

Lecture 1:

Income Inequality and Income Risk: *Old Myths vs. New Facts*

Fatih Guvenen
University of Minnesota

January 2024

New Facts from (New) Big Data

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- ▶ What is a “myth”? What I believed to be an empirical fact 10 years ago, but no longer do

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- ▶ What is a “fact”? What I believe to be an empirical fact today, based on new evidence.

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- ▶ What is a “myth”? What I believed to be an empirical fact 10 years ago, but no longer do
- ▶ What is a “fact”? What I believe to be an empirical fact today, based on new evidence.
- ▶ What changed? Availability of big data + More flexible econometric modeling

Two Challenges For Establishing Empirical Facts

- ▶ Until recently, surveys were the main source of data for a wide range of key economic statistics.

“It is not an exaggeration to say that large-scale probability surveys were the 20th-century answer to the need for wider, deeper, quicker, better, cheaper, more relevant, and less burdensome official statistics.”

Committee on National Statistics of the National Academy of Sciences

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- ▶ As researchers, we have learned an enormous amount from survey data over decades.
- ▶ 4,000+ papers written using PSID data alone!
- ▶ But survey data also has important limitations.

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1 Data limitations:

- Until recently, most available data sets were based on **surveys** of households/individuals.

<4> Strong empirical assumptions, often necessitated by (1)

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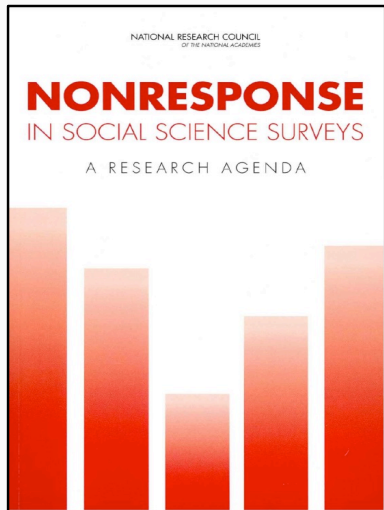
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 - ▶ small sample size
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 - ▶ non-random attrition
 - ▶ large and nonclassical measurement error
 - ▶ declining survey response rate and response quality

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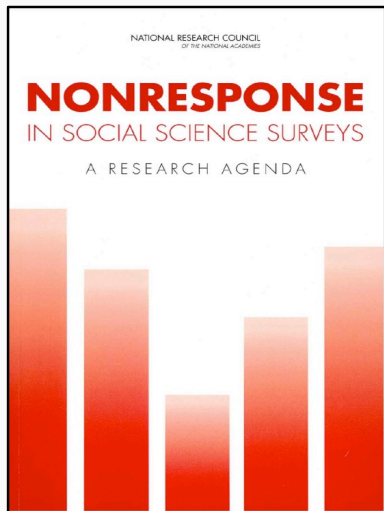
Steady Decline in Survey Response Rates



► Joint report by:

- National Research Council
- Committee on National Statistics
- Panel on a Research Agenda for the Future of Social Science Data Collection

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 - National Research Council
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 - Panel on a Research Agenda for the Future of Social Science Data Collection
- ▶ Documents steady decline in survey response rates in 30+ surveys.
- ▶ Also true in other developed countries

Quality of Response is Declining among Survey Respondents

Journal of Economic Perspectives—Volume 29, Number 4—Fall 2015—Pages 199–226

Household Surveys in Crisis[†]

Bruce D. Meyer, Wallace K. C. Mok, and
James X. Sullivan

- ▶ Compares survey responses to government records on receipts from government welfare programs (TANF, SNAP, etc.)
- ▶ Finds declining response quality: *“Our results show a sharp rise in the downward bias in household survey estimates of receipt rates and dollars received for most programs. In recent years, more than half of welfare dollars and nearly half of food stamp dollars have been missed in several major surveys.”*

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- ⇒ **myths** about empirical patterns

Old vs. New

	Conventional Approach	New Approach: Big Data
Data sources	Surveys	Administrative records
Sample size	(Tens of thousands)	(Tens of millions)
Measurement error	Large and pervasive	Small and sparse
Econometric modeling	Rigid, parametric	Flexible, non-parametric

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- ▶ *Q: What have we learned from big data about income risk and income inequality?*

BIG DATA

An Example Data Set: SSA Master Earnings File

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- ▶ Self-employment earnings from IRS tax forms (Schedule SE)

W-2 Form

22222		Void <input type="checkbox"/>	a Employee's social security number		For Official Use Only ▶ OMB No. 1545-0008					
b Employer identification number (EIN)					1 Wages, tips, other compensation	2 Federal income tax withheld				
c Employer's name, address, and ZIP code					3 Social security wages	4 Social security tax withheld				
					5 Medicare wages and tips	6 Medicare tax withheld				
					7 Social security tips	8 Allocated tips				
d Control number					9	10 Dependent care benefits				
e Employee's first name and initial		Last name		Suff.	11 Nonqualified plans	12a See instructions for box 12				
f Employee's address and ZIP code					13 Statutory employee <input type="checkbox"/>	Retirement plan <input type="checkbox"/>	Third-party sick pay <input type="checkbox"/>	12b		
					14 Other			12c		
								12d		
15 State	Employer's state ID number	16 State wages, tips, etc.	17 State income tax	18 Local wages, tips, etc.	19 Local income tax	20 Locality name				

Form **W-2** Wage and Tax Statement

2014

Department of the Treasury—Internal Revenue Service
For Privacy Act and Paperwork Reduction Act Notice, see the separate instructions.

Copy A For Social Security Administration — Send this entire page with Form W-3 to the Social Security Administration; photocopies are **not** acceptable.

Cat. No. 10134D

Do Not Cut, Fold, or Staple Forms on This Page

Other Data Sets

- ▶ US Census Bureau's [LEHD](#): 1982–today:
 - State-level data that can be aggregated to US level.
 - Quarterly earnings information. Can be merged to firm data.
 - Drawback: Handful of states going back to 1992. **More representative after 1998.**
 - Census project. Possible to join a project with access.

- ▶ Even richer administrative data sources available in 30+ countries now:
 - Austria, Australia, Argentina, Belgium, Brazil, Canada, Chile, Colombia, Costa Rica, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Japan, Mexico, Netherlands, Norway, Portugal, Spain, South Korea, Sweden, Switzerland, UK, USA, etc, etc.

GRID: The Global Repository of Income Dynamics

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- ▶ GRID is an open-access, cross-country database with 5 key features:
 - 1 **Harmonized** from ground up (one code run on all data)
 - 2 fine-grain **micro statistics**
 - 3 on **income inequality** & **income dynamics**
 - 4 based on **panel** data
 - 5 from **administrative records**
 - ▶ 10s or 100s of millions of observations per country!
 - ▶ Little to no measurement error or attrition
 - ▶ Info on both top and bottom end tails of distributions
- ▶ **First database with these features.**

Background: Data on Income Inequality

- ▶ Several harmonized cross-country databases (of statistics) on income inequality are available:
 - [World Inequality Database](#) (WID.world) spearheaded by the work of T. Atkinson, T. Piketty and E. Saez
 - [World Income Inequality Database](#) (WIID2) maintained at the United Nations University
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- ▶ Useful resources but all based on [cross-sectional surveys](#)—hence **less granularity** and **no dynamics**.

GRID: The Present

GRID 1.0: User friendly website live at www.grid-database.org

- ▶ **13 countries:** US, UK, CAN, FRA, ITA, SPA, GER, NOR, SWE, DEN, MEX, BRA, ARG
- ▶ **54 economists** in 13 country teams.
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- ▶ A Special Issue of *Quantitative Economics* with 13 papers written by country teams was published in November 2022.



SPECIAL ISSUE ON GLOBAL INCOME DYNAMICS

EDITORIAL	1319
FATH GUVENEN, LUIGI PISTAFERRI, AND GIOVANNI L. VIOLANTE Global trends in income inequality and income dynamics: New insights from GRID	1321
ANDRÉS BLANCO, BERNARDO DIAZ DE ASTARLOA, ANDRES DRENIK, CHRISTIAN MOSEER, AND DANILO R. TRUPKIN The evolution of the earnings distribution in a volatile economy: Evidence from Argentina	1361
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DANIELA PUGGIONI, MARIANA CALDERÓN, ALFONSO CEBREROS ZURITA, LEÓN FERNÁNDEZ BUJANDA, JOSÉ ANTONIO INGUANZO GONZÁLEZ, AND DAVID JAUME Inequality, income dynamics, and worker transitions: The case of Mexico	1669
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BENJAMIN FRIEDRICH, LISA LAUN, AND COSTAS MEGHIR Earnings dynamics of immigrants and natives in Sweden 1985–2016	1803
BRIAN BELL, NICHOLAS BLOOM, AND JACK BLUNDELL Income dynamics in the United Kingdom and the impact of the Covid-19 recession	1849
KEVIN L. MCKINNEY, JOHN M. AROWD, AND HUBERT P. JANICKI U.S. long-term earnings outcomes by sex, race, ethnicity, and place of birth	1879

GRID: The (Near) Future

GRID 2.0: Currently expanding with 20 more countries:

- ▶ **Europe:** Austria, Belgium, Finland, Greece, Hungary, Iceland, Ireland, Israel, Netherlands, Poland, Portugal, Switzerland
- ▶ **Australasia:** Australia, Japan, New Zealand, Singapore, S. Korea, Taiwan
- ▶ **South America:** Chile, Colombia, Costa Rica, Ecuador
- ▶ Will have 35 or so countries in GRID by Summer 2024.

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 - 3 What is the **future 5-year income volatility** facing a **35-year-old Spanish man** who was in the **80th percentile** of the income distribution **in the past 5 years**?
 - 4 Is income inequality rising globally? (say, the P90-P10 measure)
 - 5 Has income instability increased in the United States over time? (say, 1-year std)
- **HW assignment:** Answer questions 1 to 5 using GRID data. Show the relevant plots and write up your findings as a report. Email it to me before next lecture.

Examples of New Facts from Big Data

Example 1: A JMP on the Chinese Growth Miracle

Reassessing China's Rural Reforms:

The View from Outer Space *

Joel Ferguson

Oliver Kim[†]

UC Berkeley

UC Berkeley

Job Market Paper

This Version: November 27, 2023

[\[Link to Latest Version\]](#)

Abstract

We study one of the central reforms in China's economic miracle, the Household Responsibility System (HRS), which decollectivized agriculture starting in 1978. The HRS is commonly seen as having significantly boosted agricultural productivity—but this conclusion rests on unreliable official data. We use historical satellite imagery to generate new measurements of grain yield, independent of official Chinese statistics. Using two separate empirical designs that exploit the staggered rollout of the HRS across provinces and counties, we find no causal evidence that areas that adopted the HRS sooner experienced faster grain yield growth. These results challenge our conventional understanding of decollectivization, land reform, and the origins of the Chinese miracle.

Example 2: A JMP on Entrepreneurship

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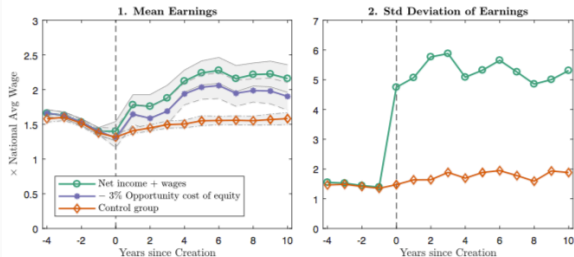
- ▶ Entrepreneurship is a very much studied topic with very little good data.
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- ▶ Sylvain Catherine (2018): *“Keeping Options Open: What Motivates Entrepreneurs?”*

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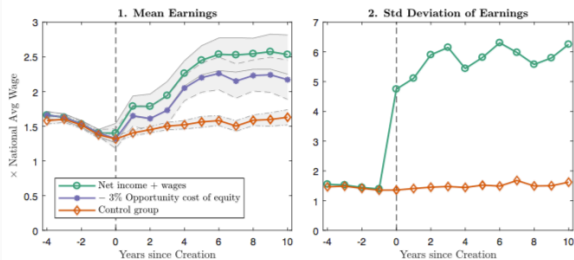
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- ▶ Sylvain Catherine (2018): *“Keeping Options Open: What Motivates Entrepreneurs?”*
- ▶ Data: Merges two French administrative sources.
 - DADS:
 - ▶ cover the 1976–2013. About 5% of French population.
 - ▶ data on wages, working period, hours, and occupation.
 - Corporate Tax files:
 - ▶ Entire universe of all French firms (!) from 1994 to 2013.

Some Results

A. Including Entrepreneurs Returning to Paid Employment

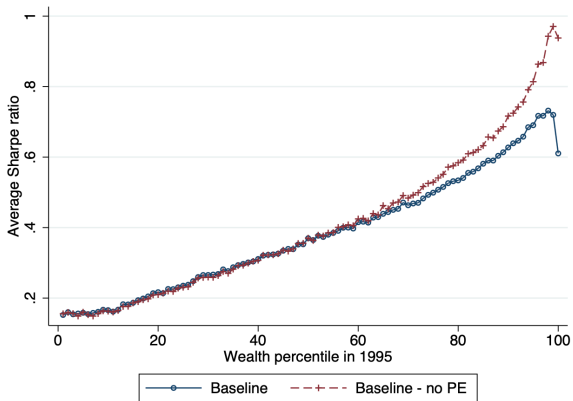


B. Conditional on Still Running a Business



II. How Much Heterogeneity in Rate of Returns?

Figure 8. The Sharpe ratio and the level of wealth

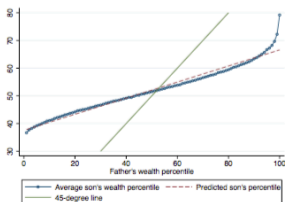


Source: Fagereng et al (2016).

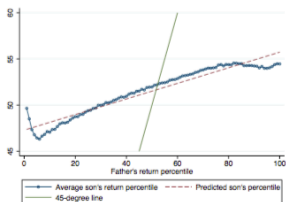
II. Intergenerational Correlation in Returns

Figure 12. Intergenerational rank correlations

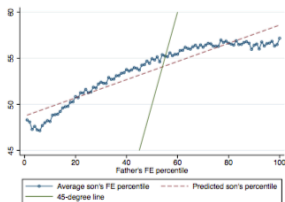
(a) Wealth



(b) Returns



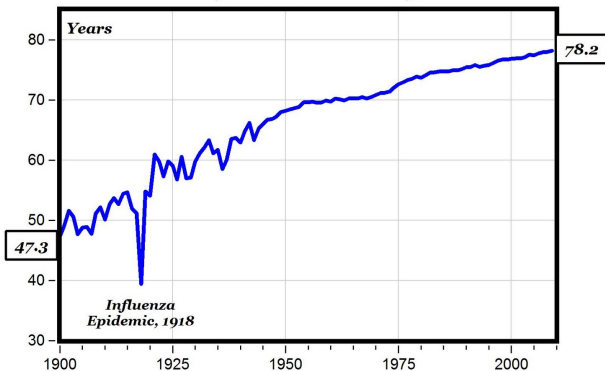
(c) Fixed Effects



Source: Fagereng et al (2016).

III. What's Happening to Life Expectancy?

U.S. Life Expectancy at Brith 1900 to 2009

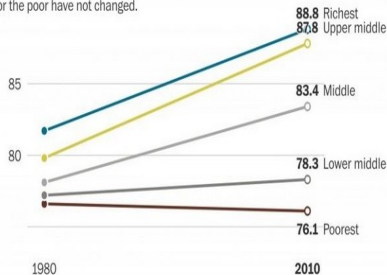


► **Average** life expectancy rose by about 8 years since 1970.

III. What's Happening to Life Expectancy?

Inequality in life expectancy widens for men

Wealthier men can expect to live longer than their parents did, while life expectancies for the poor have not changed.

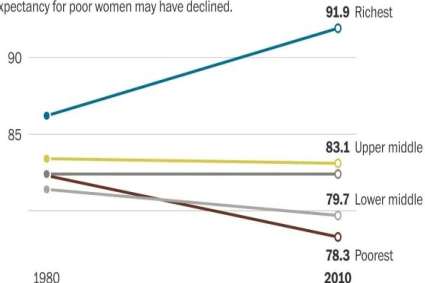


Life expectancy for 50-year-olds in a given year, by quintile of income over the previous 10 years

Source: National Academies of Science, Engineering and Medicine

Inequality in life expectancy widens for women

Wealthier women can expect to live longer than their parents did, while life expectancy for poor women may have declined.

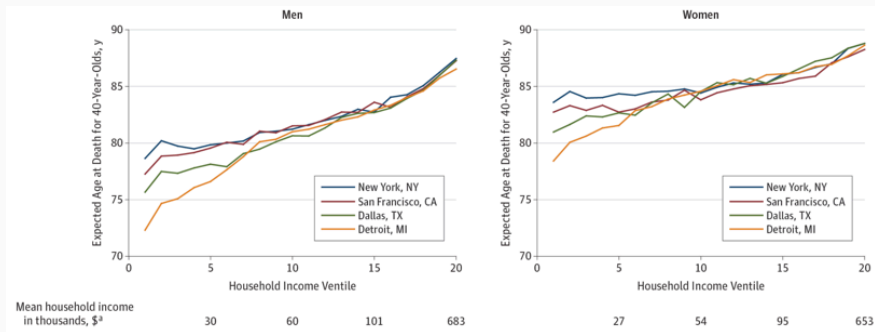


Life expectancy for 50-year-olds in a given year, by quintile of income over the previous 10 years

Source: National Academies of Science, Engineering and Medicine

- ▶ But there was substantial heterogeneity:
40% of men and 80% of women saw no gains in life expectancy!

III. What's Happening to Life Expectancy?



Source: Chetty et al (JAMA, 2016).

- ▶ Little association between where you live and life expectancy above median income.
- ▶ But much stronger variation at the low end.

Five Myths

Five Myths

I. Long-run trends:

II. Business cycle:

III. Life-cycle:

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Income Volatility

PART I:

Long-Run Trends in

Income Risk and Inequality

Myth #1:

The volatility of income shocks...

has increased significantly over the past 40 years.

Myth #1: Upward Trend in Income Risk

- ▶ Gottschalk and Moffitt (1994) is a key paper: reported **rising US income volatility from 1970 to 1988**.
- ▶ Followed by dozens of papers with broadly similar results:
 - Dynan et al. (2007): surveyed 30 papers, 27 find rising earnings volatility (2 finds flat, 1 declining vol)
 - These papers mostly use survey data (PSID, SIPP, CPS)

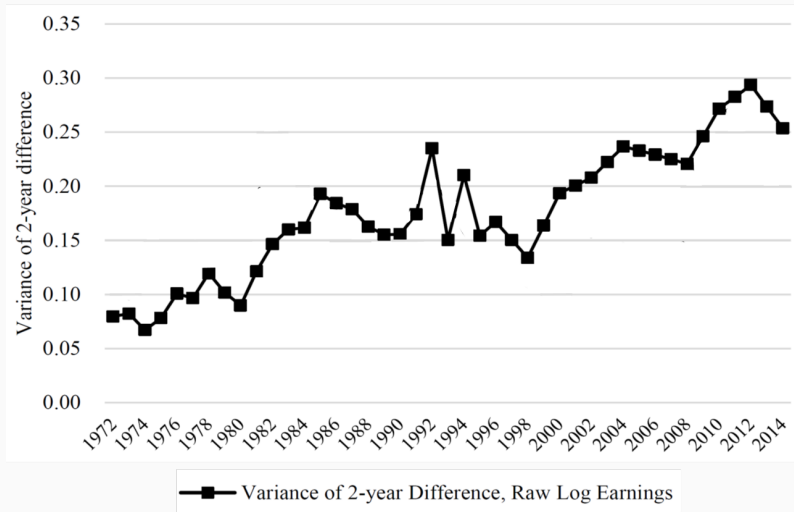
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- ▶ Opening quote from [Ljungqvist and Sargent \(2008, ECMA\)](#):

A growing body of evidence points to the fact that the world economy is more variable and less predictable today than it was 30 years ago... [There is] more variability and unpredictability in economic life

Heckman (2003)

Trend in Income Volatility in PSID



Source: Moffitt and Gottschalk (2012)

Fact #1: No Upward Trend in Volatility

- ▶ Administrative data: the **opposite conclusion** emerges robustly
- ▶ See, e.g., Congressional Budget Office (2007); Sabelhaus and Song (2010); Guvenen et al. (2014)

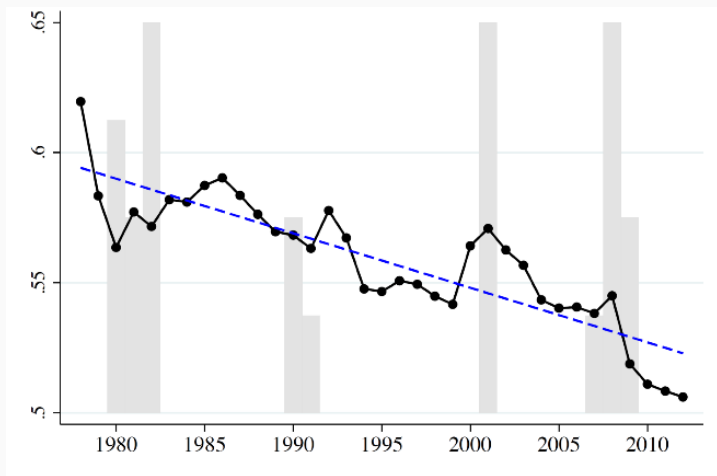
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- ▶ We study this in a new project: **“The Great Micro Moderation”**
 - **Bloom-Guvenen-Pistaferri-Sabelhaus-Salgado-Song-2017**

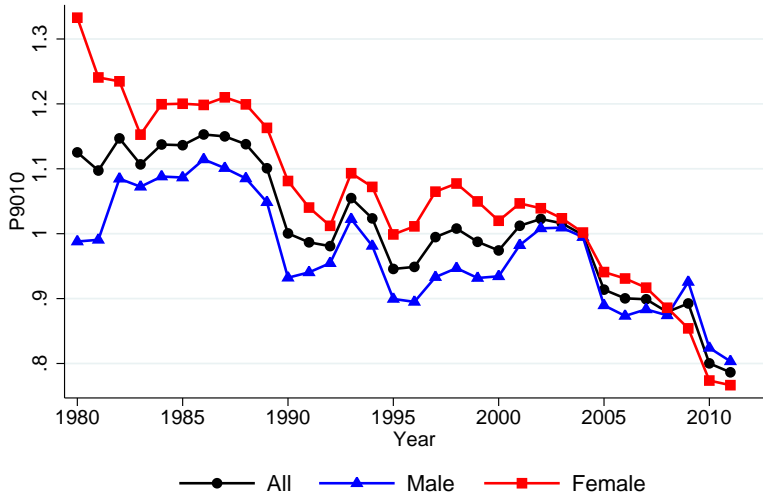
Fact #1: The Great “Micro” Moderation



Source: Guvenen, Ozkan, Song (JPE, 2014)

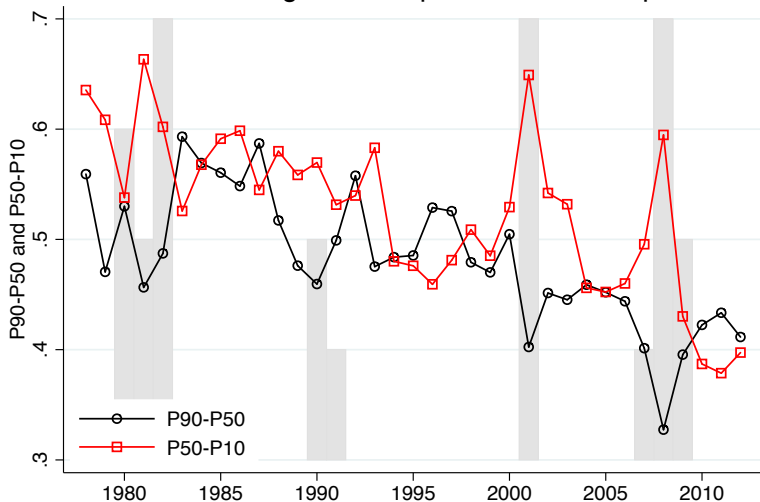
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Cross Sectional Dispersion by Sex (25 to 65 yrs)

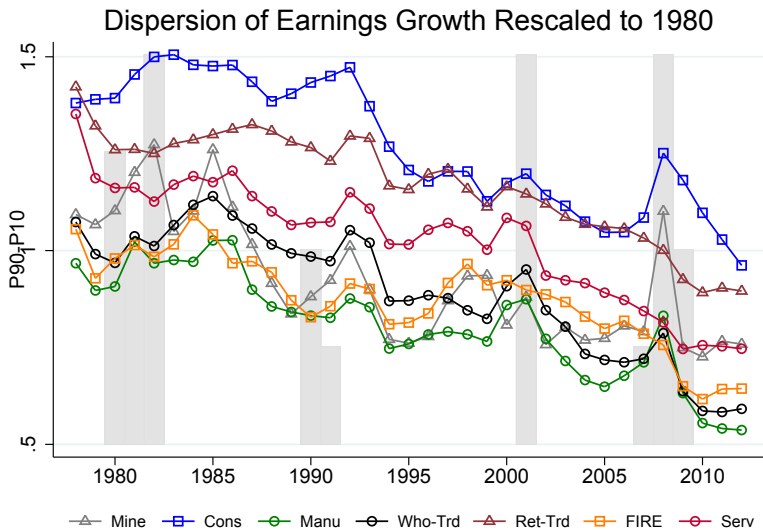


Which Tail is Shrinking? Both

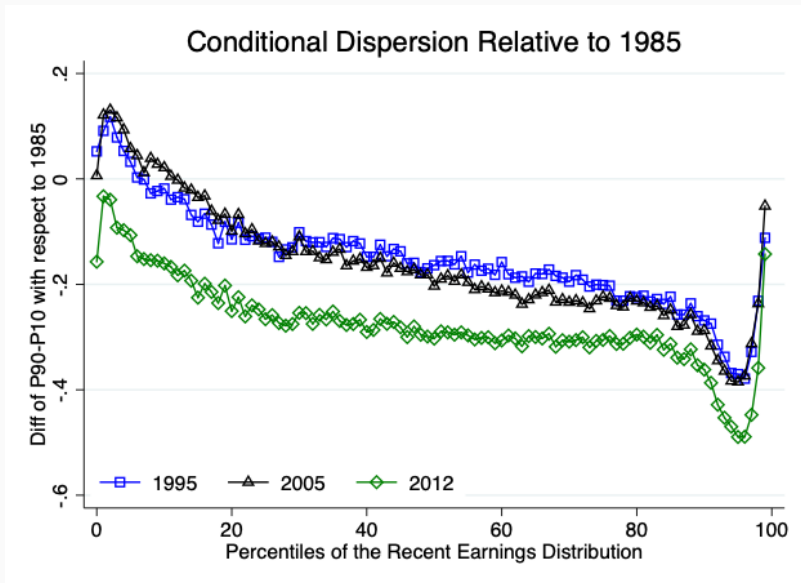
Left and Right Tail Dispersion -- All Sample



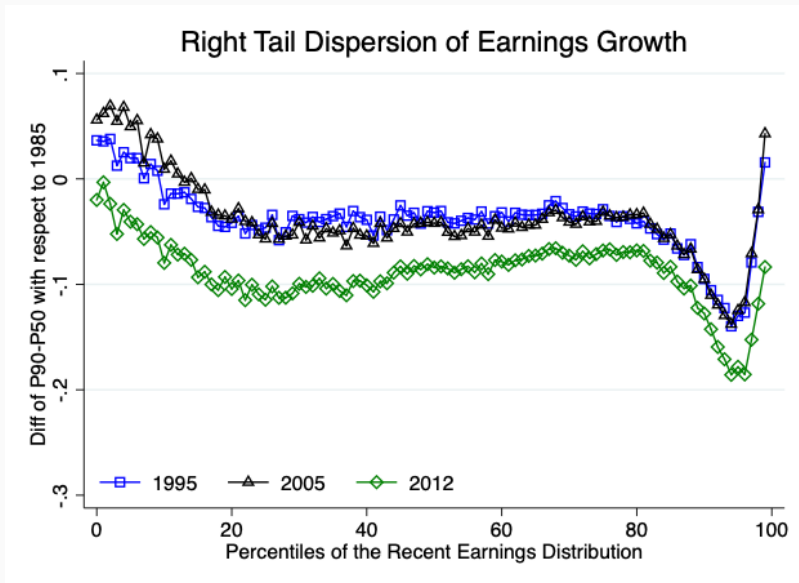
Holds in Every Major Industry



Holds For Every Income Group: Overall Volatility

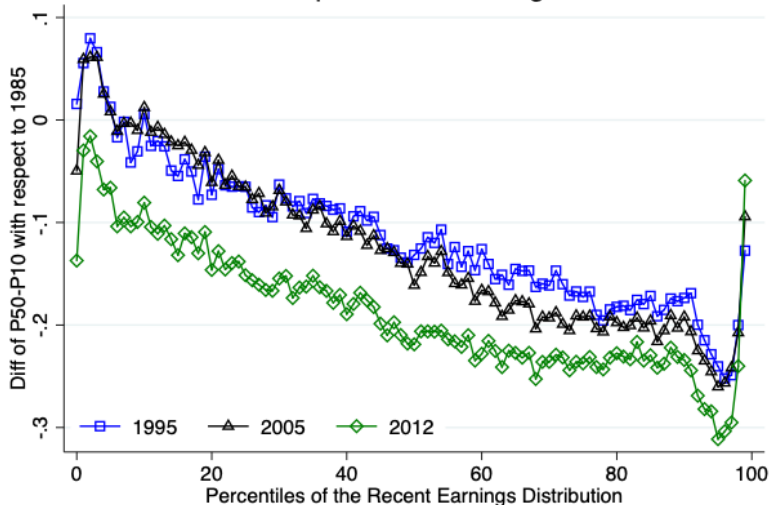


Upside Moves Became Smaller for Everyone

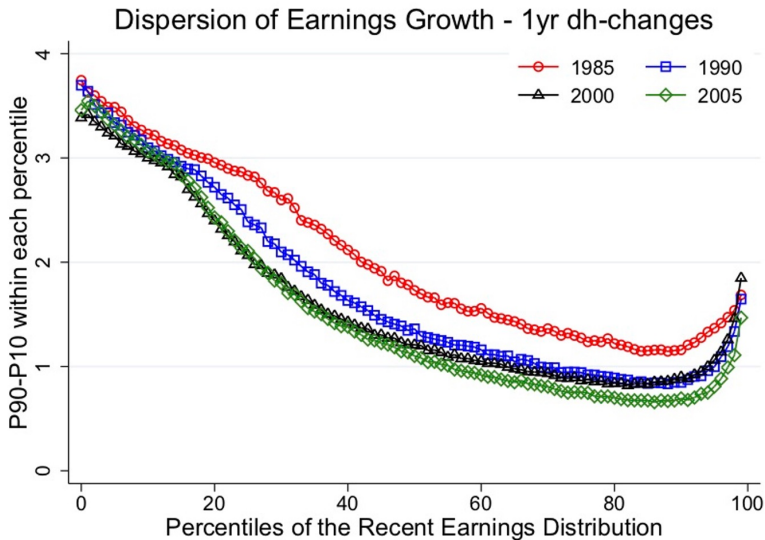


Downside Risk Fell for Everyone but More so at the Top

Left Tail Dispersion of Earnings Growth

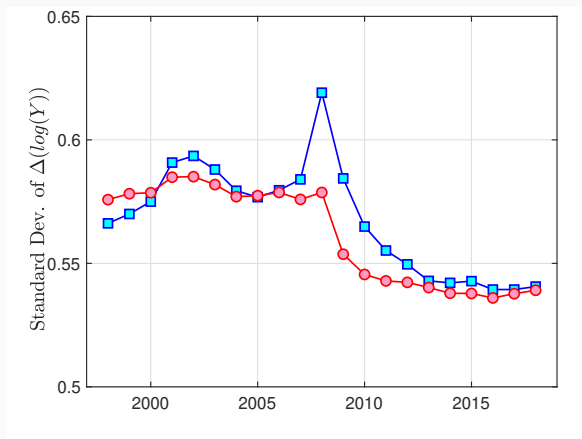


Accounting for Extensive Margin: Same Result



Complementary Evidence from LEHD

Figure 1: USA: McKinney, Abowd and Janicki (2022)



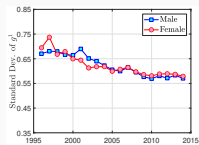
- ▶ SSA covers 1978-2013. LEHD covers a later period starting in 1998 but goes until 2018.

How About Volatility Trends in Other Countries?

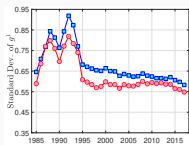
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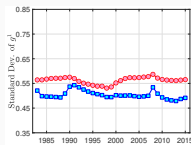
- ▶ We can look at GRID.
- ▶ All statistics are computed from **big data from administrative records** of each country and harmonized for comparability.
- ▶ Results below from Guvenen, Pistaferri, and Violante (2022)



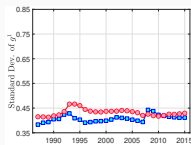
(a) ARG



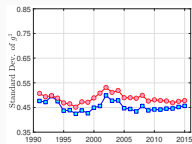
(b) BRA



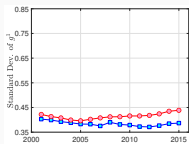
(c) CAN



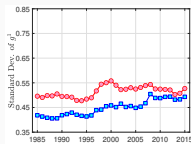
(d) DEN



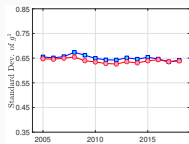
(e) FRA



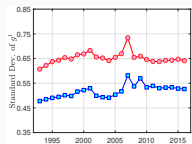
(f) GER



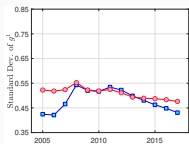
(g) ITA



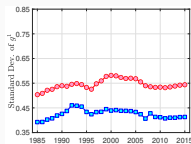
(h) MEX



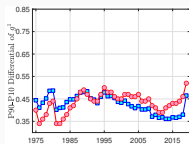
(i) NOR



(j) SPA



(k) SWE



(l) UK

Let's Pause for a Moment:

Why Do Surveys and Admin Data
Show Such Different Results?

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- ▶ More importantly: **sample attrition was systematic.**

Problems with Surveys

	Always in	Attritors	Diff.
Var(log(inc.) inc>0)	0.248	0.481	+94%
Annual labor income	\$21,345	\$17,277	-19%
Home ownership %	74.9	58.0	-22.5%
Education <12 yrs	31.5	50.8	+62%
Education = 12 yrs	32.8	27.3	-17.0%
Education > 16	19.9	10.4	-48%
Race: black %	6.6	11.5	+74%

Source: Fitzgerald, Gottschalk, and Moffitt (1998)

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- ▶ Now back to the facts vs. myths.

Q: How Can **Volatility Go ↓** and **Inequality Go ↑** ?

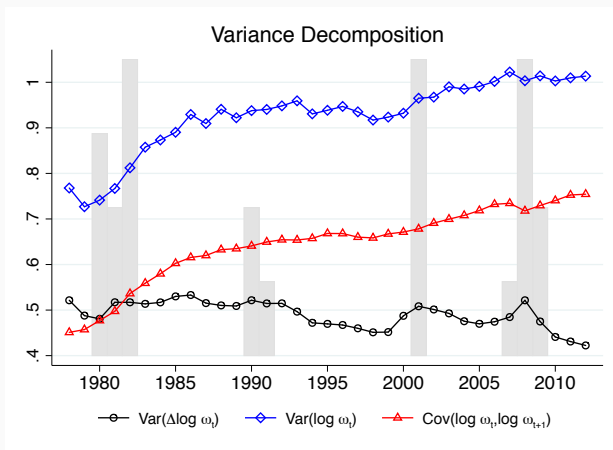
$$\underbrace{\text{var}(\Delta w_t^i)}_{\text{volatility}} \equiv \underbrace{\text{var}(w_t^i) + \text{var}(w_{t-1}^i)}_{\approx 2 \times \text{inequality}} - \underbrace{2 \times \text{cov}(w_t^i, w_{t-1}^i)}_{\text{persistence}}$$

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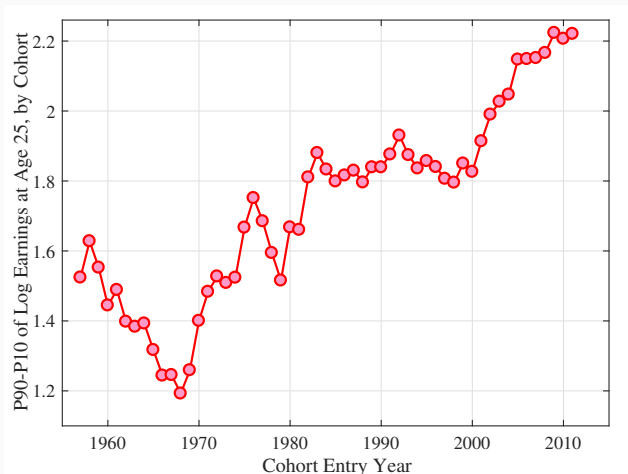
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► Guvenen-Kaplan-Song-Weidner (2017) find **strong evidence for (2)**.

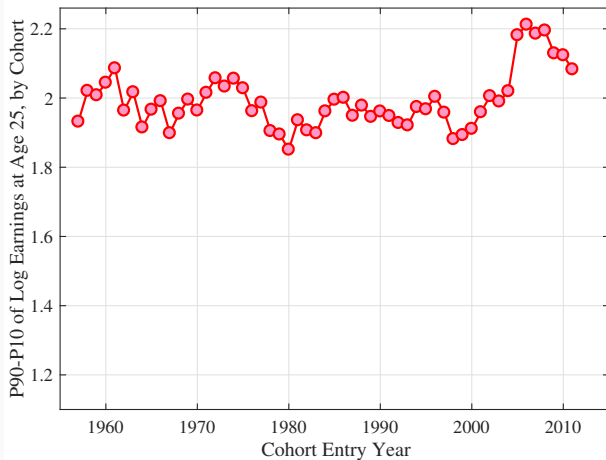
Income Inequality at Age 25, Men

Figure 2: P90-P10 Log Income Gap at 25, by Cohort



Income Inequality at Age 25, Women

Figure 3: P90-P10 Log Income Gap at 25, by Cohort



Income Inequality

Long-Run Trends in Income Risk and Inequality

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- Results from “**Firming Up Inequality**” with Song, Price, Bloom, von Wachter (2015)

Where Do the Wage Gains Go?

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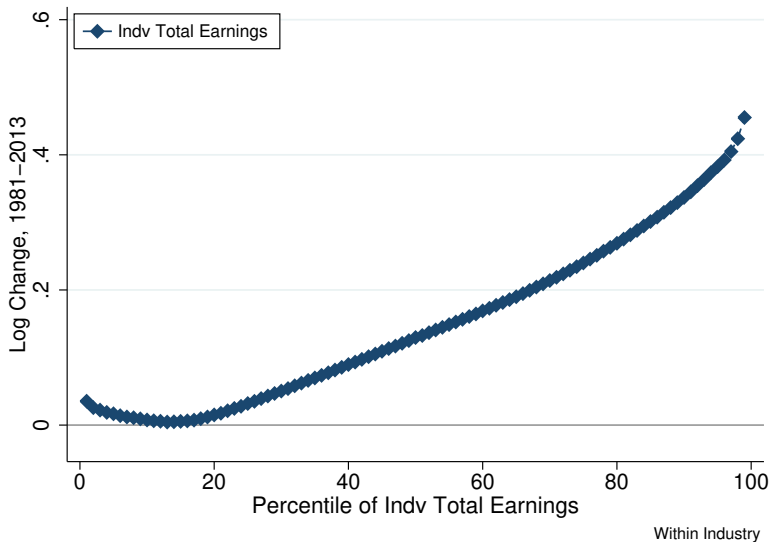
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- ▶ **Our findings:** This view misses the “big picture”.

Fact #2: Rise in Inequality is Fractal



1 Result 1: Inequality Rose Across the Entire Wage Distribution.

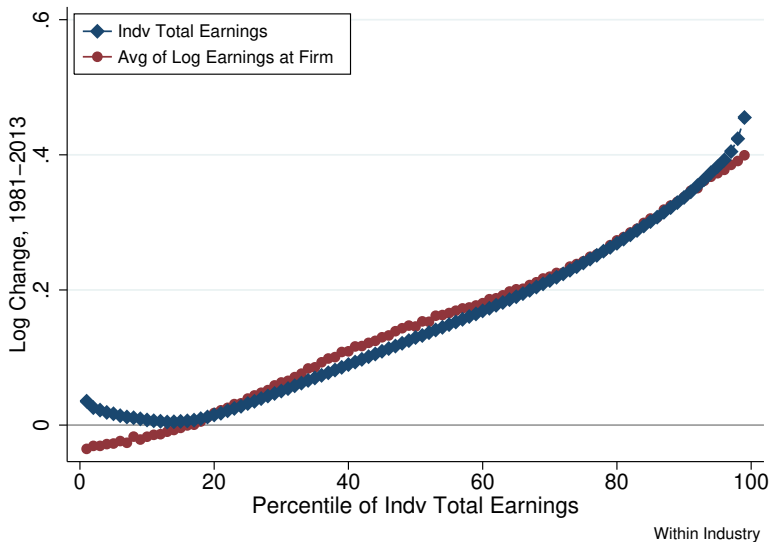
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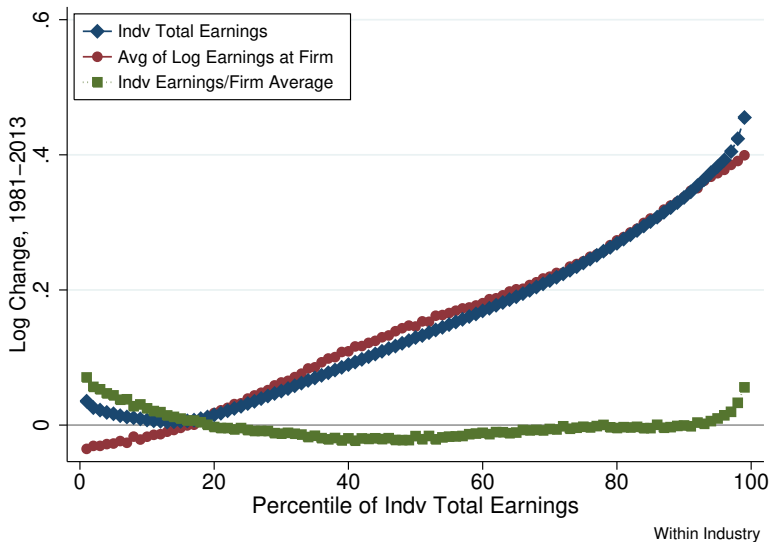
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2 Next question: What is the role of employer's in rising inequality?

Fact #2: What is the Role of Employers?



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Our findings, cont'd

- 1 **Result 1:** Inequality rose across the entire wage distribution.
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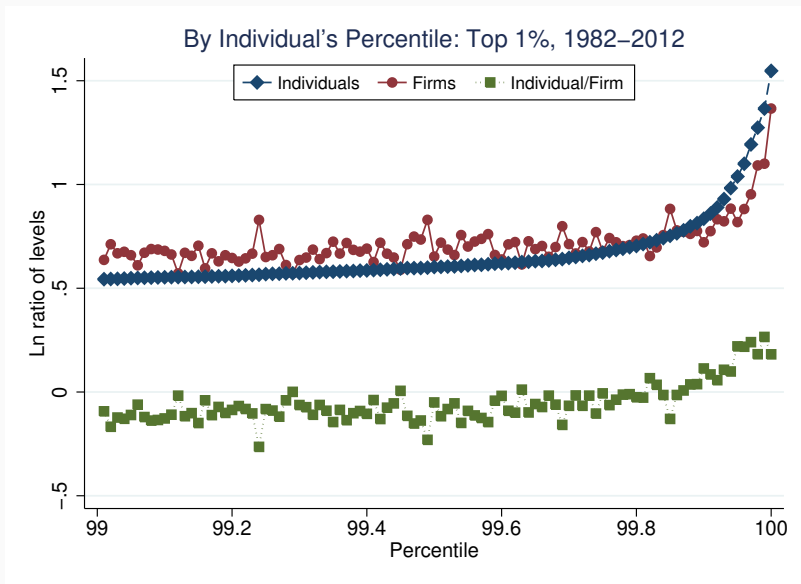
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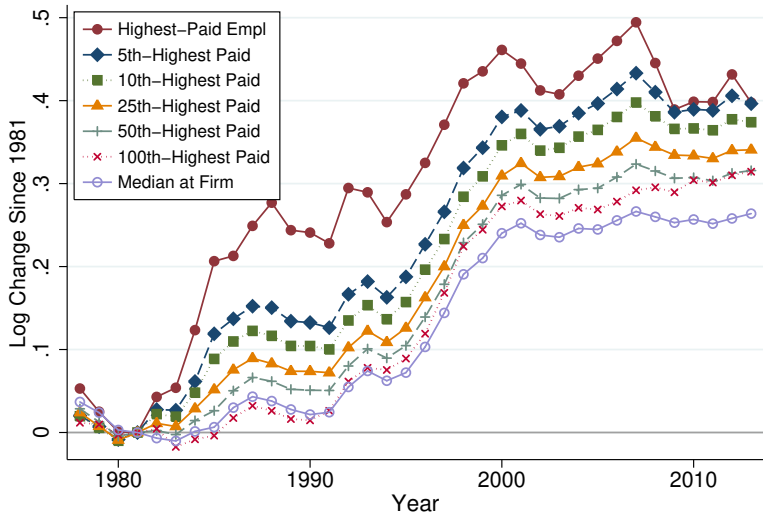
A key driver of wage inequality is the growth of chief executive officer earnings and compensation.

Mishel and Sabadish (2014)

Fact #2A: Top Paid Workers vs Firm Pay

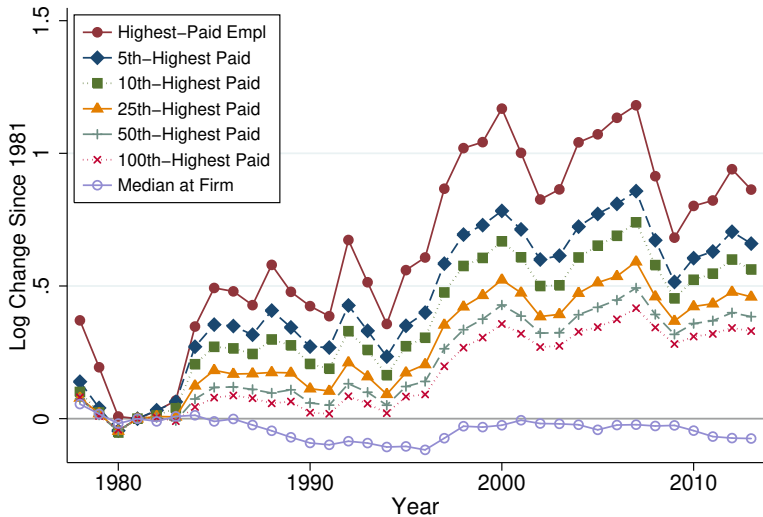


Fact #2B: Dodd-Frank: CEO/median pay



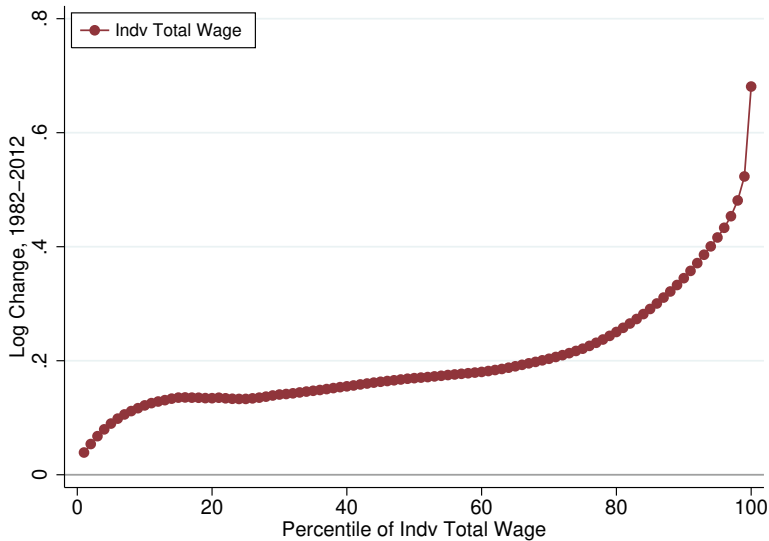
Subgroup: $100 \leq \text{Firm Size} < 10k$

Fact #2B: Mega Firms (10,000+ FTE)

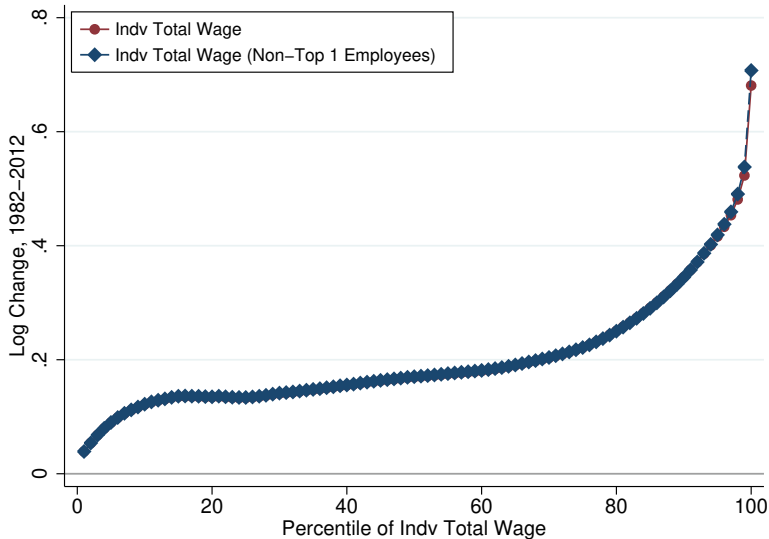


Subgroup: 10000 ≤ Firm Size

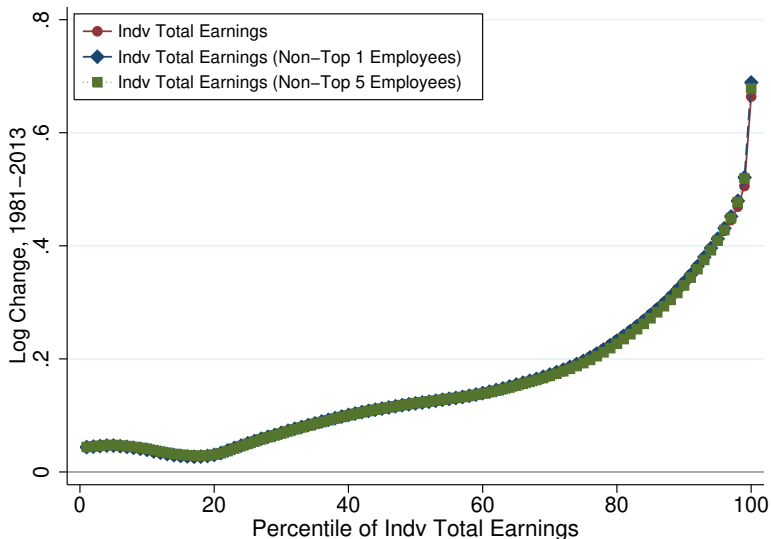
Fact #2C: Rise in Inequality



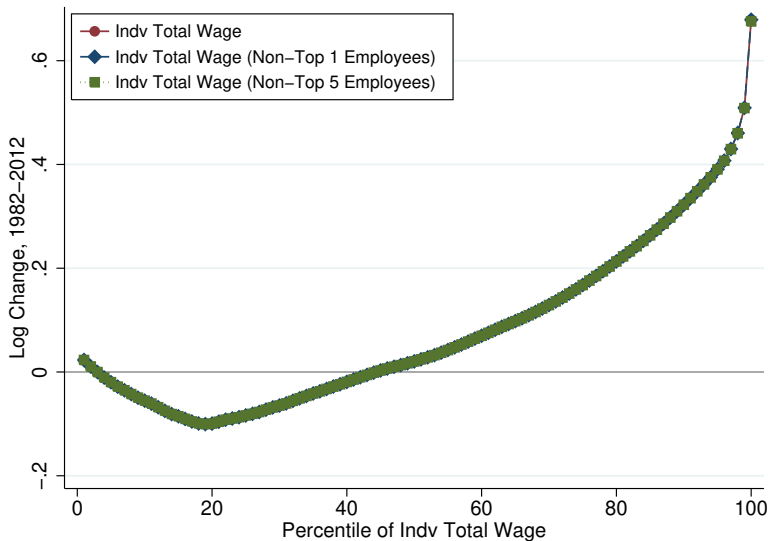
Rise in Inequality *Without Top Executives*



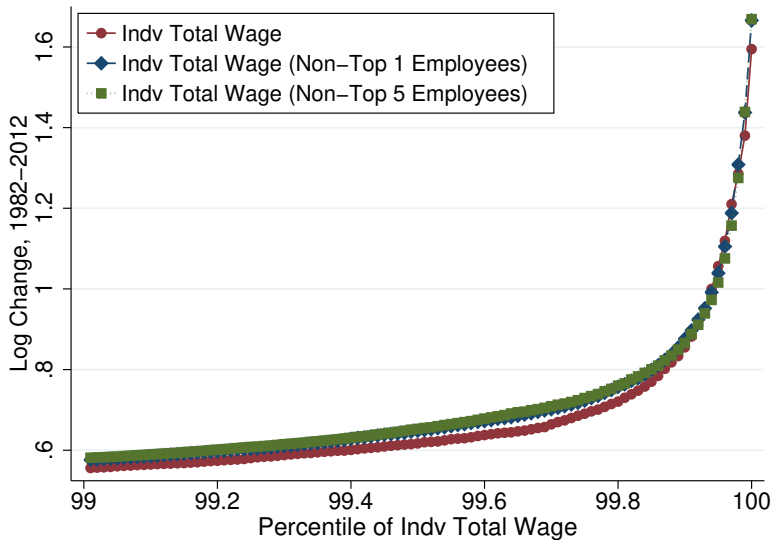
Rise in Inequality *Without Top Executives*



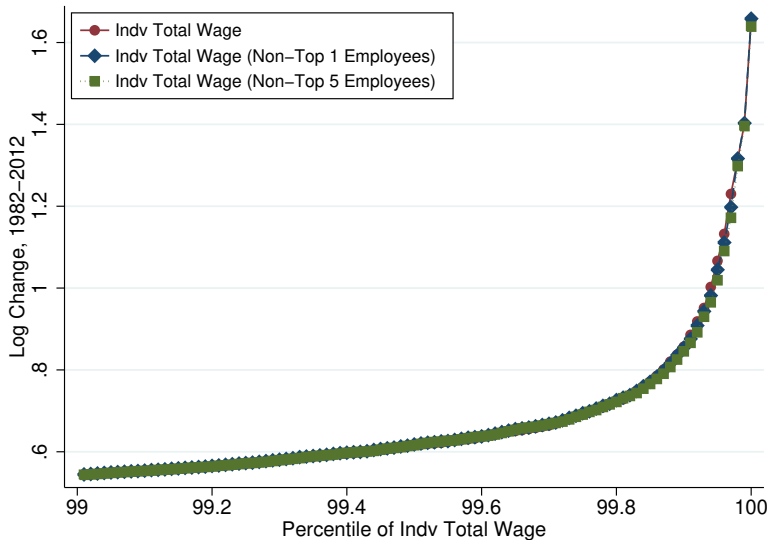
Rise in Inequality: 1000+ FTE



Top 1% Inequality: *Baseline*



Top 1% Inequality: 1000+ FTE



- ▶ **This pattern is pervasive.** It holds within
 - most industries (44 of 49 Fama-French industries)
 - US regions (Census regions, counties)
 - across firms of different sizes
 - **In different countries:** UK, Sweden, Brazil, Germany, and...

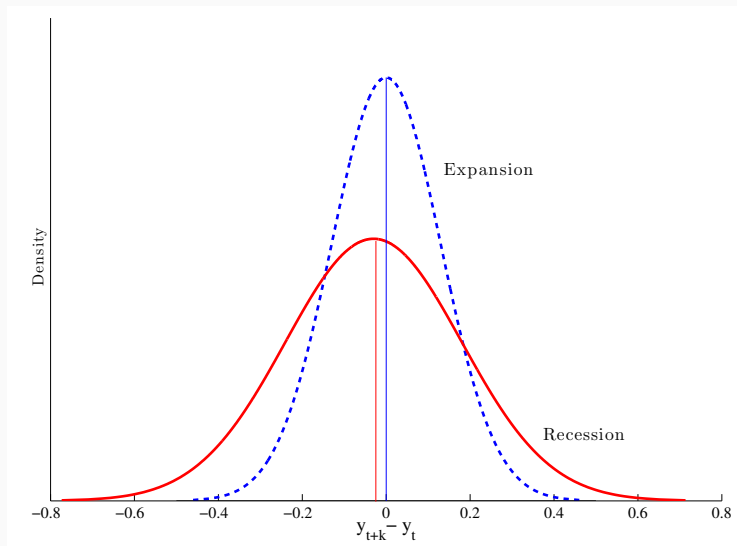
Business Cycle Risk

Risk and Inequality Over the Business Cycle

Myth #3:

The **variance** of idiosyncratic shocks
rises substantially during recessions.

Myth #3: Countercyclical Shock Variances



Countercyclical Variance

- ▶ Constantinides and Duffie (1996): **countercyclical variance** can generate interesting and plausible asset pricing behavior.

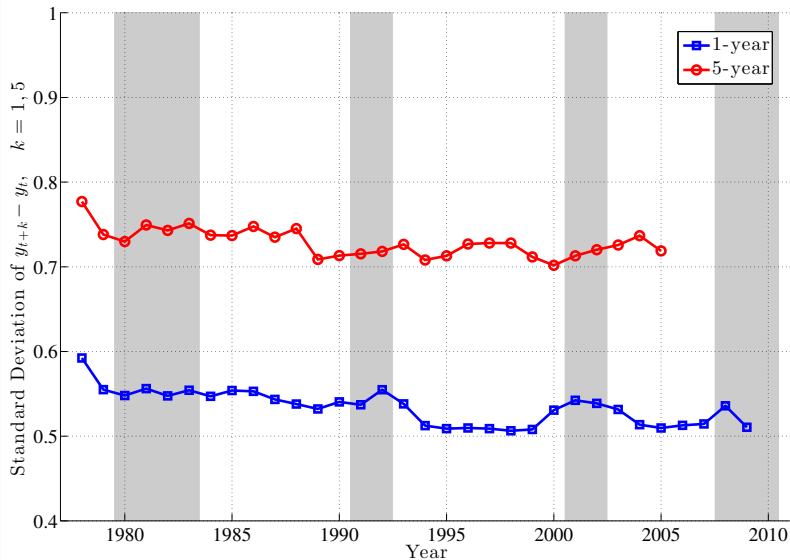
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- ▶ Constantinides and Duffie (1996): **countercyclical variance** can generate interesting and plausible asset pricing behavior.
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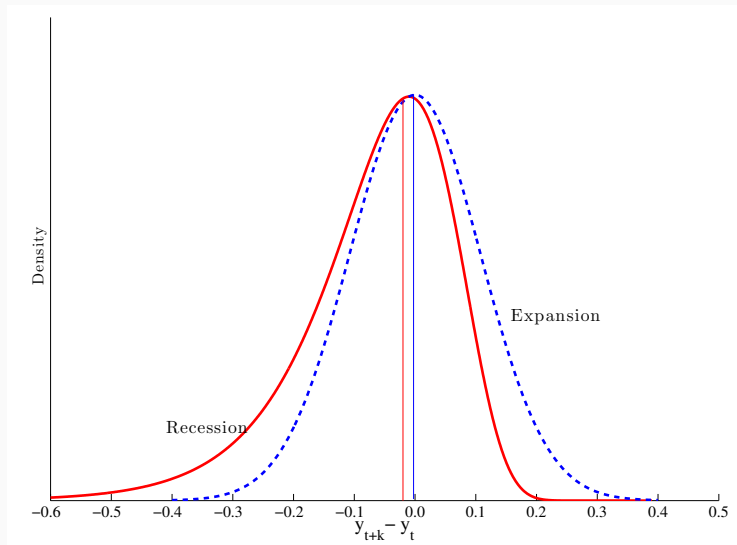
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- ▶ Existing **indirect parametric** estimates find **a tripling** of the variance of persistent innovations during recessions (e.g., Storesletten et al (2004)).
- ▶ Our **direct and non-parametric** estimates show no change in variance over the cycle.

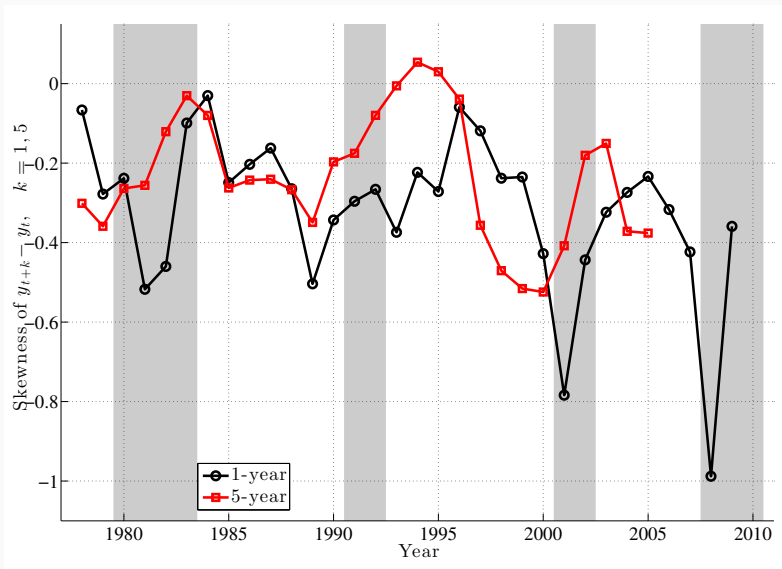
Fact #3: No Change in Variance



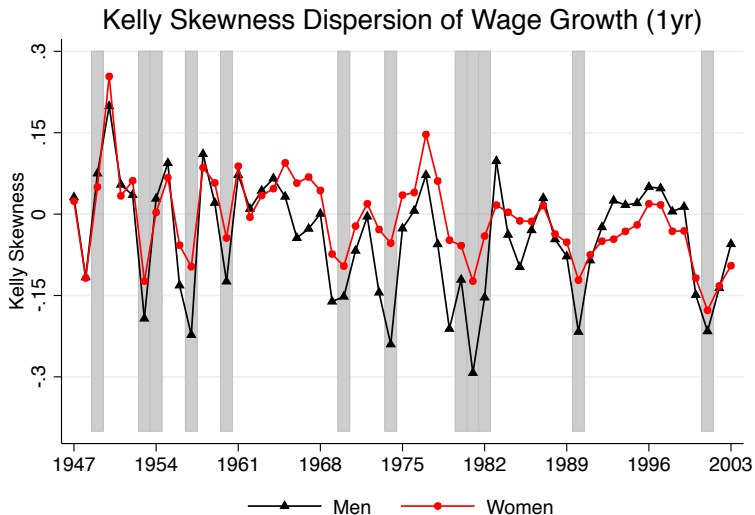
Fact #3: Procyclical Skewness



Fact #3: Procyclical Skewness



Fact #3: Procyclical Skewness: Longer Series



How About in the Rest of the World?

- ▶ We find the same patterns for Sweden, Germany, and France:
 - flat shock variance, procyclical skewness (Busch, Domeij, Guvenen and Madera, 2016; Busch, Fialho, Guvenen, 2016, Catherine (2017)).

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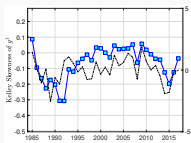
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- ▶ Gov't policy more effective in Germany and Sweden

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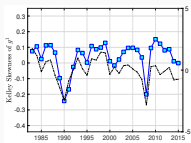
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- ▶ Gov't policy more effective in Germany and Sweden
- ▶ How about GRID countries? Next slide.



(a) ARG



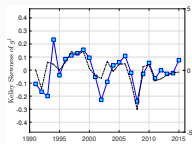
(b) BRA



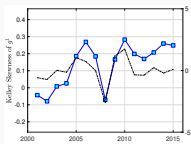
(c) CAN



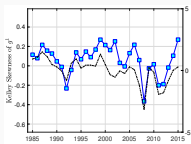
(d) DEN



(e) FRA



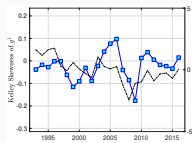
(f) GER



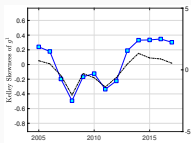
(g) ITA



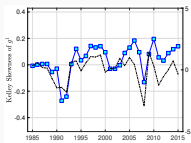
(h) MEX



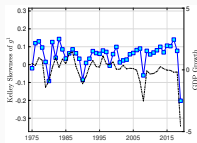
(i) NOR



(j) SPA



(k) SWE



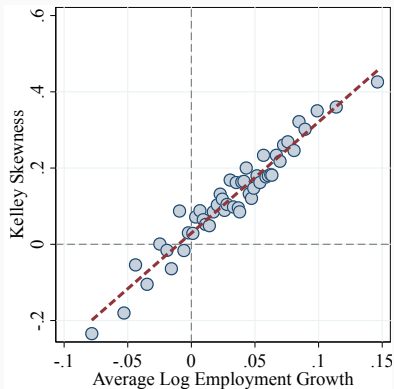
(l) UK

- ▶ Salgado, Guvenen, Bloom (2021): examine firm-level variables in a panel of firms covering 44 countries:
 - growth rate of sales, profits, employment, inventories
 - stock prices

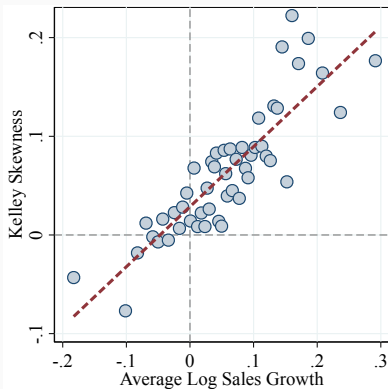
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- ▶ Kehrig (2016): estimates firm-level TFP for US firms and finds no cyclicity in variance, but procyclical skewness.

Skewness is Procyclical in a Panel of 44 Countries

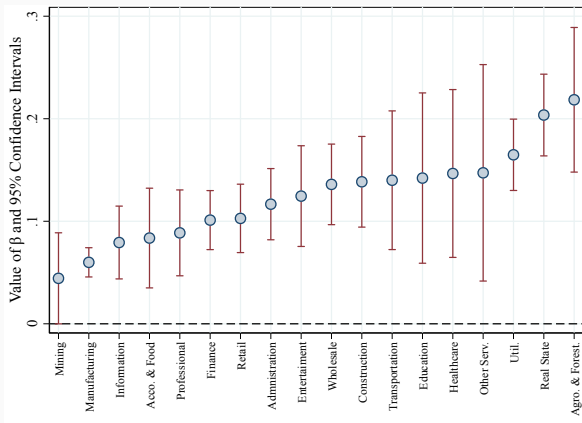


(m) Employment Growth



(n) Sales Growth

Within-Industry Skewness of Sales Growth is Proccyclical (Compustat)



Regression coefficients of within-industry regression

$$KSK_{jt} = \alpha + \beta \Delta S_{jt} + \delta_t + \varepsilon_{jt}$$

Notes: US data from all **Compustat firms** with +10 years of data for the 1970-2017 period. Total firm-quarter observations: 205K.

► NB: Employment growth is very similar.

To Sum Up: Business Cycles

So far, evidence on both workers and firms collectively imply:

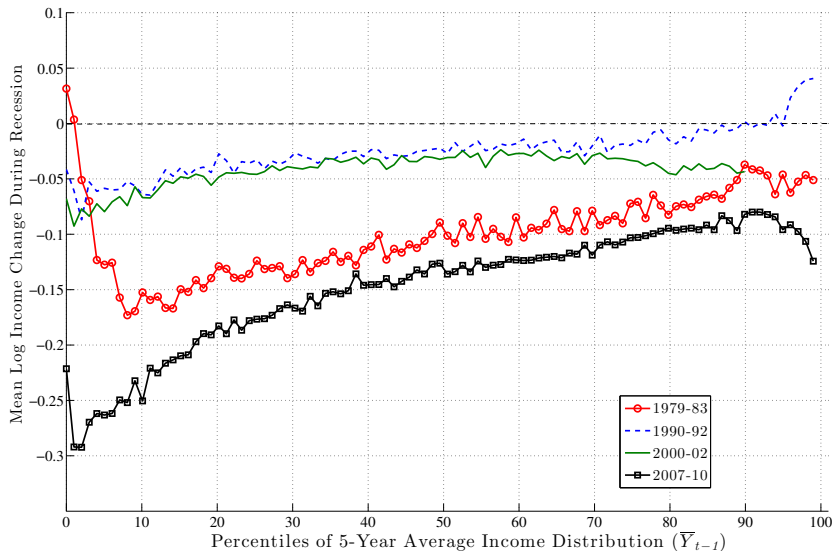
1. Procyclical skewness is a prominent feature of business cycles.
2. Countercyclical variances: not nearly as robust

Is Business Cycle Risk Predictable?

Myth #4:

Business cycle risk is mostly *ex-post* risk

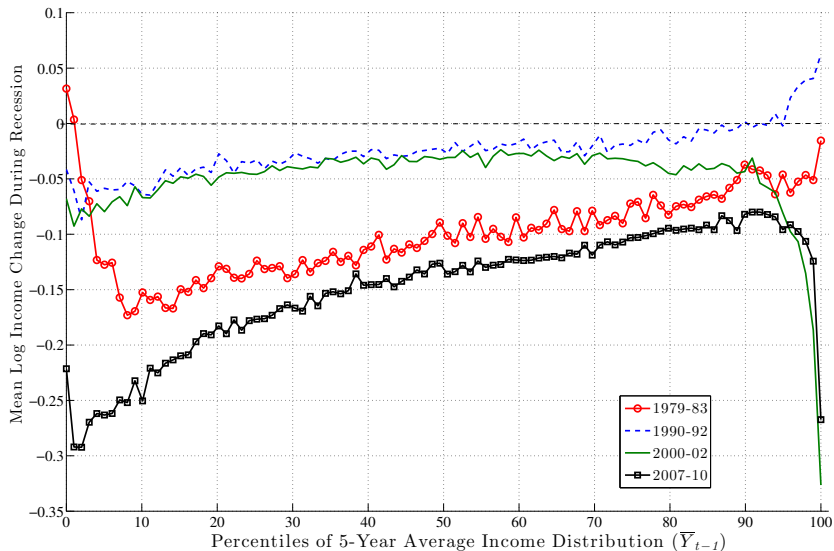
Fact #4: Business Cycle Risk is Predictable



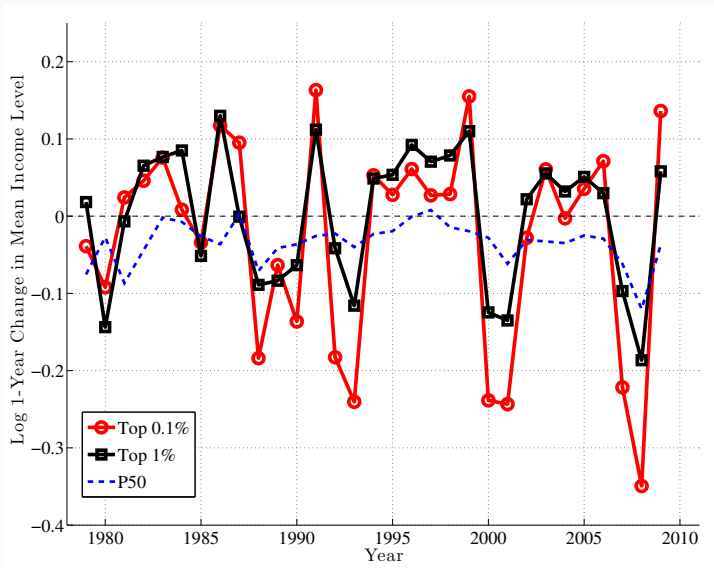
Myth #4:

The top 1% are largely immune
to the pain of business cycles.

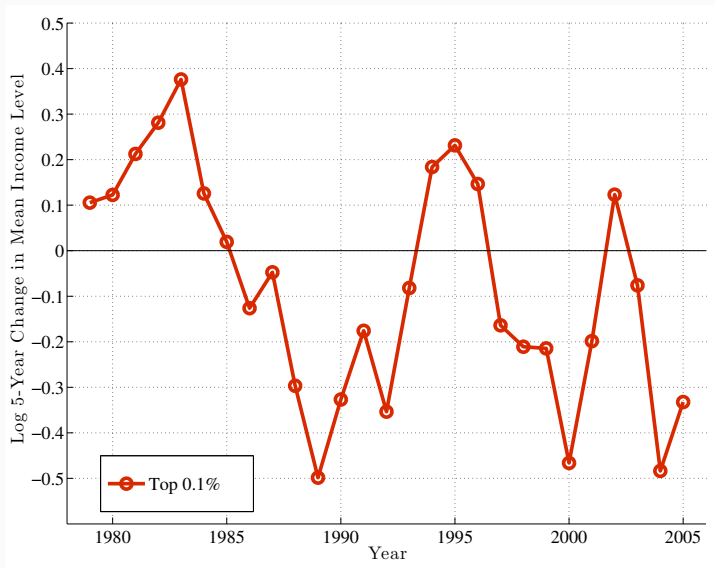
Fact #4: The “Suffering” of the Top 1%



Fact #4: 1-Year Income Growth, Top 1%



Fact #4: 5-Year Income Growth, Top 0.1%



Life Cycle Risk

Risk and Inequality Over the Life Cycle

Distribution of Income Shocks

Myth #5:

It is OK to model income growth...

...as a lognormal distribution

⇒ it is OK to assume...

...zero skewness and no excess kurtosis

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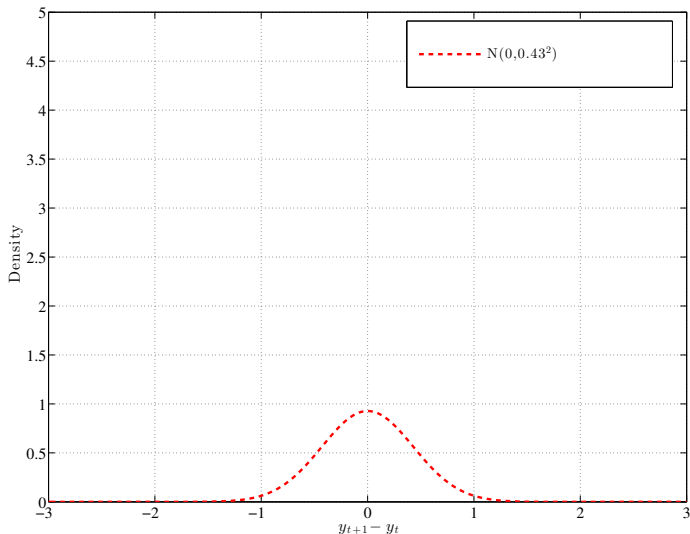
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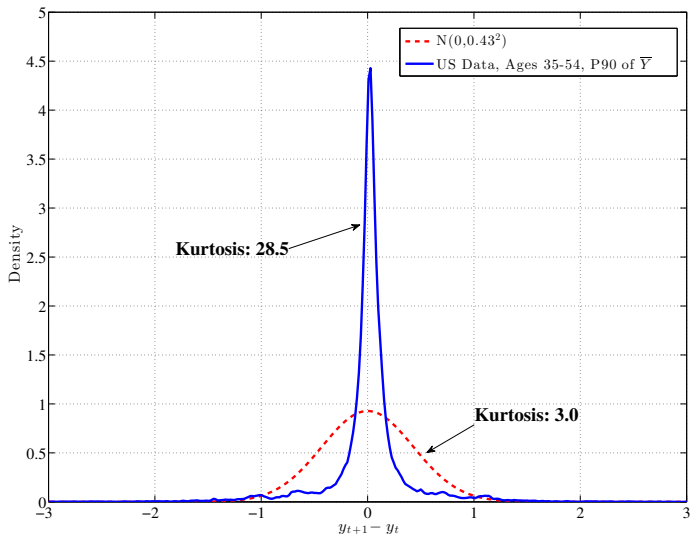
$$\begin{aligned}y_t &= z_t^i + \varepsilon_t^i & \varepsilon_t^i &\sim \mathcal{N}(0, \sigma_\varepsilon^2) \\z_t^i &= \rho z_t^i + \eta_t^i & \eta_t^i &\sim \mathcal{N}(0, \sigma_\eta^2)\end{aligned}$$

Kurtosis

Myth #5: Lognormal Histogram of $y_{t+1} - y_t$



Fact #5: Excess Kurtosis

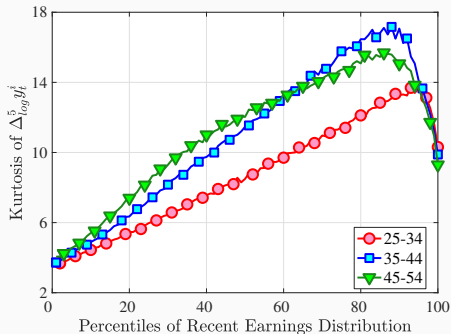


Fact #5: Excess Kurtosis

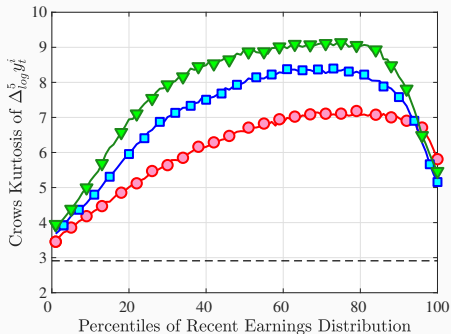
$x \downarrow$	Prob($ y_{t+1} - y_t < x$)	
	Data	$N(0, 0.43^2)$
0.05	0.39	0.08
0.10	0.57	0.16
0.20	0.70	0.30
0.50	0.80	0.59
1.00	0.93	0.94

Fact #5: Excess Kurtosis

Figure 4: Kurtosis of Five-Year Log Earnings Growth



(a) Fourth Standardized Moment

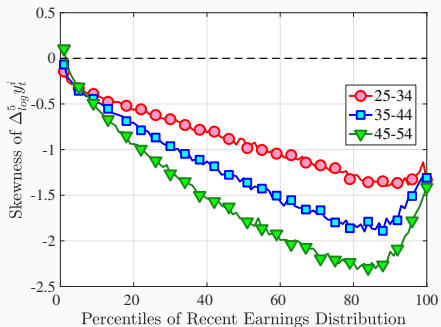


(b) Crow-Siddiqui Measure

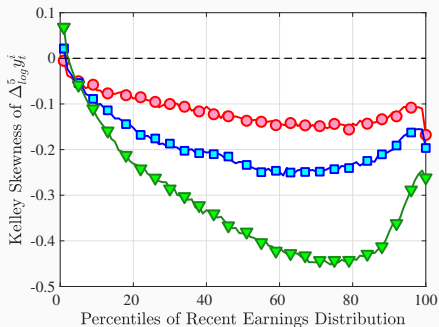
Skewness

Fact #5: Skewness of $y_{t+1} - y_t$

Figure 5: Skewness of Five-Year Log Earnings Growth

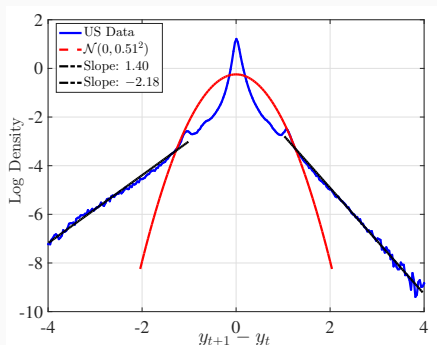


(a) Third Standardized Moment



(b) Kelley Measure

Double Pareto Tails of Earnings Growth



- ▶ Tails of earnings growth distribution are
 - Very thick and long
 - Straight line (Double Pareto distribution)
 - Asymmetric (left tail thicker)
- ▶ Earnings growth distribution: far from lognormal

Do Higher-Order Moments Matter?

- ▶ Guvenen-Ozkan (2022):
 - Welfare costs of idiosyncratic fluctuations are 25-40% of lifetime consumption compared to 10-12% with Gaussian shocks. (RRA=2)

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- ▶ Constantinides-Ghosh (2015, JF), Golosov-Troschkin-Tsyvinski (2016, AER), Schmidt (2016), Kaplan-Moll-Violante (2016) find substantially different results when higher-order moments are taken into account.

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- ▶ I hope these new facts will feed back into theory and policy work.

References

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