
- var labor endowment;
- rate of SBTC 1970-95

Hidden parameters:

- curvature of hc production function;
- hc depreciation (set to 0),
- uniform distribution of abilities
- endowment correlations
- constant h_0

Calibration Targets

1. Avg college wage premium over 1970-95;
2. avg cross-sectional variance of wages;
3. mean wage growth over life-cycle
4. var(log wage 1995)

These 3 moments are supposed to identify the joint distribution of (h_0, l, A) (!)

What About Shocks?

The model is deterministic - there are no wage shocks.

The solution:

- simply scale down the variance of log wages by a constant
- the constant is the cross-sectional variance of shocks implied by estimated AR(1) processes

As Huggett et al. (2011) point out: this is wrong.

Even though the variance should vary by age, GK simply remove a constant.

- This means: one cannot compare the model with wage distribution stats that condition on age.

Results

The model matches (roughly) the time series of wage inequality

- of course it matches 1995 and the average by construction

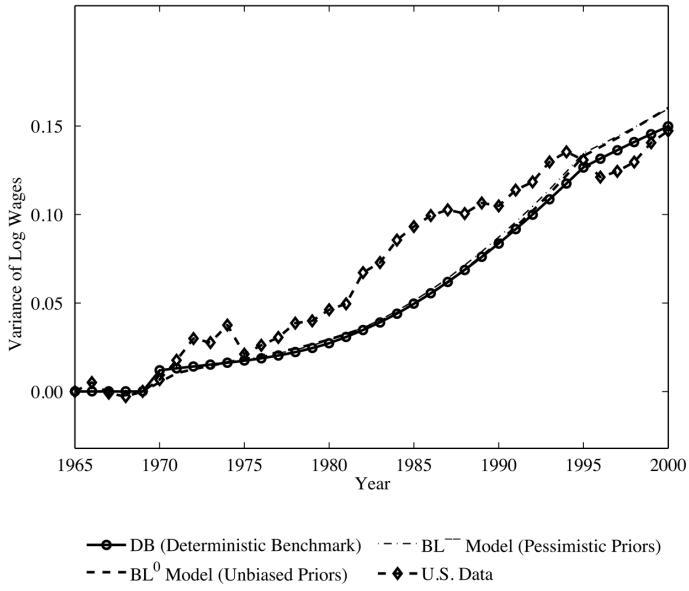

Fig. 3. The evolution of overall wage inequality: model versus U.S. data, 1965–2000

Results: College Premium

The model matches that the college premium initially falls and then rises

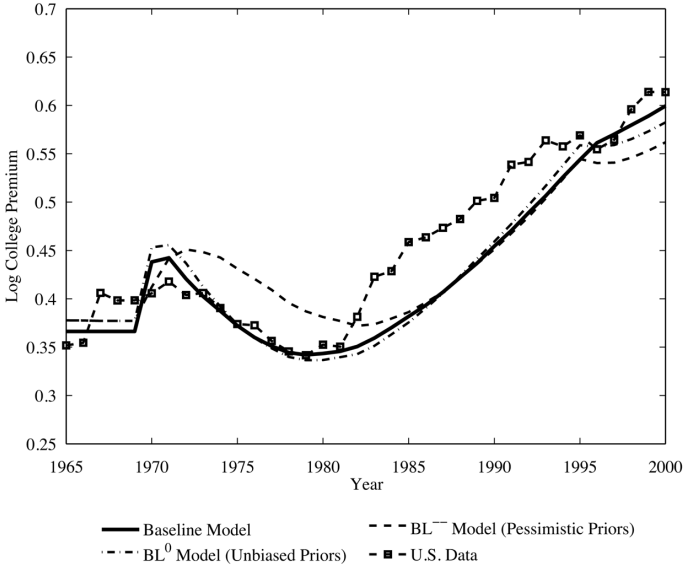

Fig. 4. The evolution of the college premium: model versus U.S. data, 1965–2000

Caveat:

There is no schooling in the data.

Solution: those who hit the corner $i = 1$ long enough are counted as college grads.

Results: College Premium By Age

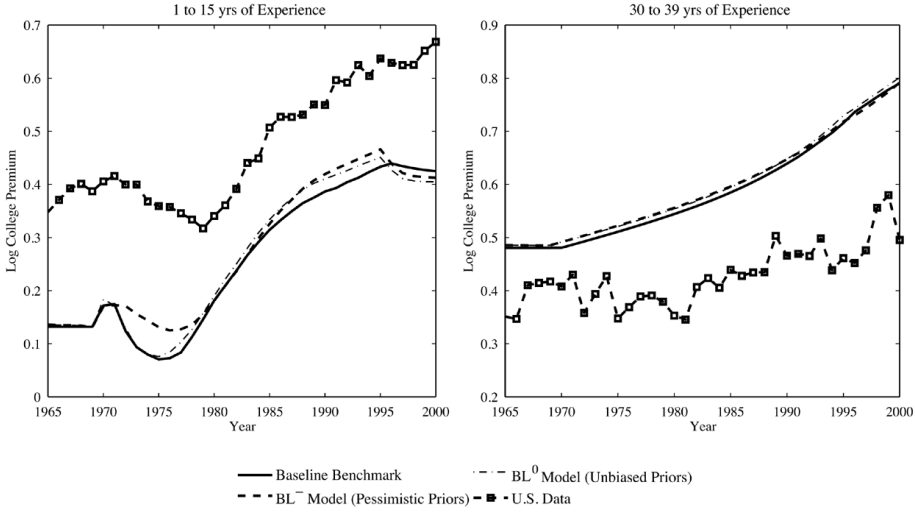

Fig. 7. The college premium by experience level: model versus U.S. data

The model matches that the college premium evolves differently for young / old workers.

Caveat:

The level is all wrong

The model does not match how wage inequality changes with age (even though the authors claim success).

Results: Within Group Inequality

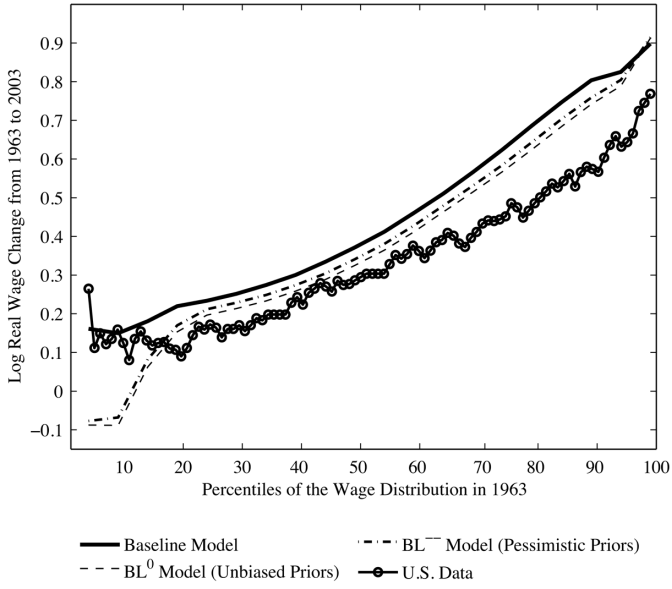

Fig. 8. Log real wage changes by percentile: model versus U.S. data, 1963–2003

Problems

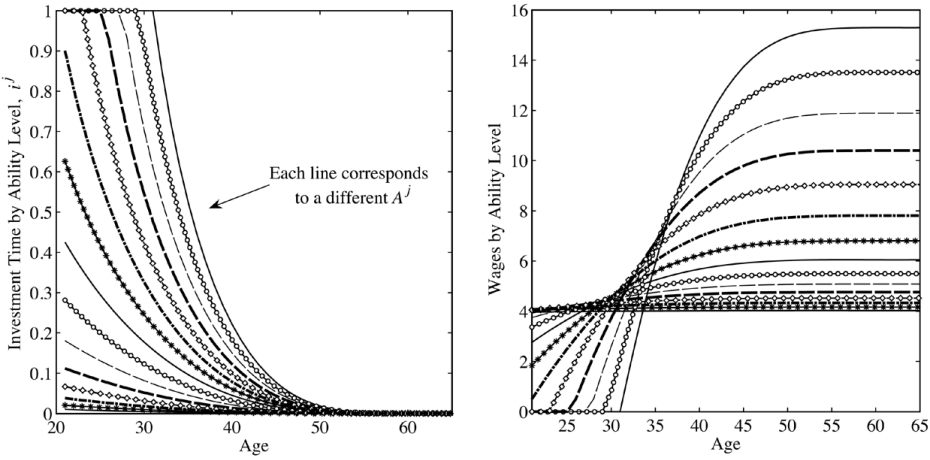

Fig. 1. Cross-sectional differences in investment time and wages over the life cycle

Cross-sectional heterogeneity in h investment is enormous (because of the near linear techology)

Problems

Getting big changes in wage distribution requires enormous changes in h investment

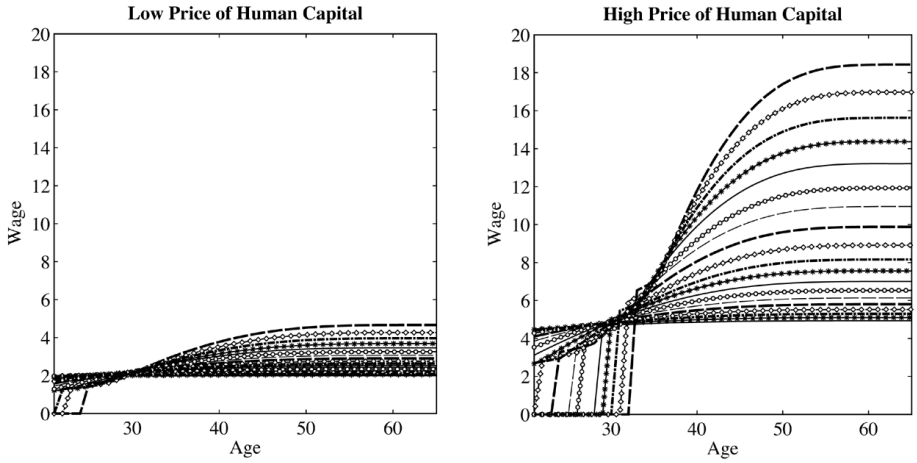

Fig. 12. Large rise in cross-sectional wage inequality: small rise in lifetime wage inequality

Thoughts

The paper tries to do too much with one shock (SBTC).

- The authors have to pick the right time period to make this work.

There is also a lot of **data picking** (in part b/c the model cannot be compared with most data moments b/c it has no shocks)

- The notion of schooling is odd

More data could be used for identification of key parameters

- endowment distribution
- curvature of Ben-Porath technology

This is an opportunity to do better:

Needed: a quantitative theory of the wage distribution over time.

Taxation: Guvenen et al. (2013)

The claim: Low progressivity is responsible for

- large pre-tax earnings inequality
- the rise in earnings inequality over time

A simple idea:

- to be rich, you must invest in human capital
- with progressive taxes, that investment is less profitable
- in addition: the rich have less of an incentive to work hard

New Fact: Progressivity and Wage Inequality

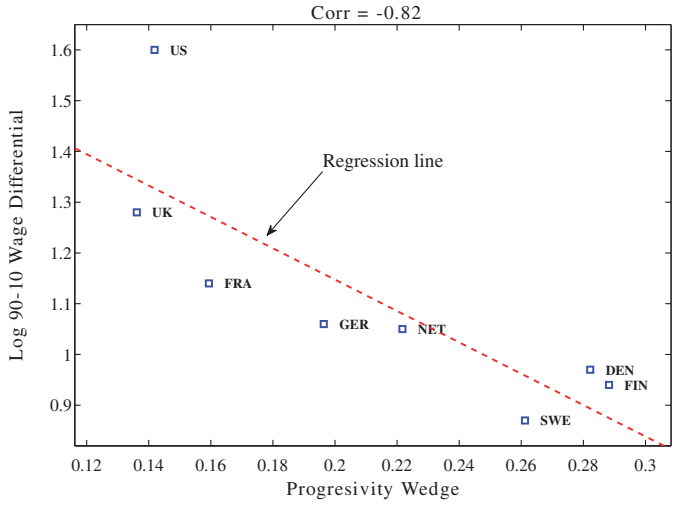

FIGURE 3
Progressivity wedge (PW(0.5, 2.5)) and L90-10 Inequality in 2003

Wage data: OECD labor force surveys (FT-FY)

New Fact: Progressivity and Change in Wage Inequality

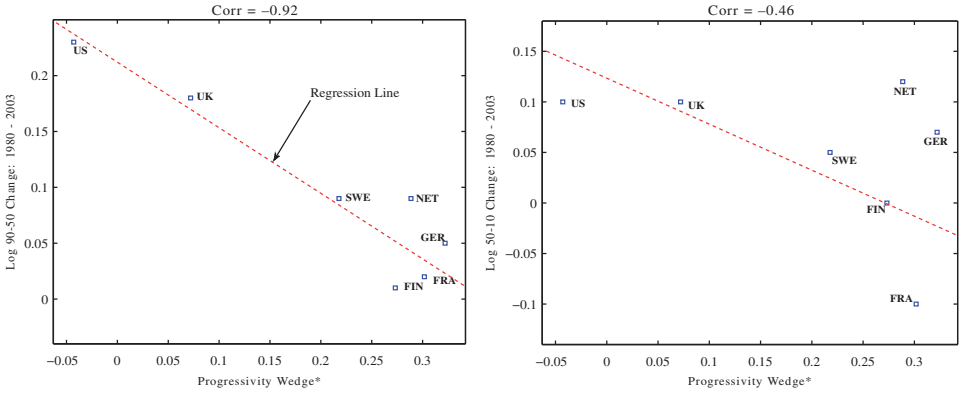

FIGURE 4

Progressivity wedge* (PW*(0.5, 2.5)) and change in L90-50 (Left) and L50-10 (Right): 1980 to 2003

Model

Demographics:

- Overlapping generations of constant size
- Each person lives for S periods

Preferences:

$$\sum_{s=1}^{S} \beta^{s-1} u\left(c_s, 1-n_s\right) \tag{6}$$

Endowments:

- A^j: human capital productivity
- h_0: human capital at age 0
- 1 unit of time in each period that can be split between work, leisure, studying

Technologies:
Human capital is produced from time only:

$$h_{s+1} = h_s + A^j \left(h_s i_s n_s\right)^{\alpha} \tag{7}$$

This is partial equlibrium (other technologies not specified).

Individual's Problem

Max lifetime utility subject to

1. budget constraint

$$c_s + a_{s+1} = (1 - \bar{\tau}(y_s))\, y_s + (1 + r)\, a_s \tag{8}$$

   with

$$y_s = P_H h_s (1 - i_s)\, n_s \epsilon \tag{9}$$

2. human capital law of motion
3. $i \in [0, \chi] \cup 1$: either schooling or part-time job training

Choices are consumption, leisure, study time
(and implied: saving, hours worked, assets)
ϵ is a Markov shock.

What Do Taxes Do?

The household problem has a closed form solution (given work hours):

$$\left(1-\tau\left(y_s\right)\right) C_j'\left(Q_s^j\right)=\sum_{t=1}^{S-t}\left(1+r\right)^{-t}\left(1-\tau\left(y_{s+t}\right)\right) n_{s+t} \tag{10}$$

where $C_j'\left(Q_s^j\right)=P_H\left(Q_s^j/A^j\right)^{1/\alpha}$ and $Q_s^j=A^j\left(h_s i_s n_s\right)^{\alpha}$.
The simple idea:

- The opportunity cost of investing in h is foregone earnings (subject to today's marginal tax)
- The gain is the present value of future earnings (subject to future taxes)
- Progressivity reduces investment (in the same wage as declining wages would)

The most able workers are affected the most (in some vague sense).

Quantitative Model

Add a simple pension system

Balanced government budget

Full consumption insurance

- Each type j can fully insure consumption risk among its members.
- For each member of type j, consumption is the same and constant over time (with $\beta(1+r)=1$).

Calibration

Tax scheduled are pieced together from OECD data

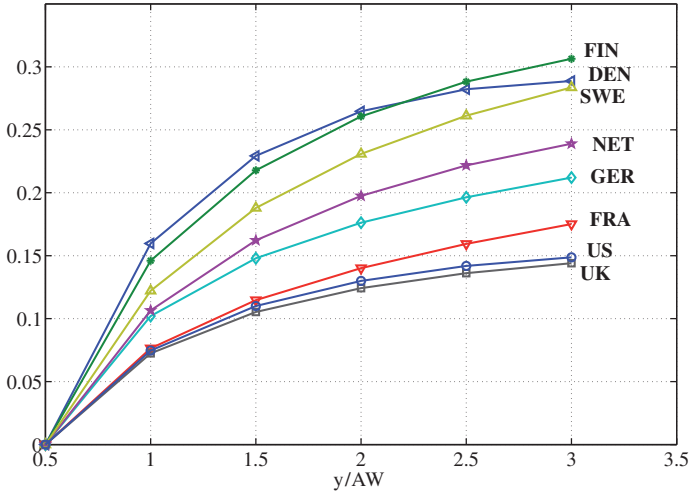

FIGURE 2

Progressivity wedges at different income levels: $1-\frac{1-\tau(k\times 0.5)}{1-\tau(0.5)}$ for $k=2,3,..,6$

Other parameters are calibrated to US data.

Calibration

Key parameter: $\alpha = 0.8$ (nearly linear h technology).
Endowment distribution:

- invented
- A and h are uniform and perfectly correlated

Shocks ϵ: 2 value Markov chain

Quantitative Experiment

Fix all parameters at US levels.

Compute inequality in the US's steady state with Norway's tax schedule

Main Result

The model accounts for about half the variation in wage inequality across countries

	L90-10				
	Data		Model		Fraction explained
	Level (a)	Δ from US (b)	Level (c)	Δ from US (d)	(d)/(b) (e)
Denmark	0.97	0.63	1.22	0.38	0.60
Finland	0.94	0.66	1.27	0.33	0.49
France	1.14	0.46	1.44	0.16	0.35
Germany	1.06	0.54	1.29	0.30	0.56
The Netherlands	1.05	0.55	1.36	0.24	0.43
Sweden	0.87	0.73	1.28	0.31	0.43
CEU	1.00	0.59	1.31	0.29	**0.48**
U.K.	1.28	0.32	1.56	0.03	0.10
U.S.	1.60	0.00	1.60	0.00	–

Differences are mainly due to progressivity, not due to consumption tax or retirement benefits

Thoughts

Key issue: what part of earnings dispersion is

- "shocks" and "endowments" (not affected by taxes)
- h investment (affected by taxes)?

All of the fanning out of the earnings distribution is due to h

- that must be important

Key issues: how responsive is investment to taxes?

- governed by α
- where does $\alpha = 0.8$ come from?

Where is a demonstration that the model "fits" the data?

- There is some comparison against cross-country data at the end of the paper

Once again: not much data was hurt in the making of this paper.

- Could one do better?

Time Series Experiment

U.S. and Germany

1983 and 2003

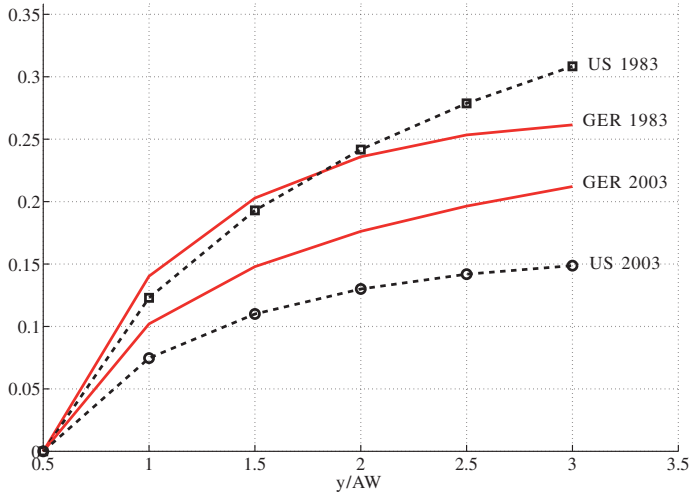

FIGURE 6

Progressivity wedge by income level: U.S. versus Germany, 1983 and 2003

Experiment: Using US parameters, change tax schedule from 1983 to 2003

- US: 90/10 ratio rises by 21 log points (32 in the data)
- Germany: little change

Interesting Fact

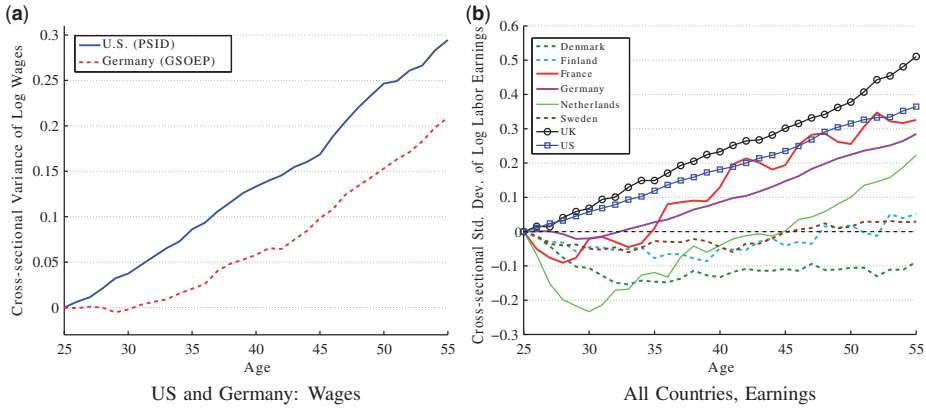

FIGURE 8
Life cycle profile of wage and earnings variance

Very different pattern of inequality over the life-cycle.

Could be a good start for a paper!

Thoughts

This part of the paper is pretty weak.

Possible project:

- Goal: quantitative theory of changing wage distribution in the US
- Ben-Porath model (e.g. Huggett et al., 2011)
- Add progessive taxes that change massively over time
- How to deal with the rising college premium?

Likely outcome: h must be far less sensitive to taxes than Guvenen-Kuruscu think with $\alpha = 0.8$)

- Otherwise earnings profiles would move around like crazy

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