

The Great Micro Moderation

Nicholas Bloom, Fatih Guvenen, Luigi Pistaferri,
John Sabelhaus, Sergio Salgado, & Jae Song

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Preliminary and Incomplete

Motivation

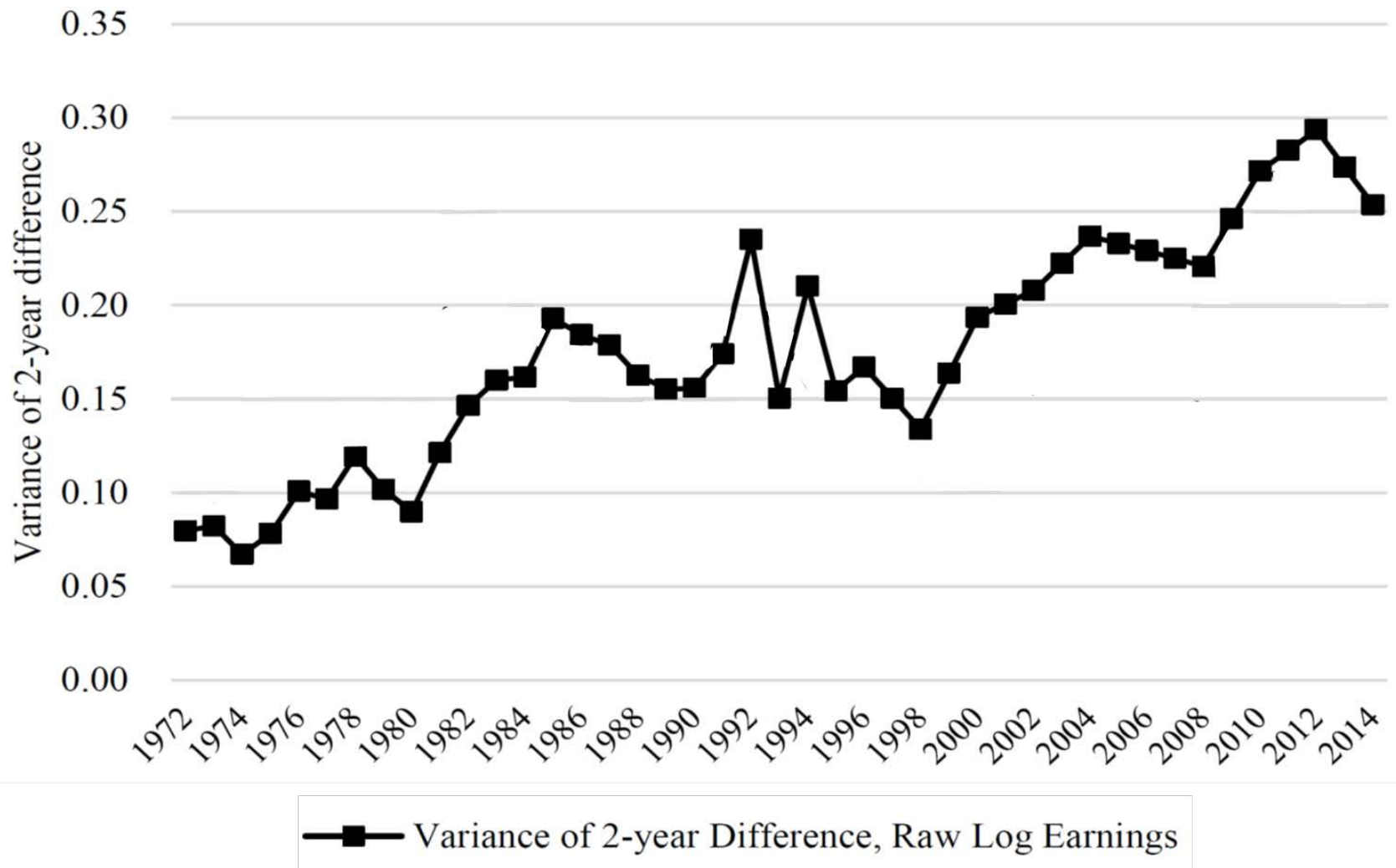
- ❑ Individual earnings are volatile:
 - Std. dev. of log annual earnings growth is about 0.5
 - Earnings growth distribution has long tails — extreme changes are common
 - Volatility is often interpreted as a key metric for the economic risk faced by workers/individuals

- ❑ **Question:** How has labor income volatility changed over the last 40 years?

Motivation

- Gottschalk and Moffit (1994) is a key early paper: reported large rise in income volatility using 1970-1988 PSID data
 - Extending results to more recent years: rising volatility continues.

Moffitt and Zhang (2018)



[Moffitt-Gottschalk \(2012\).](#)

Motivation

- Gottschalk and Moffit (1994) is a key early paper: reported large rise in income volatility using 1970-1988 PSID data
 - Extending results to more recent years: rising volatility continues.
- GM's seminal work followed by dozens of papers with broadly similar results.
- Dynan, Elmendorf and Sichel (2012):
 - Survey 30 papers, **27 find rising volatility** (2 finds flat, 1 declining vol)
 - These papers mostly use survey data (PSID, SIPP, CPS, etc.)

Motivation

- Finding of rising volatility used as “stylized fact” in most papers

TWO QUESTIONS ABOUT EUROPEAN UNEMPLOYMENT

BY LARS LJUNGQVIST AND THOMAS J. SARGENT¹

A general equilibrium search model makes layoff costs affect the aggregate unemployment rate in ways that depend on equilibrium proportions of frictional and structural unemployment that in turn depend on the generosity of government unemployment benefits and skill losses among newly displaced workers. The model explains how, before the 1970s, lower flows into unemployment gave Europe lower unemployment rates than the United States and also how, after 1980, higher durations have kept unemployment rates in Europe persistently higher than in the United States. These outcomes arise from the way Europe's higher firing costs and more generous unemployment compensation make its unemployment rate respond to bigger skill losses among newly displaced workers. Those bigger skill losses also explain why U.S. workers have experienced more earnings volatility since 1980 and why, especially among older workers, hazard rates of gaining employment in Europe now fall sharply with increases in the duration of unemployment.

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, pp. 30–31)).

1. INTRODUCTION

American Economic Review 101 (August 2011): 2248–2270
<http://www.aeaweb.org/articles.php?doi=10.1257/aer.101.5.2248>

Did Household Consumption Become More Volatile?[†]

By OLGA GORBACHEV*

By now it is well documented that volatility of male earnings increased substantially from the 1970s to early 1980s, was stable in the 1980s to early 1990s, and began to increase again in the mid 1990s.¹ Volatility of family income, both its permanent and transitory components, has also increased since the 1970s.²

Motivation

- Finding of rising wage volatility used as “stylized fact” in most papers
- Employment volatility declines over the same period (Davis et al., 2007)
 - Davis and Kahn (2008): “Great moderation” everywhere but in earnings
 - A “great risk shift” induced by increasing flexibility in pay setting?

Our Contribution

- Revisit key question using SSA data:
 - Administrative records:
 - No survey response error, no attrition, no top or bottom coding
 - Very large sample size (up to full population):
 - Allows detailed analysis of subpopulations:
 - Worker cohorts, firm cohorts, industries, etc.
 - Can study tails of earnings change distribution
 - Long time span (full data back to 1978; 1% sample back to 1947)

Our Contribution (cont'd)

- Same data can also be used to study **firm-based measures of volatility**
 - Employment
 - Wage bill
- Growing literature investigates role of firms in explaining the rise in wage *inequality* (Card et al., 2013; Song et al., 2019; among others)
- Our focus: Are worker-based measures of *volatility* linked to firm-based measures of *volatility*?

Our Findings

1. Individual earnings volatility *declined* by ~1/3 since mid-'80s
 - Sabelhaus and Song (2010) on 1% SSA sample reached similar conclusions
2. Firms' employment volatility *declined* by ~1/3 since mid-'80s
3. These two trends are tightly linked – worker earnings volatility and firm employment volatility strongly related (controlling for firm permanent characteristics)
4. Open questions:
 - Causality?
 - Is the decline in volatility a decline in economic risk?
 - Is Great **Micro** Moderation linked to Great **Macro** Moderation?

Data

Declining Worker Volatility

Reconciling Evidence

Robustness and Heterogeneity

Declining Firm Volatility

Firm and Worker Volatility

Social Security Administration Data

- ❑ Use the Master Earnings File of the SSA
- ❑ **From 1978 to 2012**: contains the earnings record of every person that has ever been issued an SSN.
- ❑ Includes basic demographics (sex, date of birth, place of birth, death record, etc.)
- ❑ Includes a firm identifier: the Employer Identification Number (EIN) for each job → 4 digit SIC + location
- ❑ Supplement analysis with 1% SSA sample **1947-2004**.

An Example W2

22222		Void <input type="checkbox"/>	a Employee's social security number 078-05-1120		For Official Use Only ▶ OMB No. 1545-0008	
b Employer identification number (EIN) 94-1156365			1 Wages, tips, other compensation 1,000,000		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

2016

Department of the Treasury—Internal Revenue Service

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

For Privacy Act and Paperwork Reduction Act Notice, see the separate instructions.

Cat. No. 10134D

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

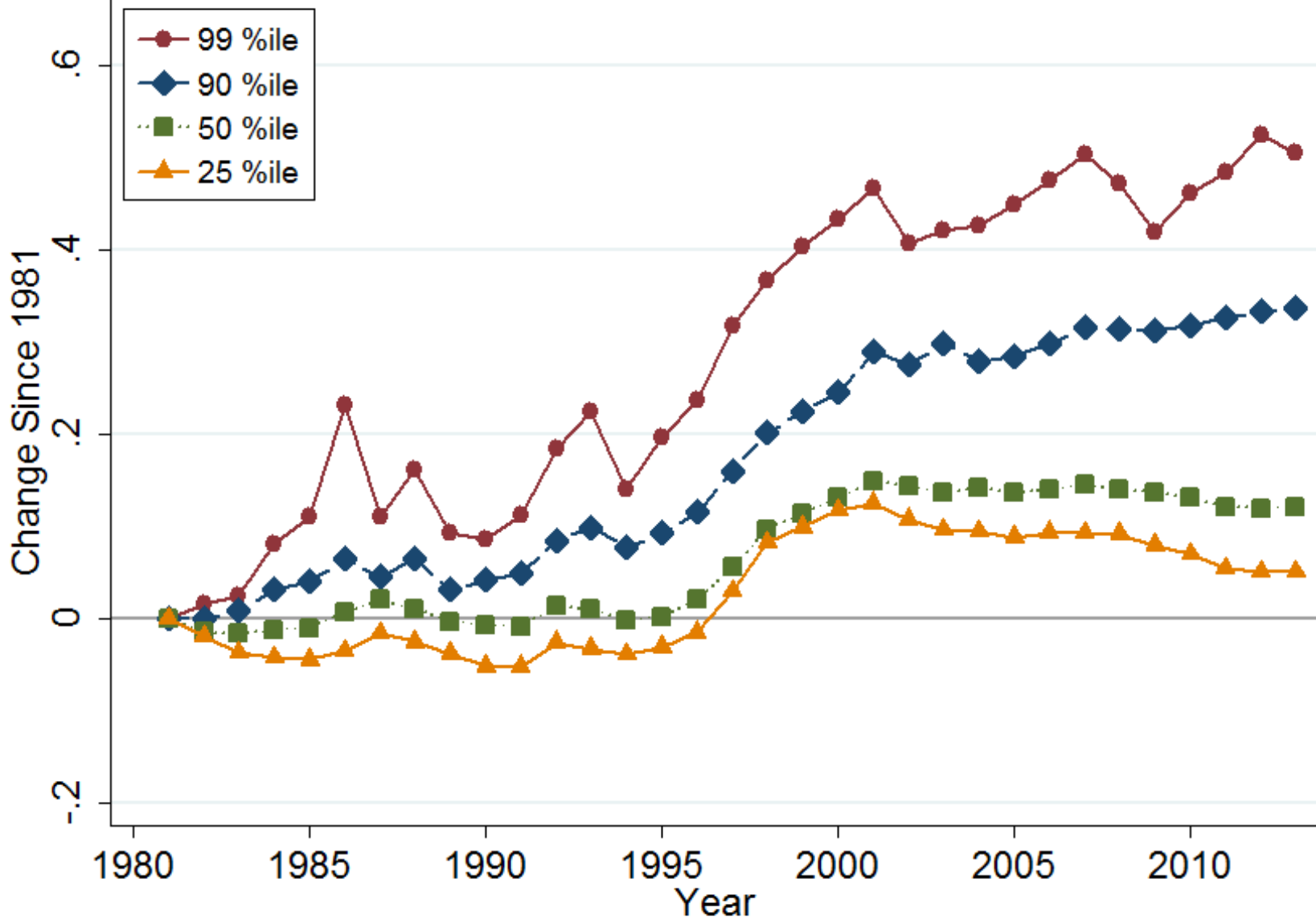
Our data

- We use Box 1 earnings:
“wages, salaries, tips, restricted stock grants, exercised stock options, severance payments, & all other income considered remuneration for labor services by the IRS”
- Annual earnings is the sum of Box 1 income for each SSN in one year
- Allocate individuals to the firm with their highest earnings

Sample Selection

- Our baseline sample
 - Ages 25 to 64
 - Must have earnings above one quarter of full-time work (13 weeks at 40 hours) at $\frac{1}{2}$ of legal minimum wage (\approx \$1800 in 2012)
 - Exclude education and the public sector
- Consider several variations around these selection criteria

Basic Data Facts: Rising Inequality



Bloom, Guvenen, Pistaferri, Sabelhaus, Salgado, and Song. "The Great Micro Moderation"

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Earnings growth measures

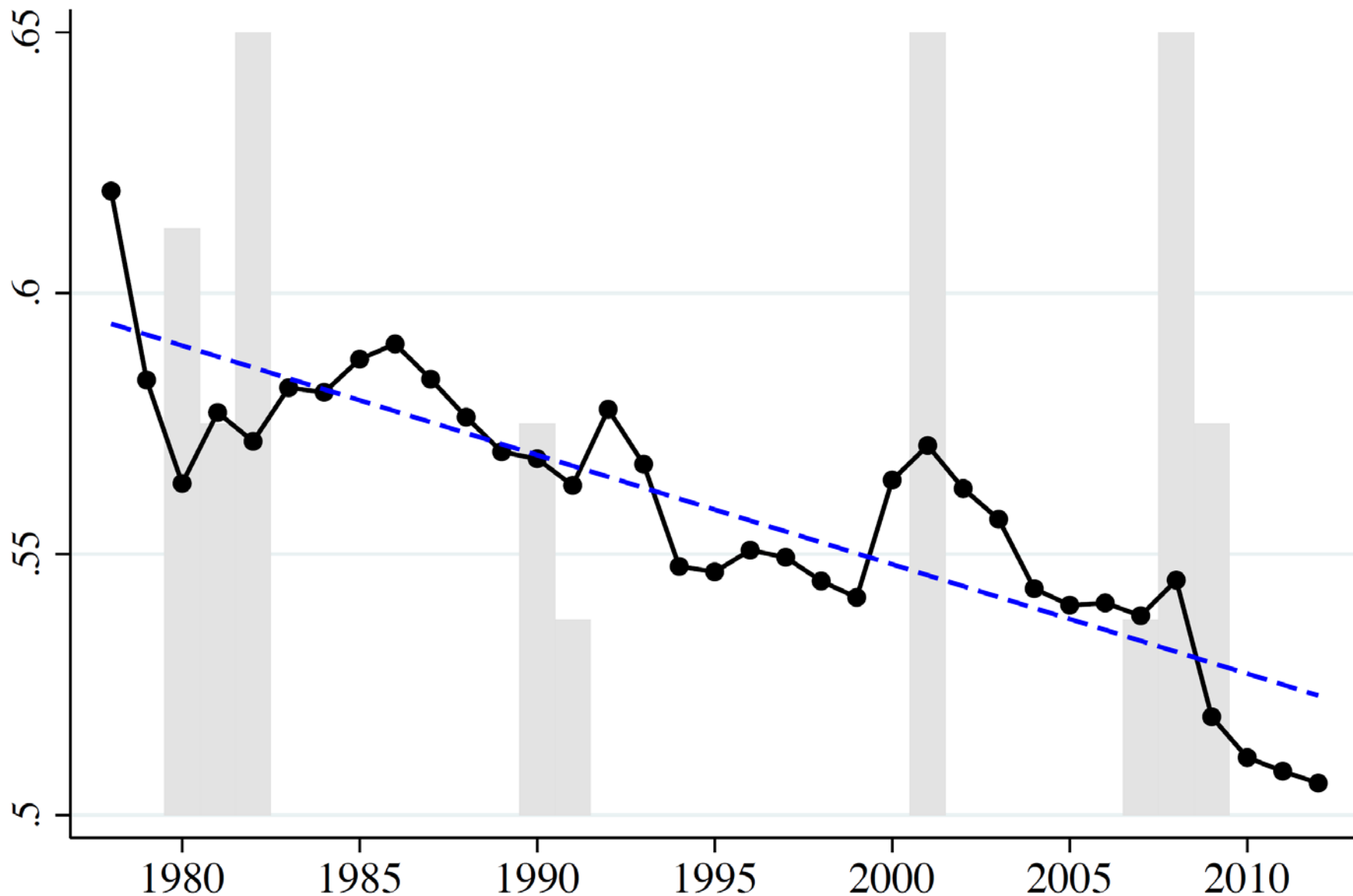
1. Log earnings change:

$$g_{it} = \log(w_{it}) - \log(w_{it-1})$$

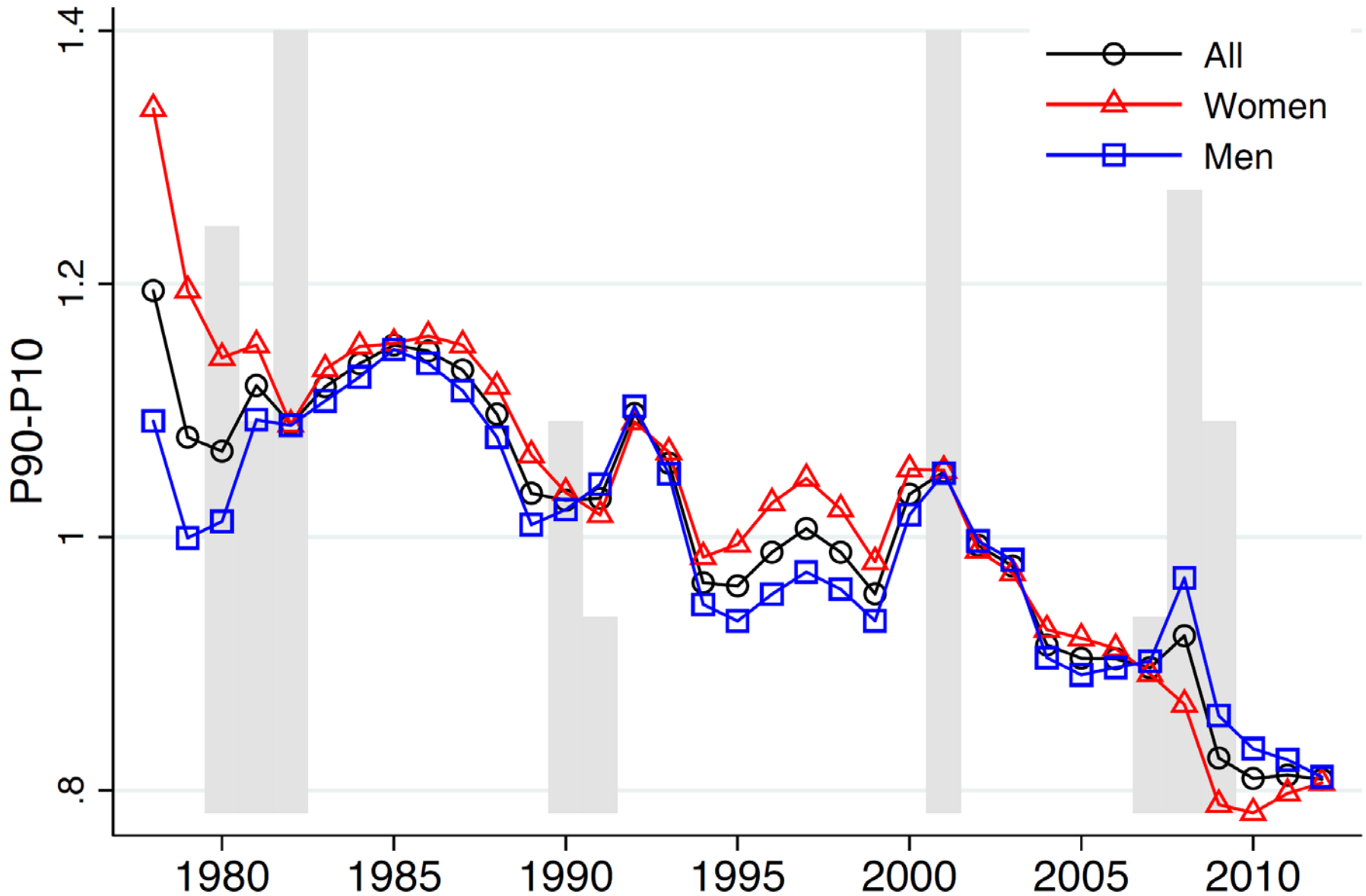
2. Or the arc-percent change (to allow for zeroes):

$$\tilde{g}_{it} = \frac{w_{it} - w_{it-1}}{(w_{it} + w_{it-1})/2}$$

SD of 1-year log earnings changes



90-10 diff. of log annual earnings change drops by about 1/3 (30 log pct)



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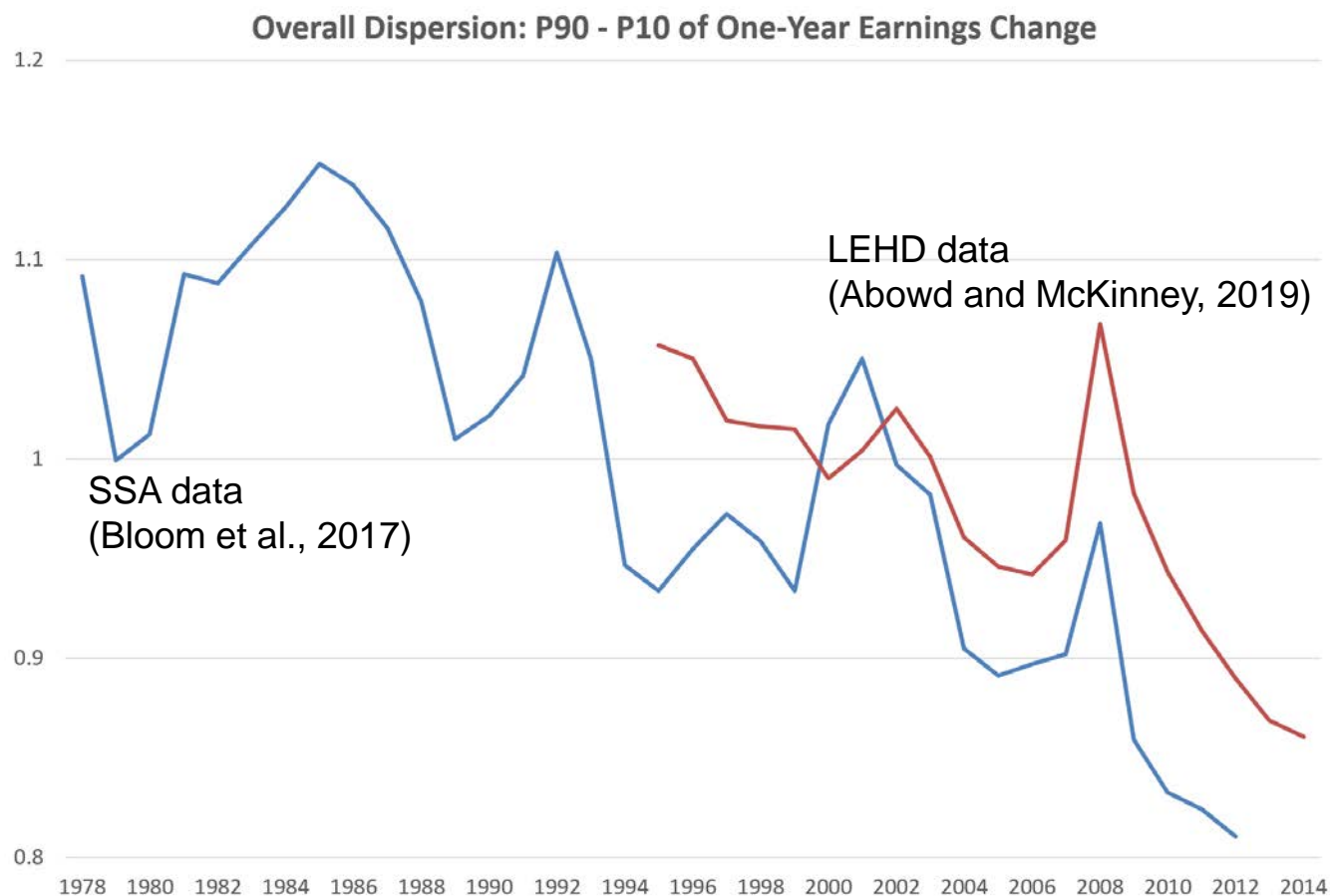
Firm and Worker Volatility

Questions

1. Are SSA data anomalous?
2. Why survey and admin data tell different stories?
3. Can rising inequality and falling volatility coexist?

Are SSA data anomalous?

- Abowd and McKinney (2019) validate our findings using LEHD 1995-2015



Why do household surveys show different pattern?

Most prior work uses the PSID. Great dataset used in 4000+ papers, but for long-run earnings volatility some issues:

- 1) *Representativeness*: tracks households sampled in 1968.
- 2) *Large cumulative attrition rate*. Of the 1968 families:
 - 37.5% had dropped by 1981.
 - 51% had dropped by 1989.
- 3) *Attrition not random* (Fitzgerald et al 1998). [Table](#)
- 4) *Headship*
- 5) *Survey changes*: 1973 phone, 1993 CATI, 1997 bi-annual, refresher sample, 1/3 of original households dropped, etc.
- 6) *Response quality*: Meyer et al. (2016) note general decline in survey “unit non-response”, “item non-response”, and “accuracy”. [CPS](#)

How come inequality is rising while earnings volatility is falling?

$$\underbrace{\text{var}(\Delta \log w_{it+1})}_{\text{Volatility}} = \underbrace{\text{var}(\log w_{it+1}) + \text{var}(\log w_{it})}_{\text{Inequality (next and current period)}} - 2\text{cov}(\log w_{it+1}, \log w_{it})$$

Volatility



Inequality

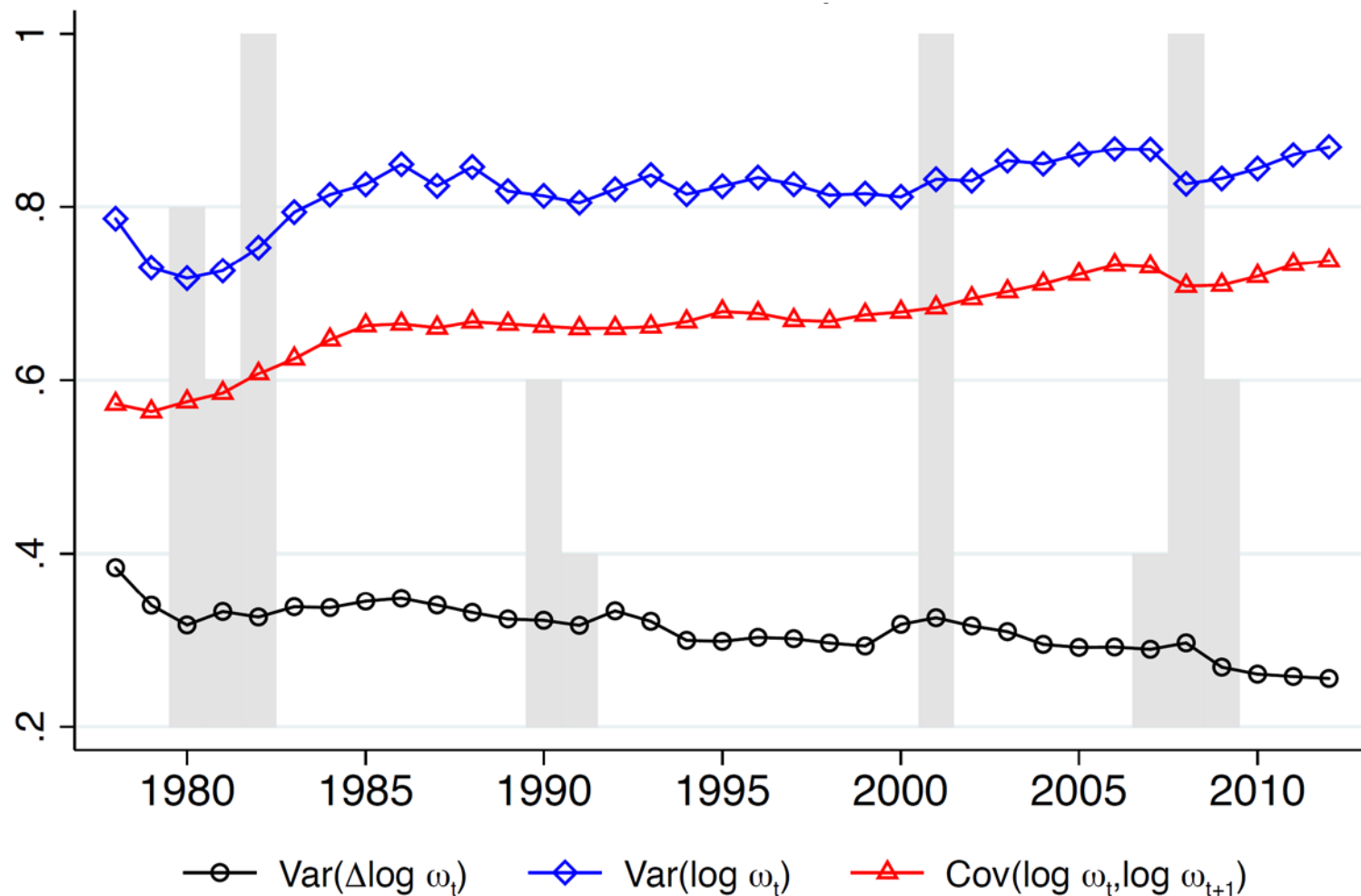
(next and current period)



Persistence



Earnings persistence has been rising steadily



- **More inequality**, more persistence (i.e., **less mobility**): A version of the “Great Gatsby” relationship observed across countries (Krueger, 2012)

What can explain rising persistence?

- Consider income process:

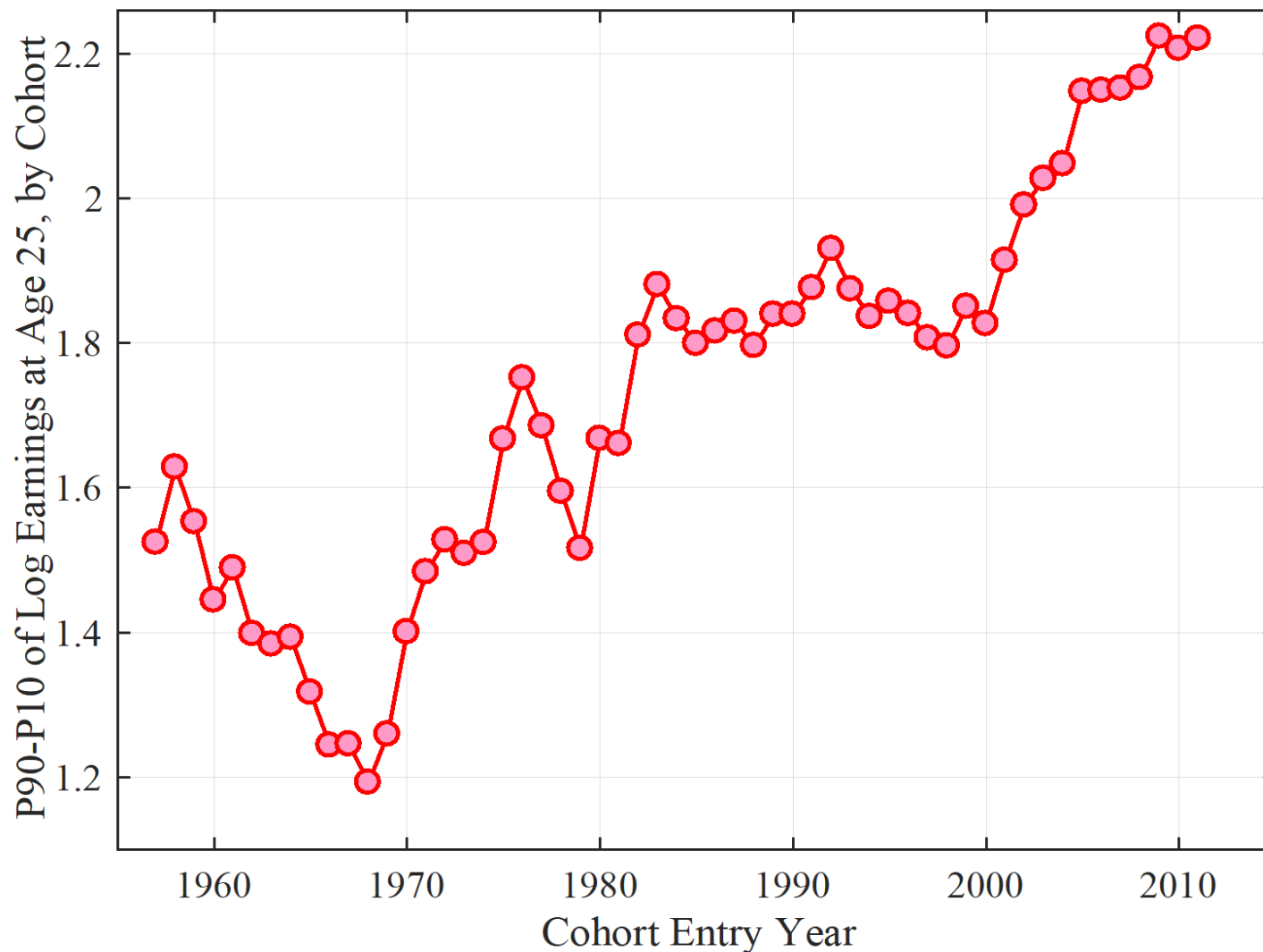
$$w_{i(b)t} = \underbrace{f_{i(b)}}_{\text{indiv. fixed effect}} + \underbrace{P_{i(b)t}}_{\text{persistent component}} + \underbrace{\varepsilon_{i(b)t}}_{\text{transitory component}}$$

$$P_{i(b)t} = \rho P_{i(b)t-1} + \zeta_{i(b)t}$$

$$\text{cov}(w_{i(b)t}, w_{i(b)t-1}) = \text{var}(f_{i(b)}) + \sum_{s=0}^{t-1} \rho^{2s+1} \text{var}(\zeta_{i(b)t-s})$$

- Hence covariance can go up if: (i) ρ goes up, (ii) shocks become more volatile, or (iii) fixed effect dispersion rises.

Dispersion of earnings at age 25, US males, 56 cohorts (from Guvenen et al., 2017)



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Robustness and Heterogeneity

Declining Firm Volatility

Firm and Worker Volatility

Robustness

- Results very similar for **arc-pctg change measure** ([Details](#))
- Results robust to include education/public back in ([Details](#))
- Similar findings if focus is on “earnings instability” ([Details](#))

What about Heterogeneity?

Results are robust across many breakdowns (so can rule out many purely compositional stories):

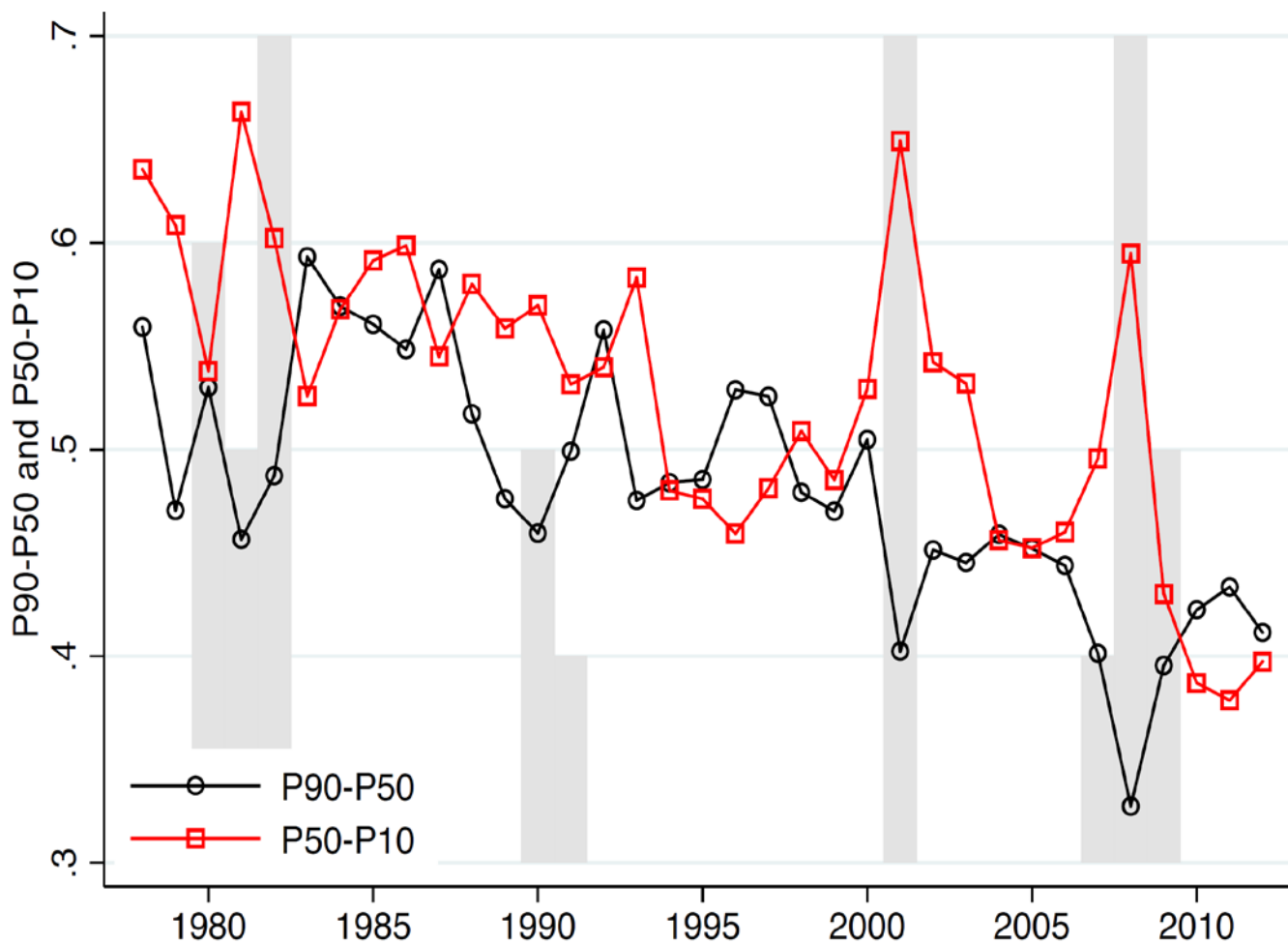
- Positive and negative shocks
- By income level
- Industry
- Worker age
- Firm age & size
- Job stayer/switcher

Upside vs downside volatility

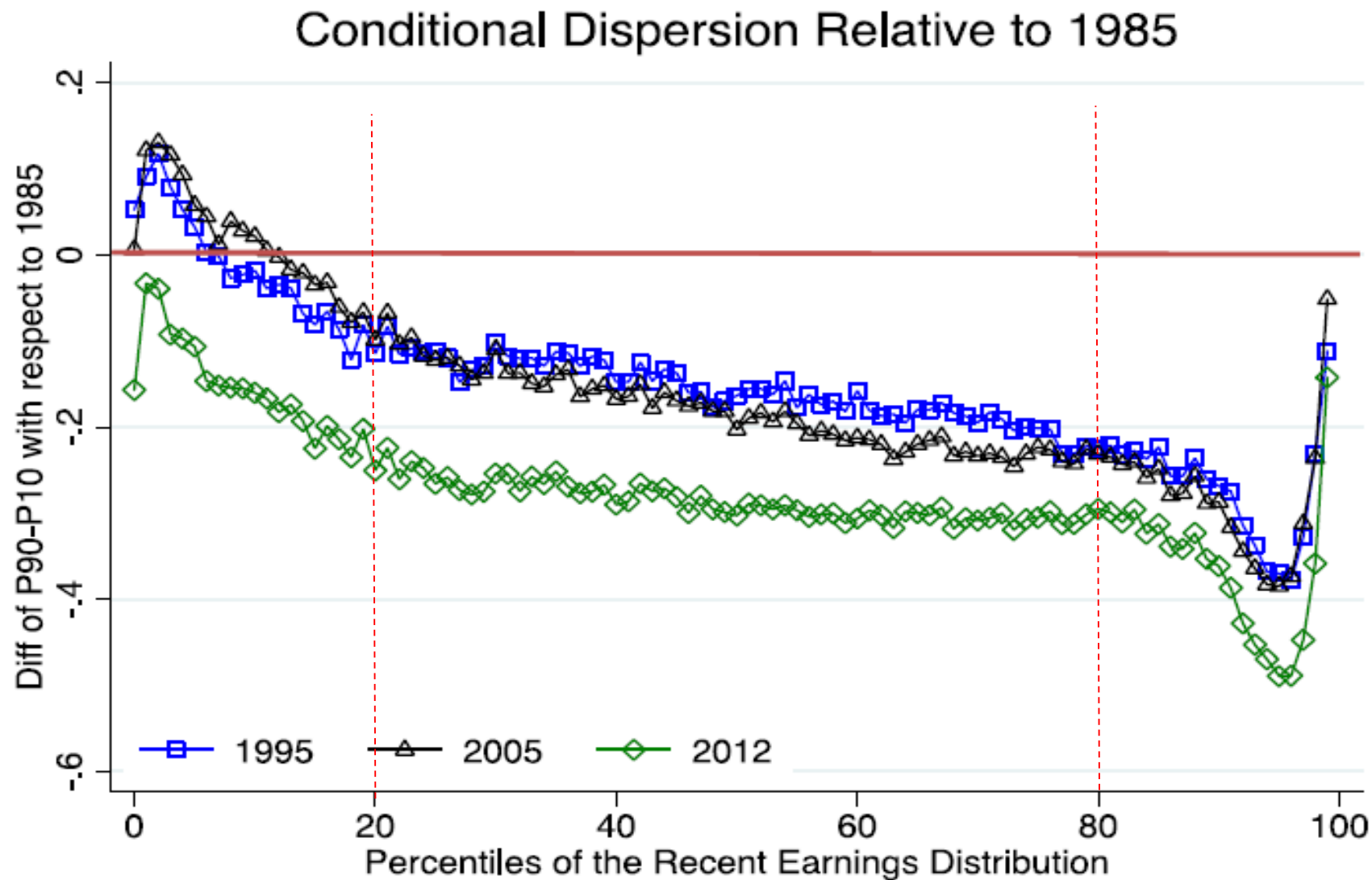
- Whether declining volatility is “good” or “bad” depends on what drives it
- In principle, declining volatility may come from less frequent (large) wage hikes or less frequent (large) wage cuts
 - “Bad” → decreasing chance of moving up
 - “Good” → decreasing chance of sliding down

Upside vs downside volatility

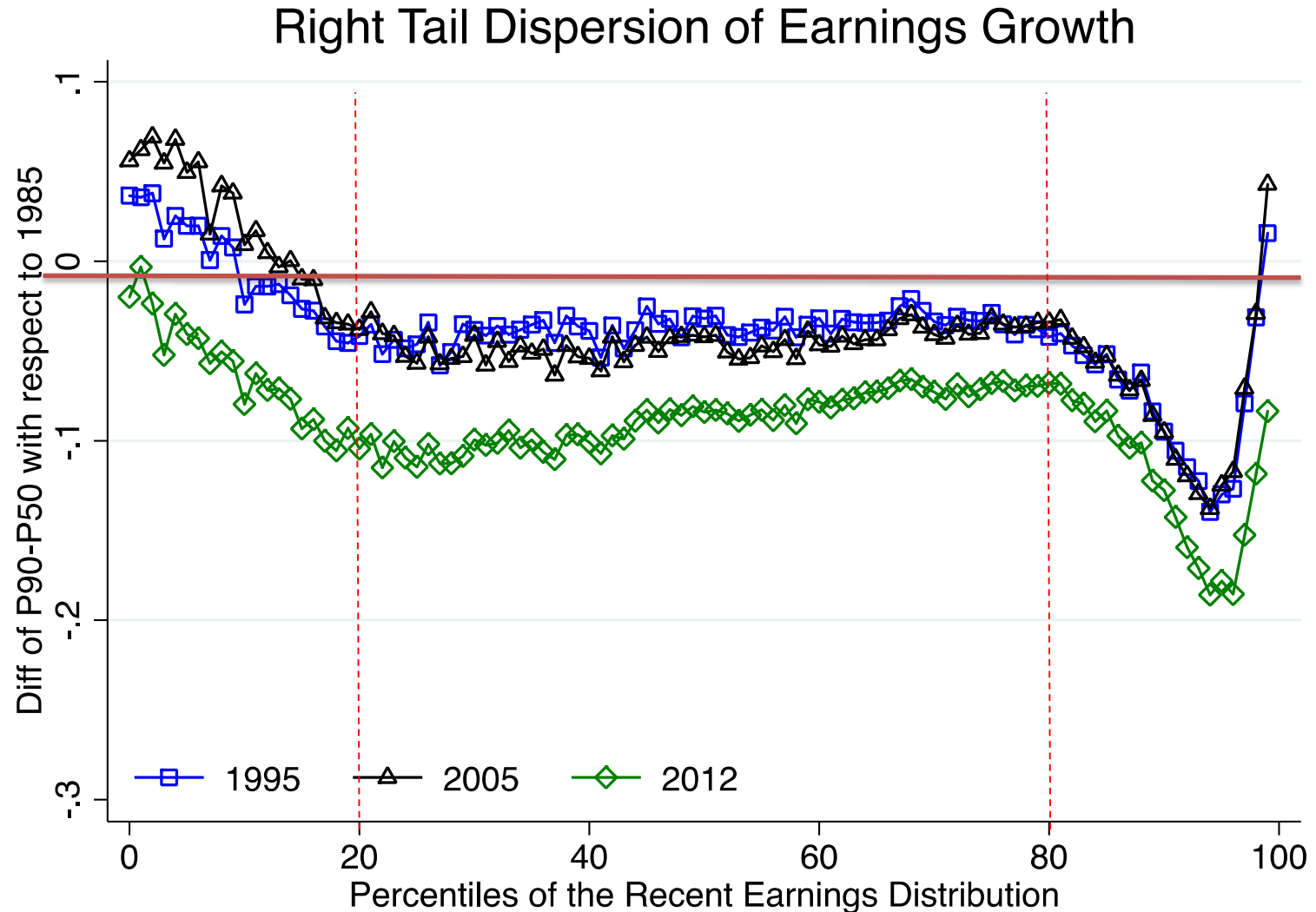
$$\underbrace{P_{9010}}_{\text{Volatility}} = \underbrace{P_{9050}}_{\text{Upside moves}} + \underbrace{P_{5010}}_{\text{Downside risk}}$$



Earnings volatility declined for all earnings groups: relative to 1985

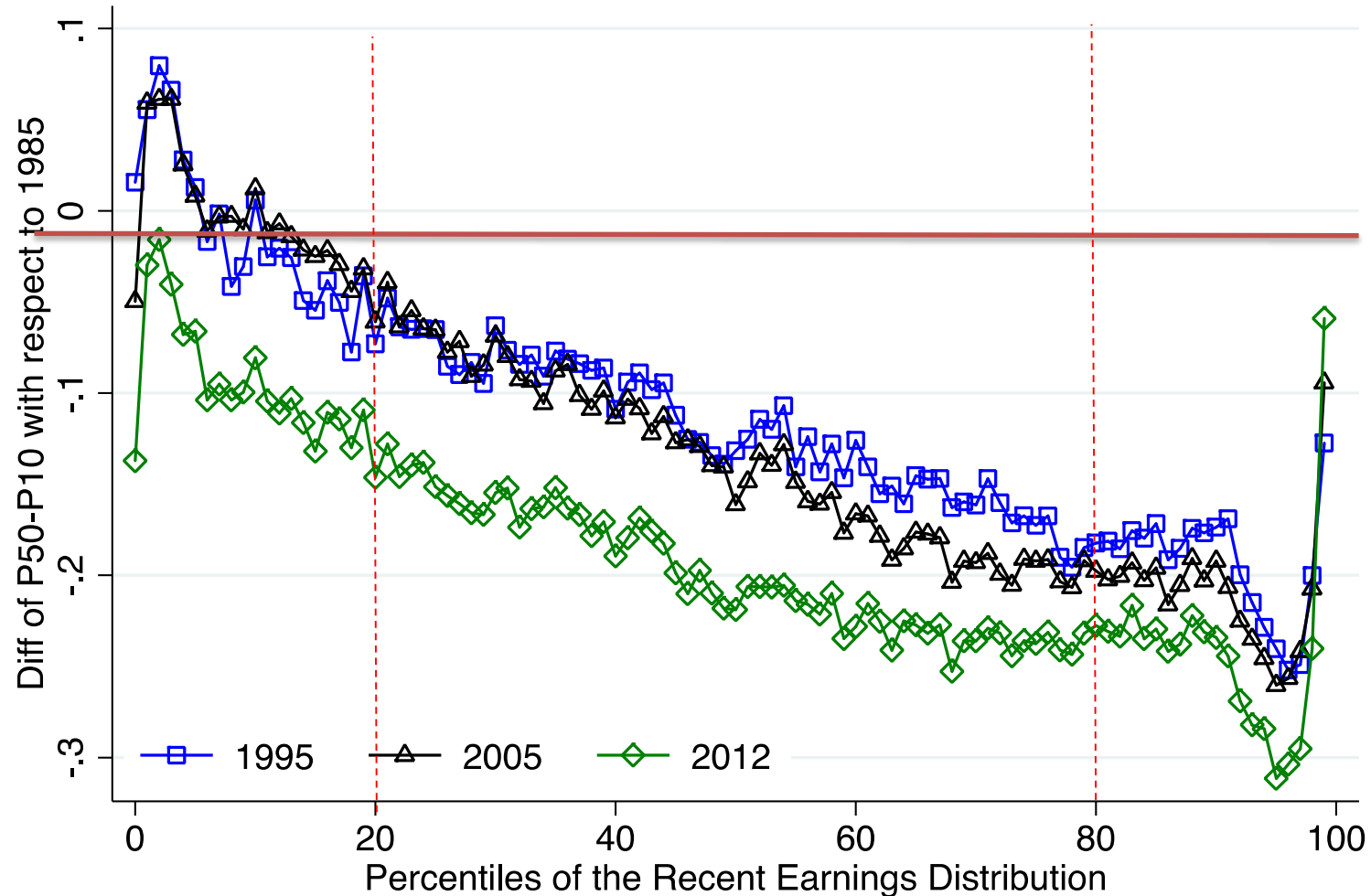


Upside moves declined for all earnings groups: relative to 1985

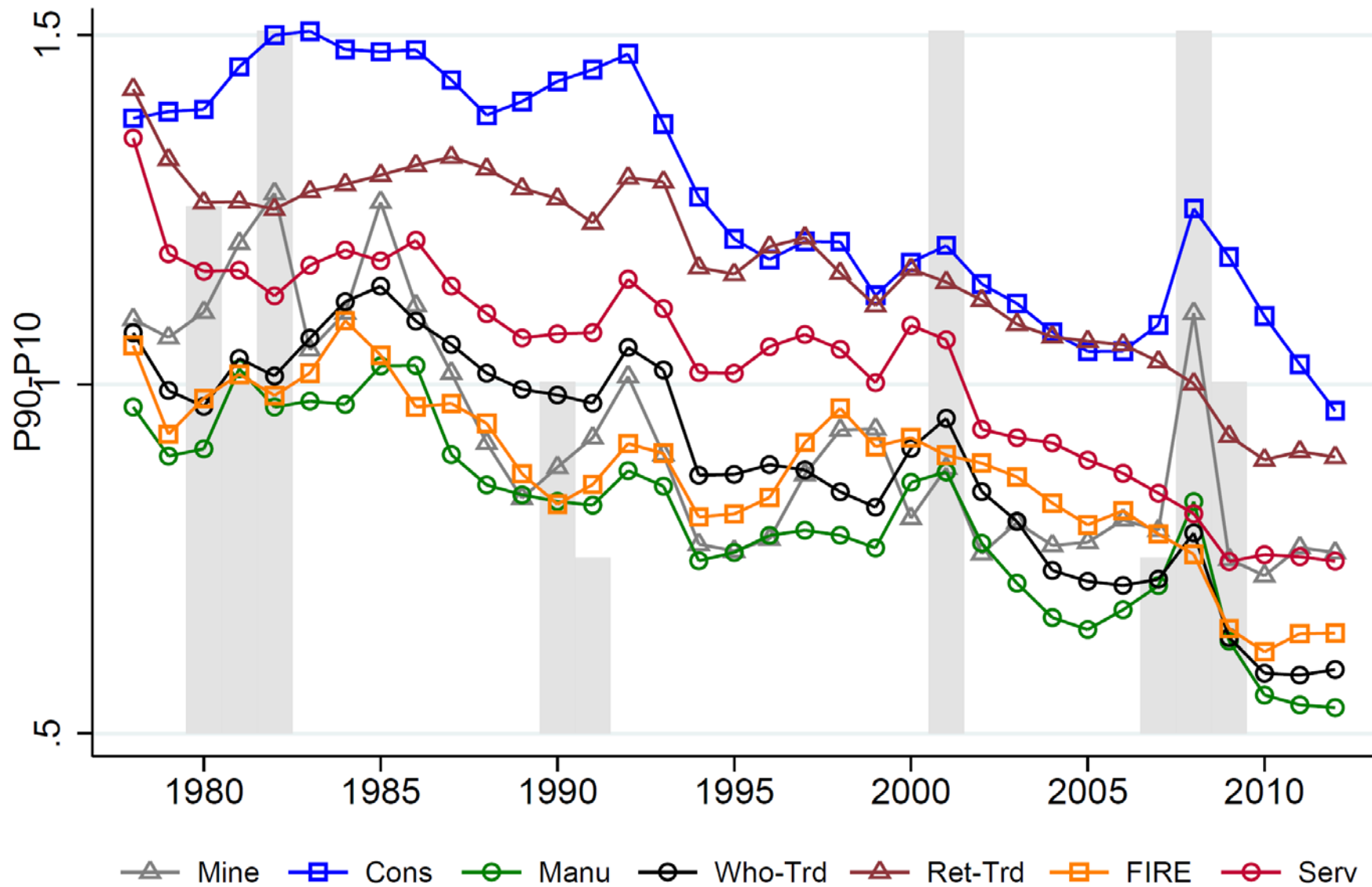


Downside moves declined for everyone, but more so for higher income workers

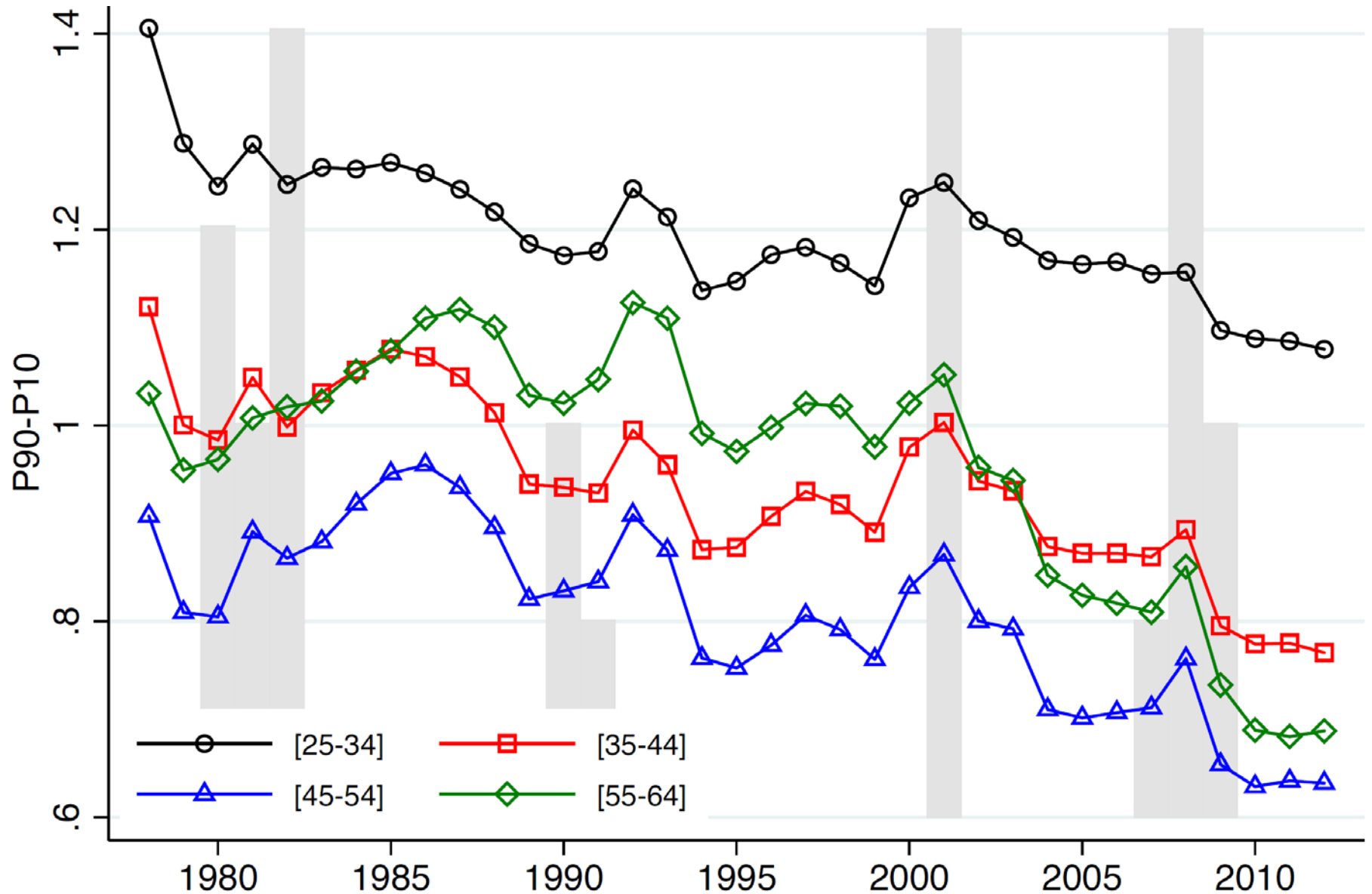
Left Tail Dispersion of Earnings Growth



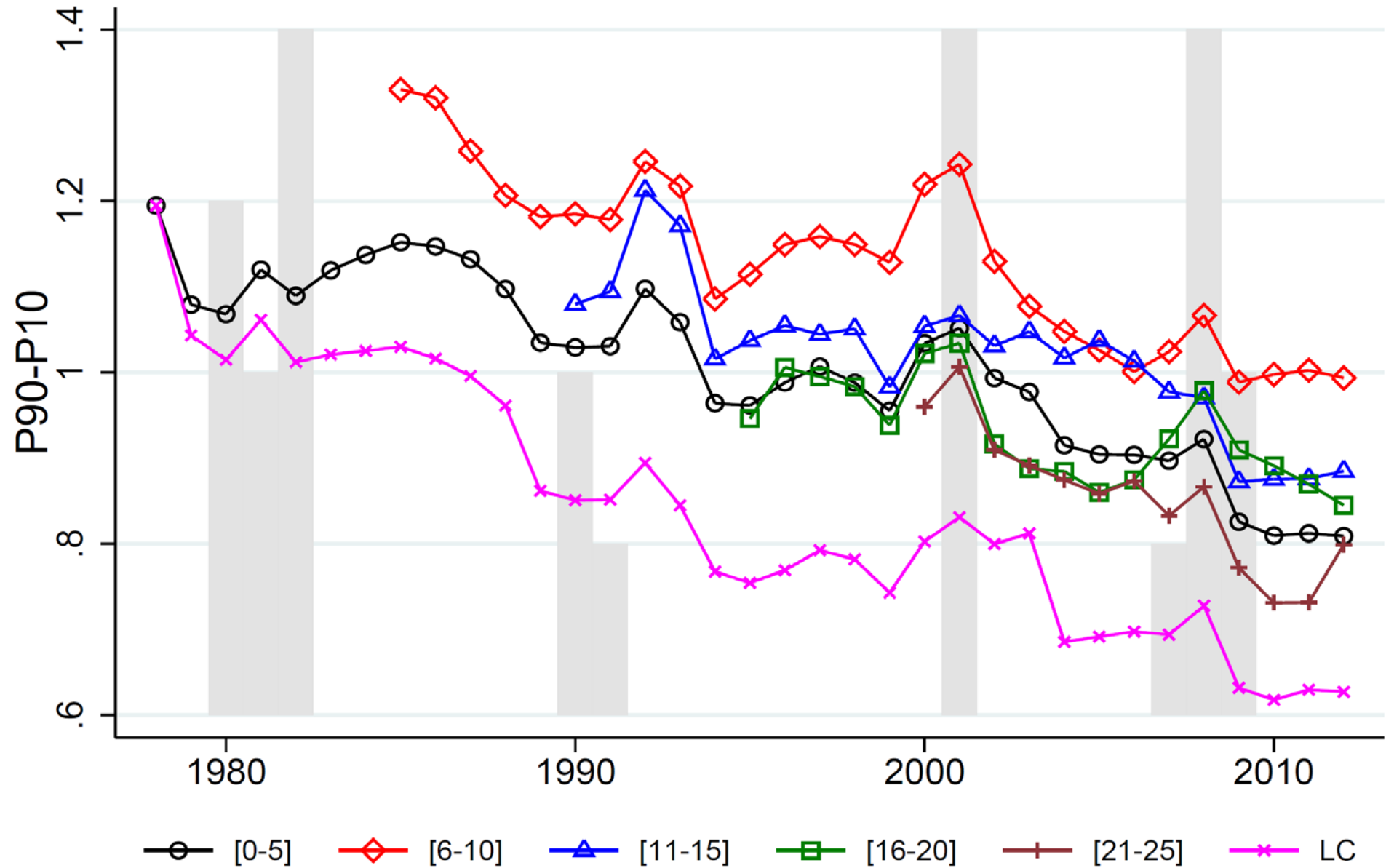
By Broad Industry



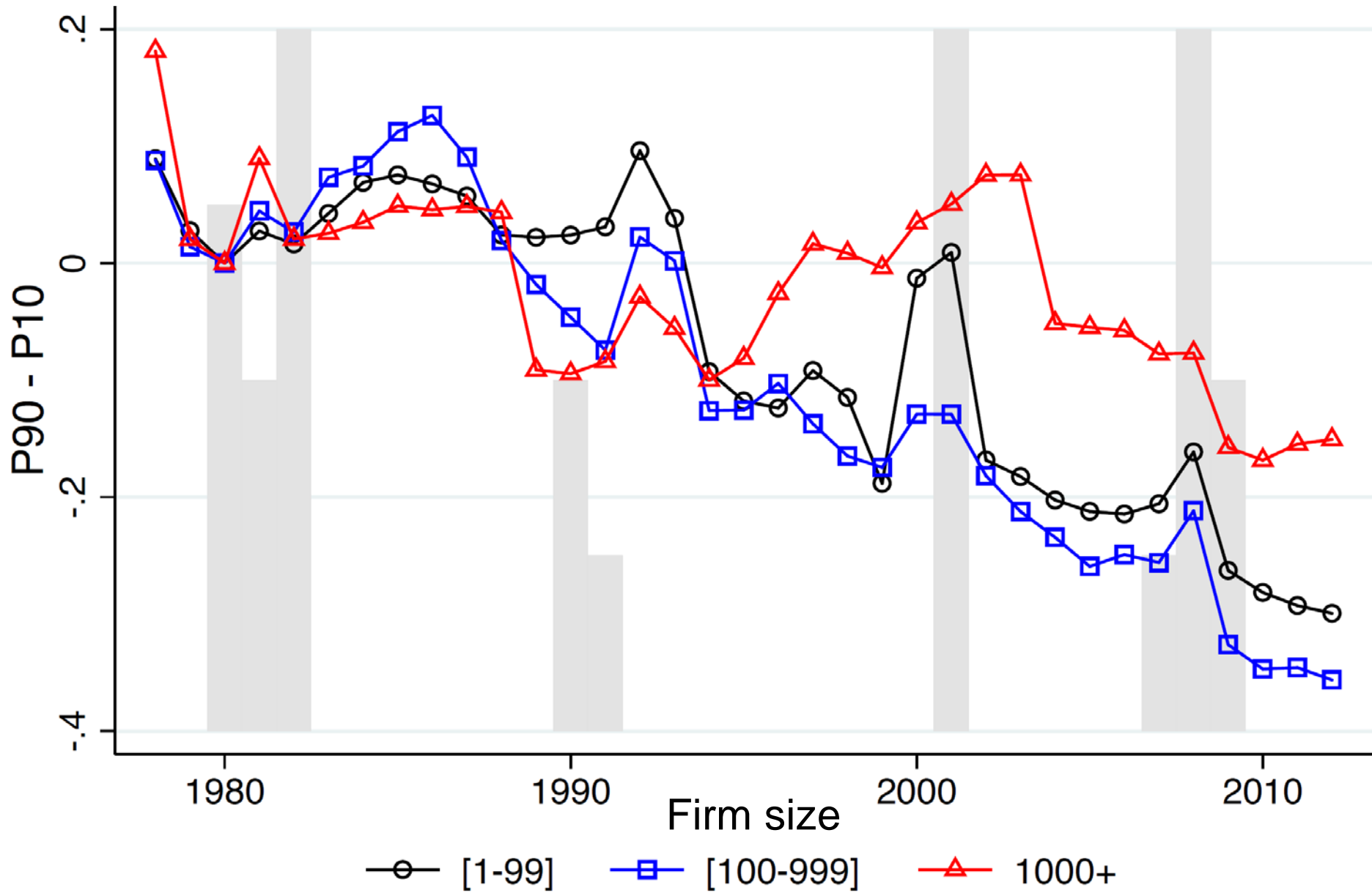
By Employee Age



By Firm Age

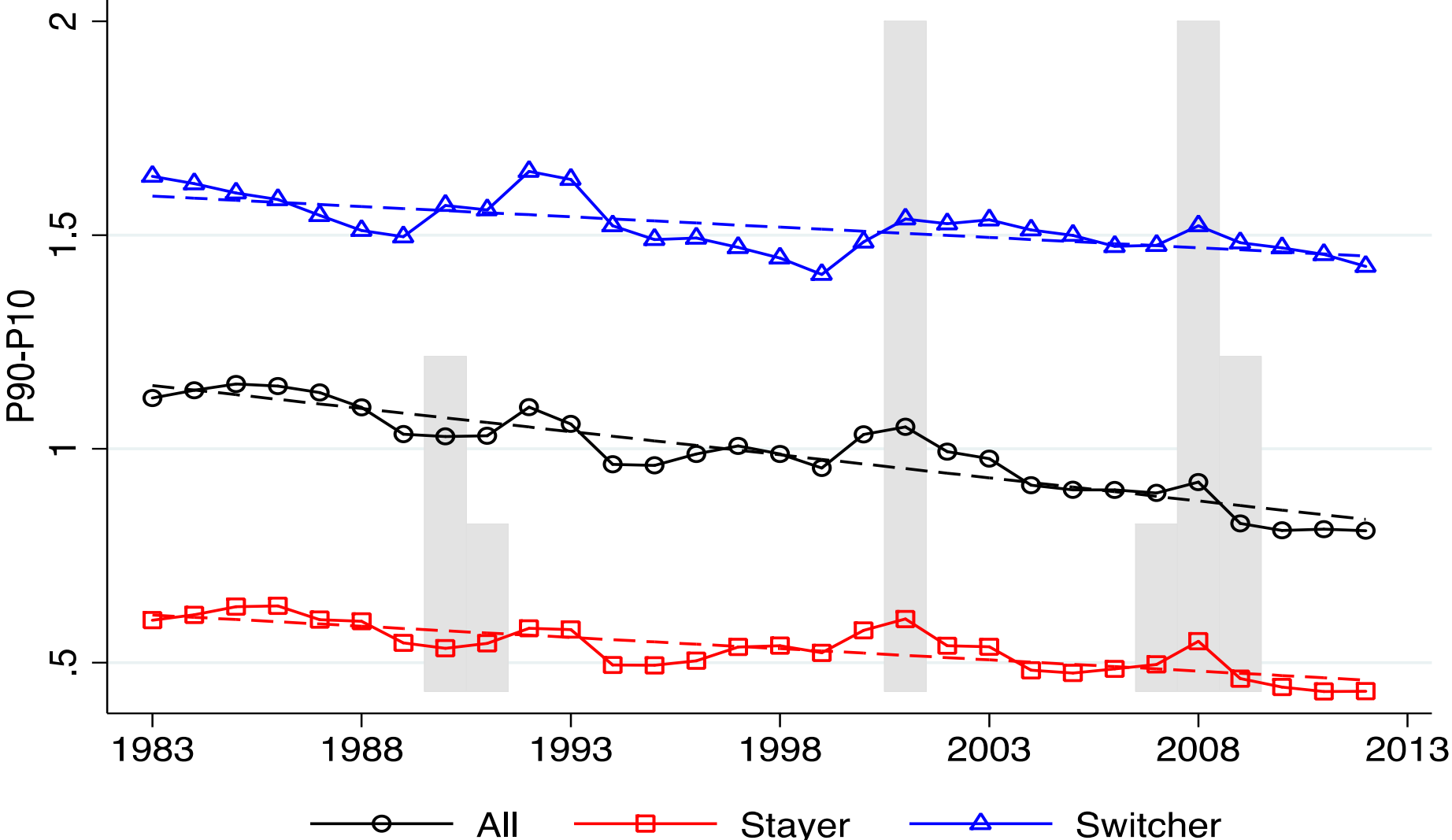


By Firm Size



By Stayer/Switcher Employee

Dispersion of Growth Rate of Earnings



Bloom, Guvenen, Pistaferri, Sabelhaus, Salgado, and Song. "The Great Micro Moderation"

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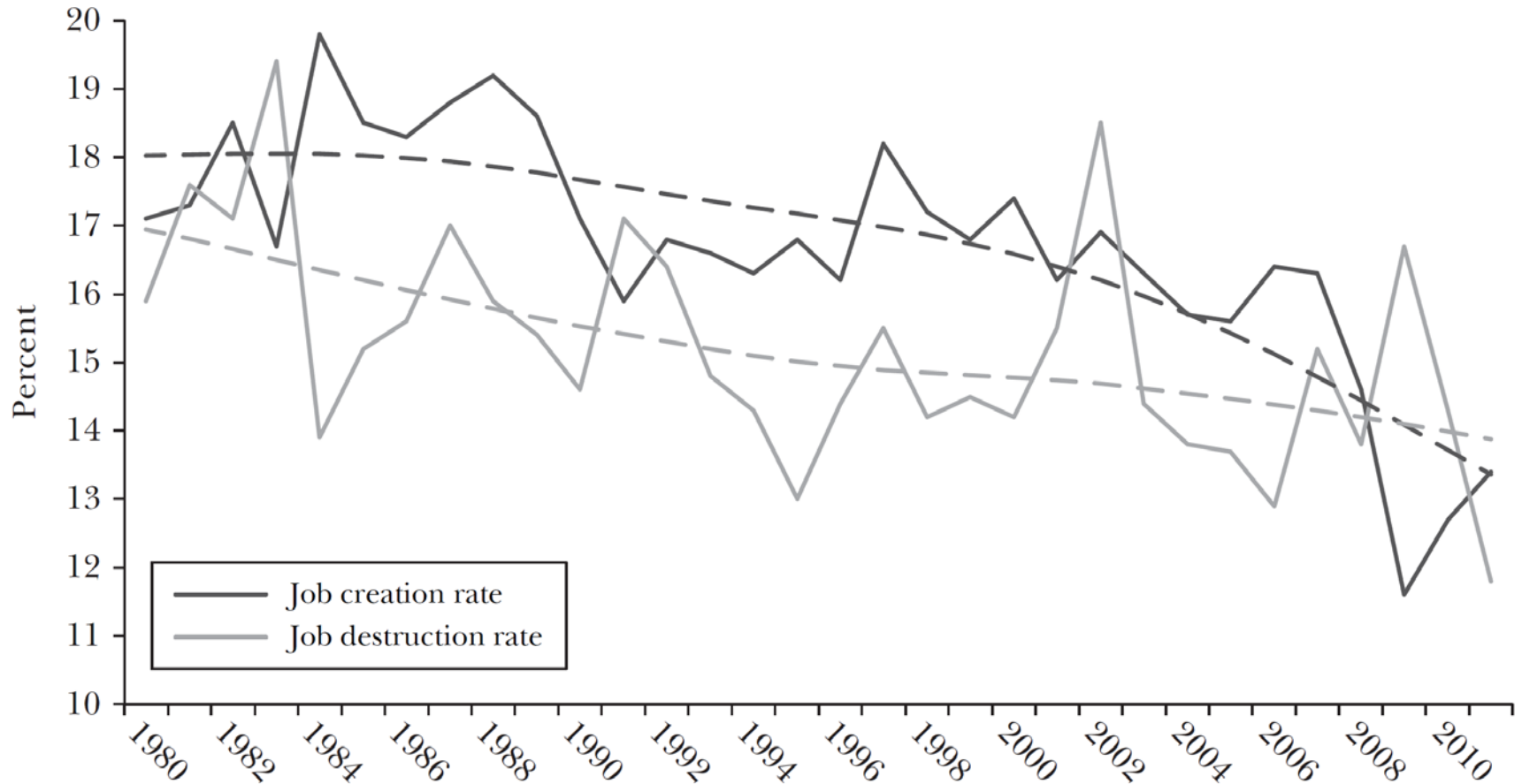
Declining Firm Volatility

Firm and Worker Volatility

Recent papers show falling job creation and destruction rates – Census data

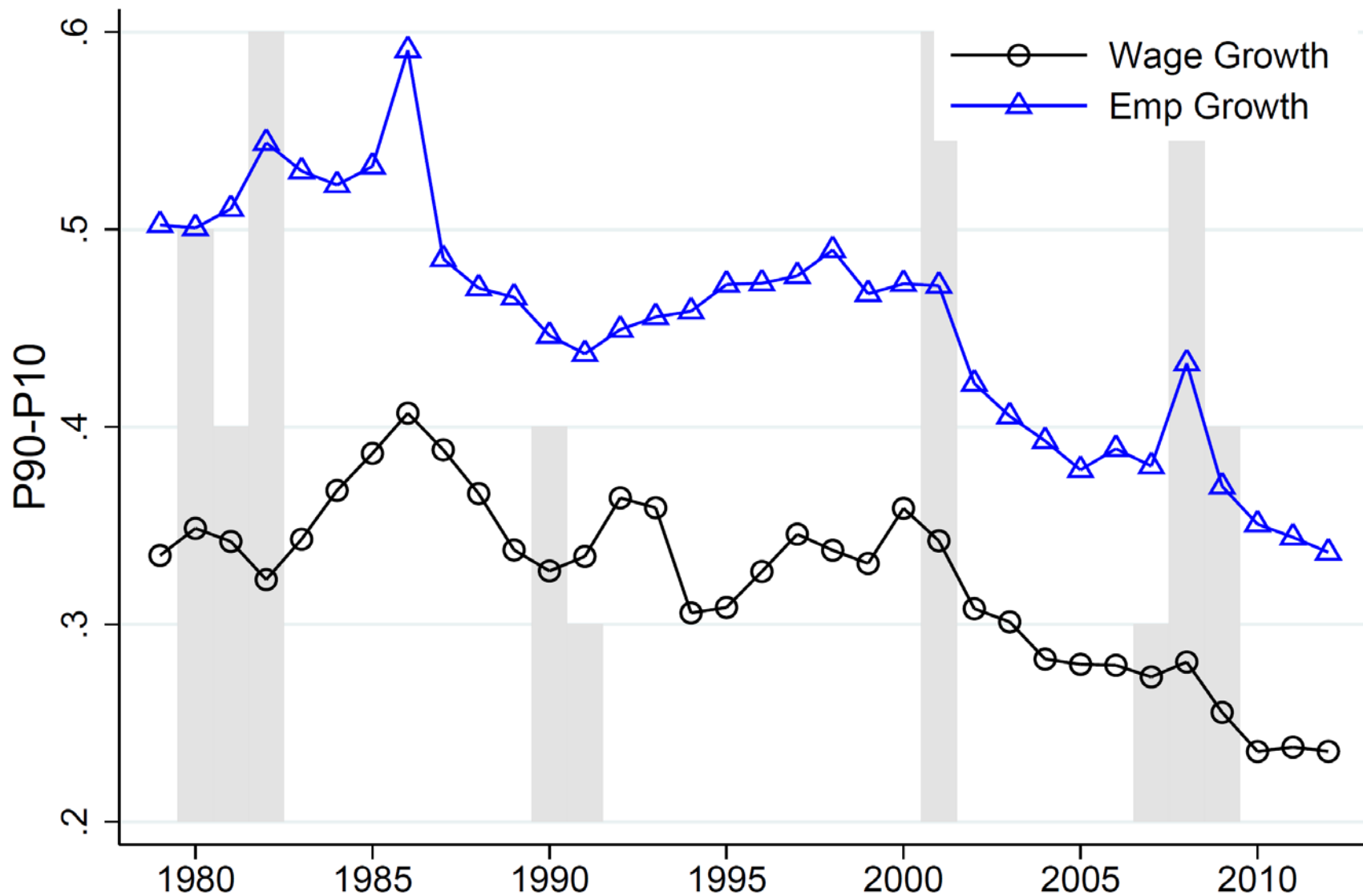
Figure 3

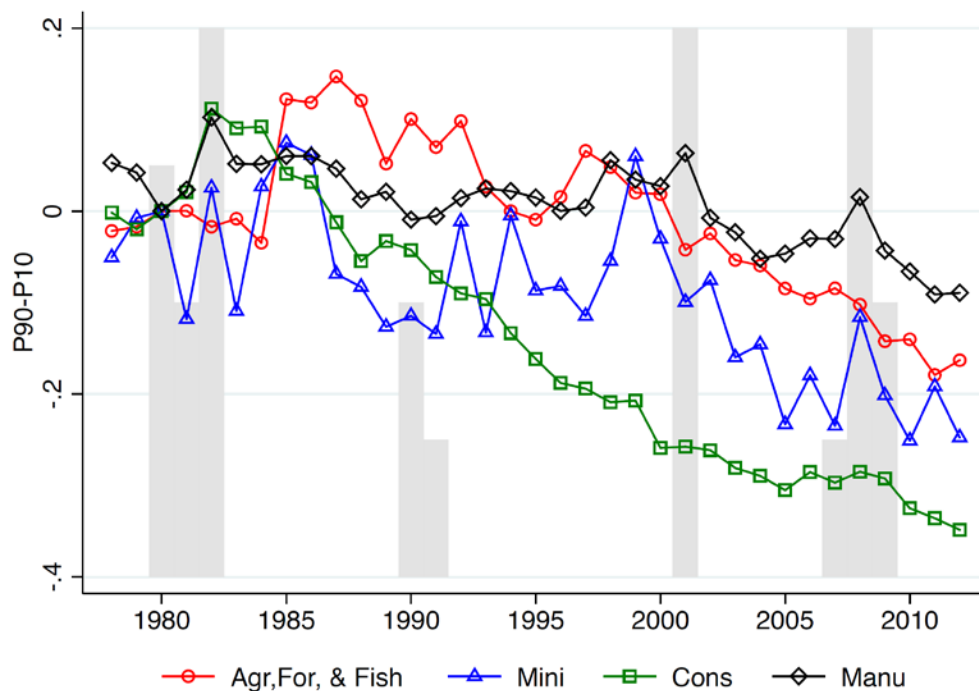
US Annual Job Creation and Destruction Rates, 1980–2011



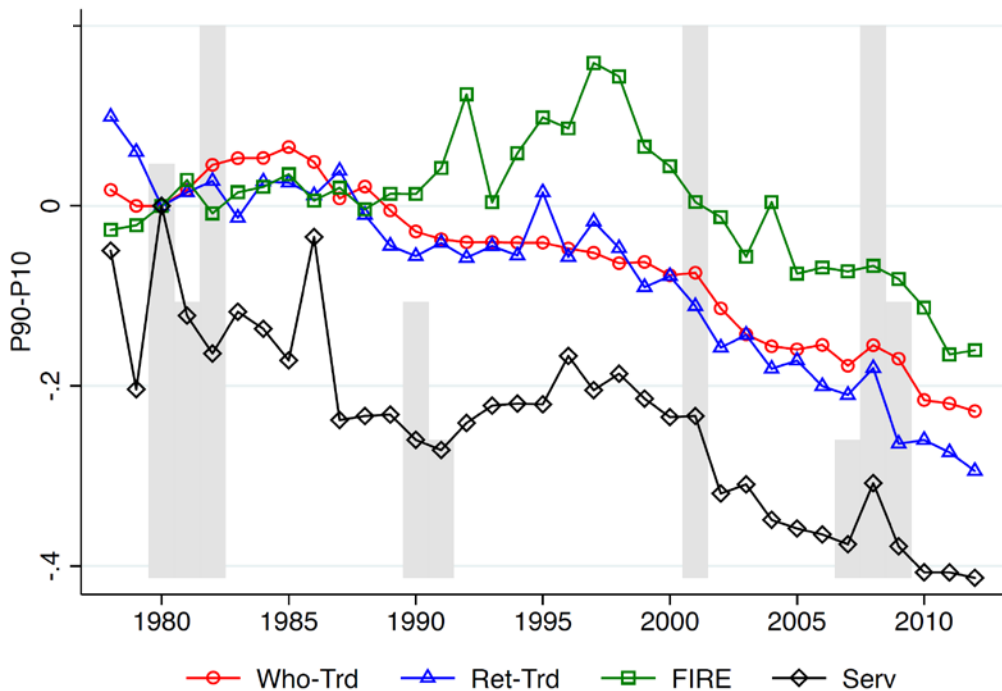
We show a related result – declining firm volatility

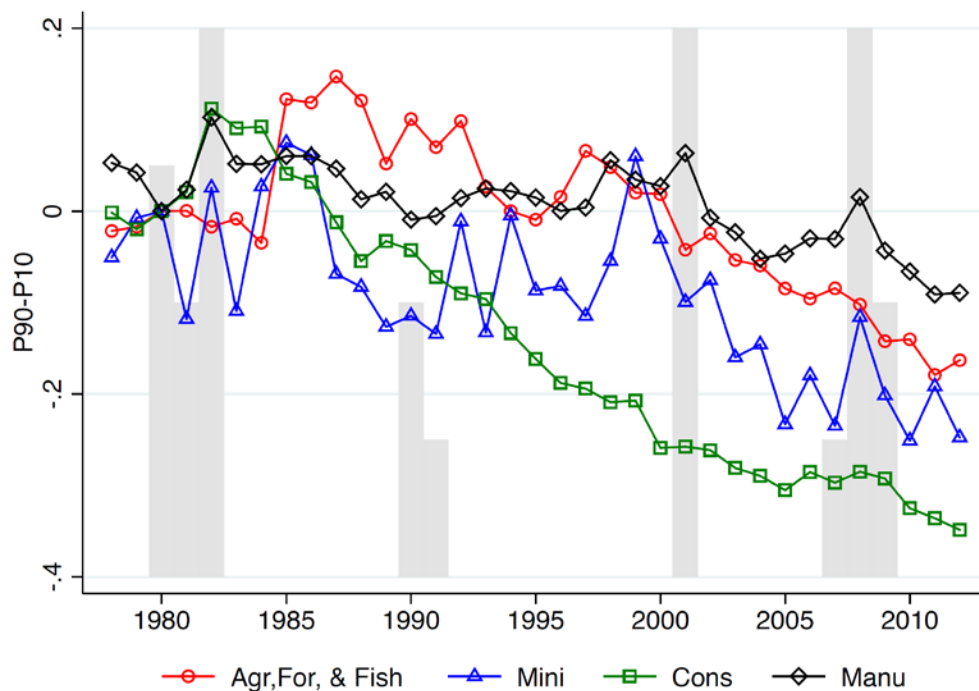
Dispersion of 1yr log-change



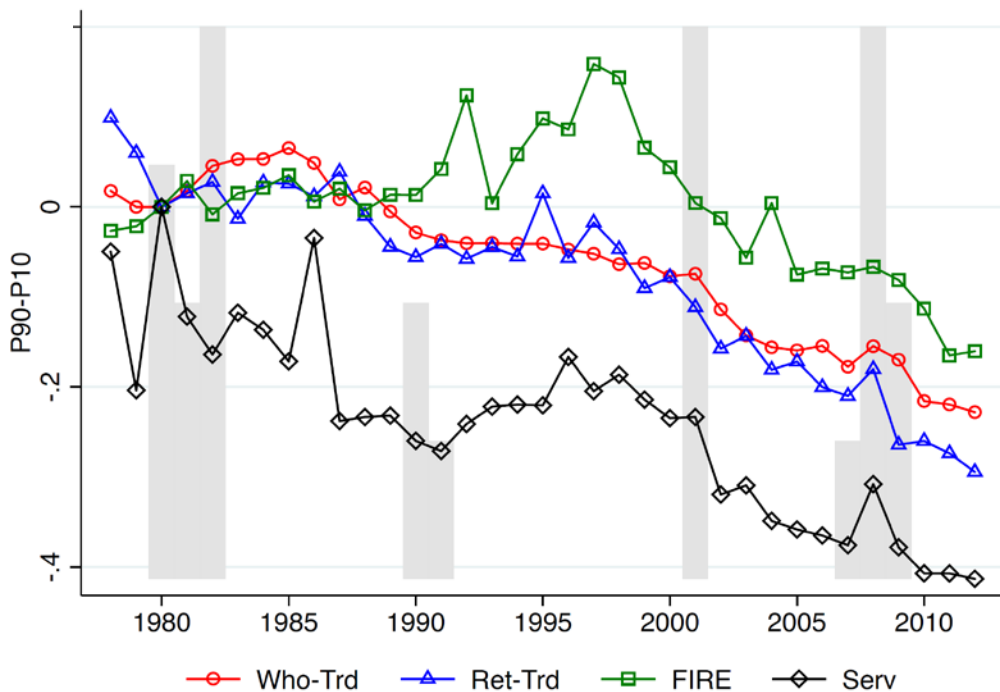


Broadly true across industries
 (manuf. and FIRE partial exceptions)





Broadly true across industries
 (manuf. and FIRE partial exceptions)



- Similar evidence from [LBD](#)

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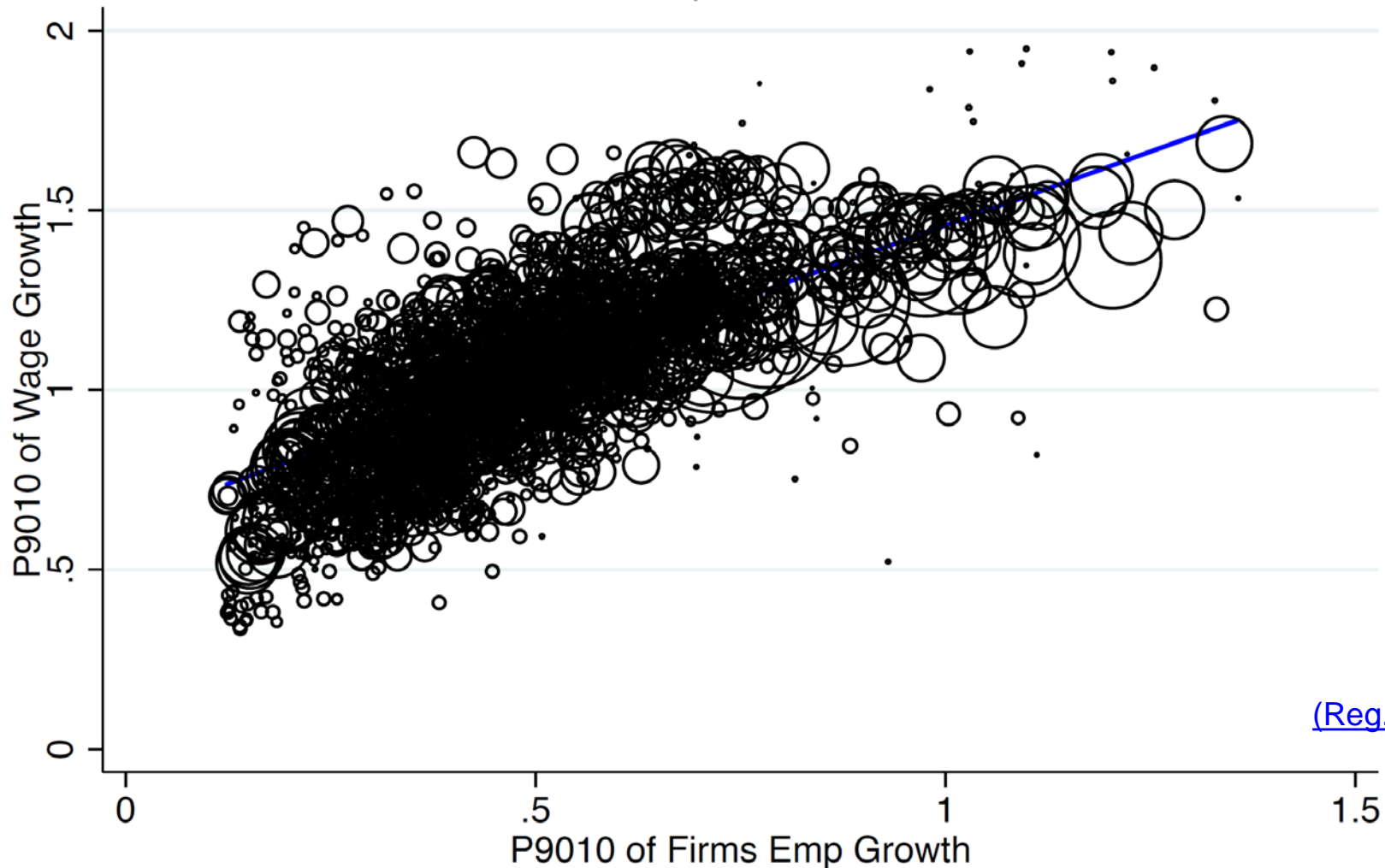
Are declining worker earnings volatility and firm employment volatility connected?

- Not obvious...
- **Potential positive link:** rent sharing and performance evaluation schemes to share risk (*Katz, 1994 - discussing Gottschalk and Moffitt; Lemieux et al., 2009; Comin et al., 2009; among others*).
- **Potential negative link:** firms shift risk onto workers (*Davis and Khan, 2008*)

In the data *positive* correlation of declining earnings and employment variance by industry-year

Dispersion of Firms Emp Growth and Workers Wage Growth - 2 digit SIC

Slope: 0.82



Also see a tight relationship at the firm level (preliminary analysis)

$$x_{j,t} = \beta \sigma_{j,t}^f + \alpha_j + \delta_\tau + \epsilon_{j,t},$$

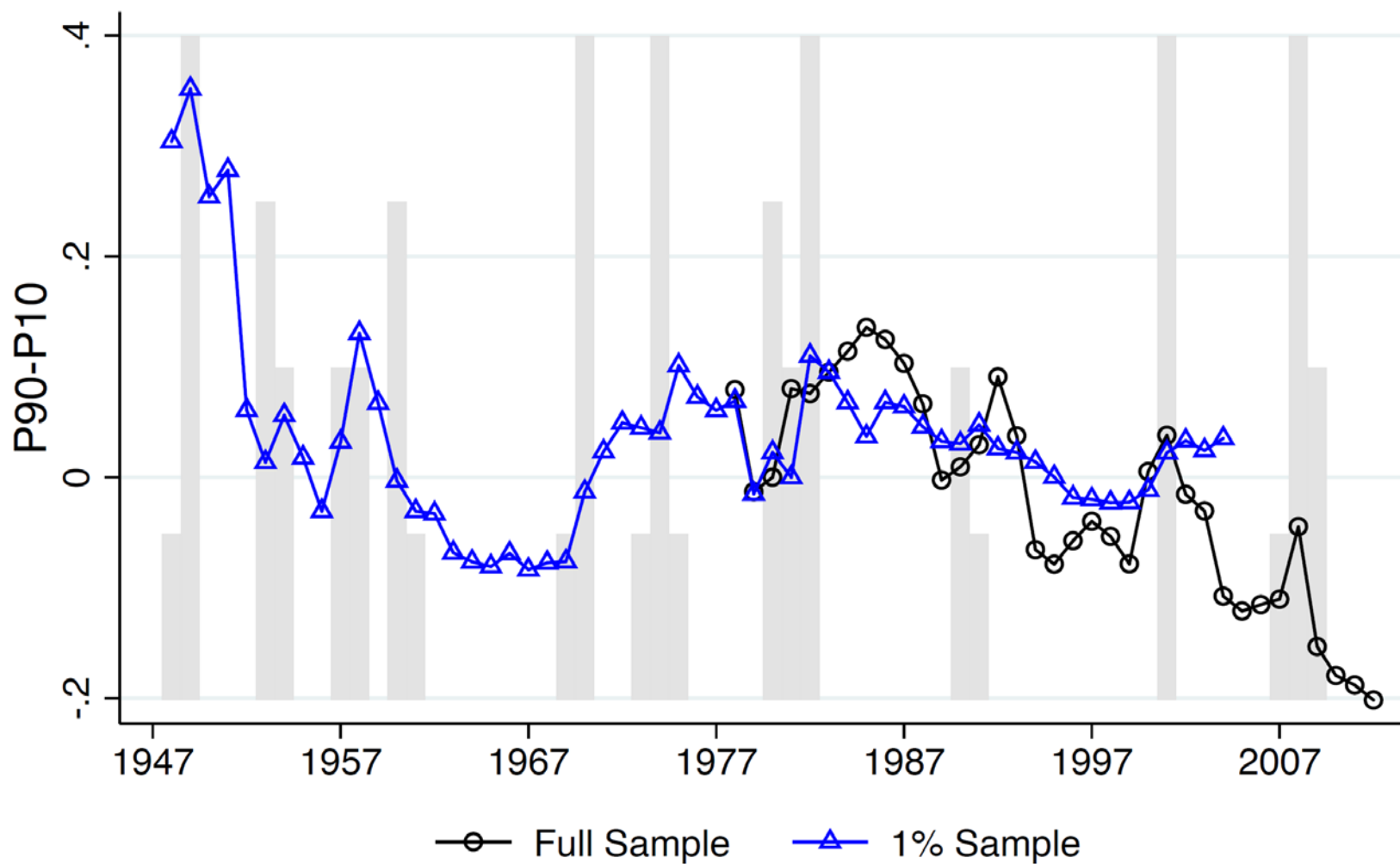
Average worker earnings
volatility in firm j in the 5
years until period t

Average firm j employment
volatility in the 5 years until
period t

	All Workers			Only Continuers		
β	.147 (.00016)	.142 (.00016)	.093 (.00015)	.199 (.00021)	.189 (.00021)	.195 (.00024)
R^2	0.10	0.11	0.67	0.10	0.12	0.5
N	8.2M	8.2M	8.2M	8.2M	8.2M	8.2M
Year FE		Y	Y		Y	Y
EIN FE			Y			Y

The long view: 1947 to 2012

P9010 of Wage Growth Distribution -- Men
Rescaled to 1980



Conclusions

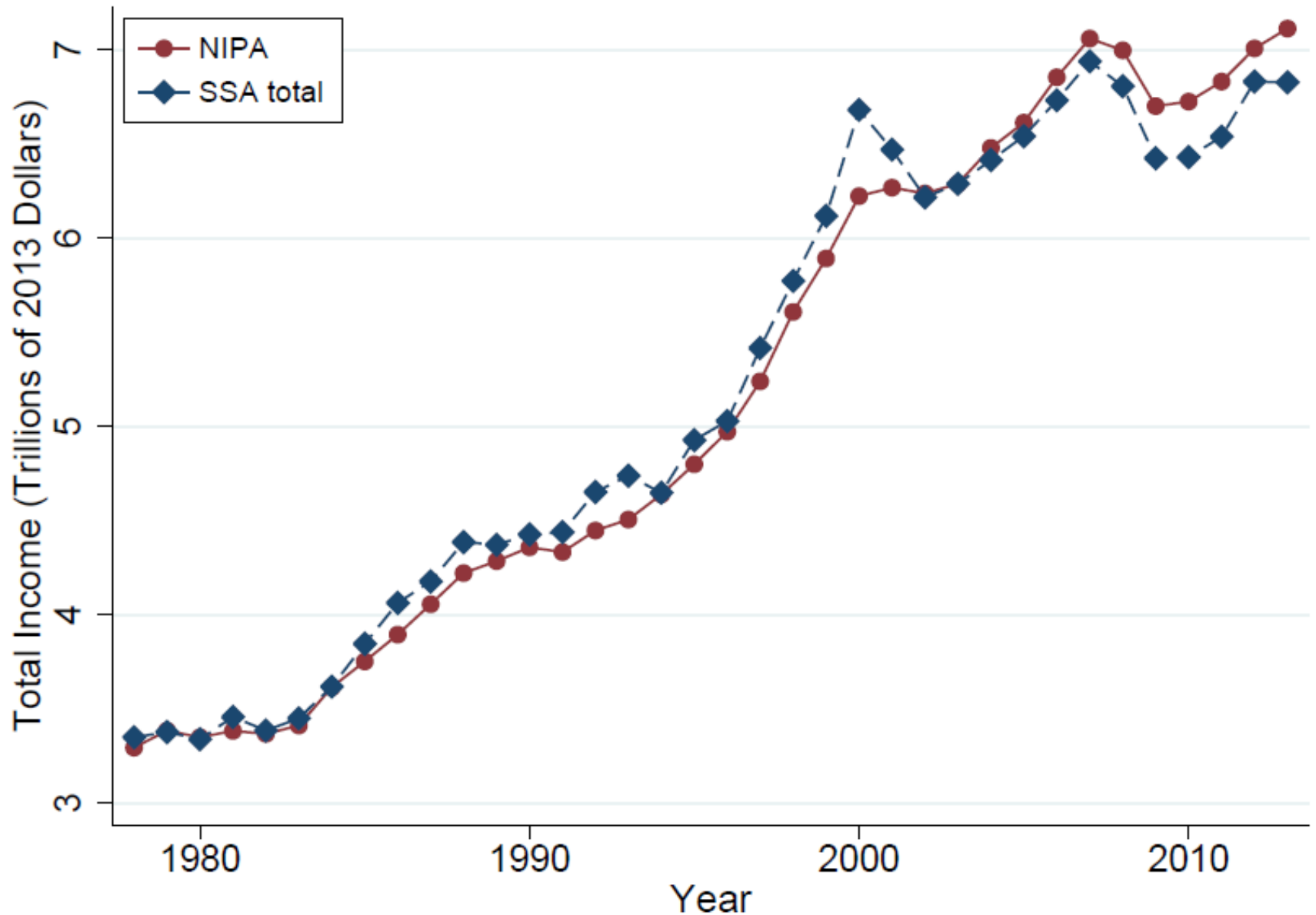
1. Evidence of a US Great Micro Moderation since mid-1980s
 - Earnings growth volatility down by about 1/3
 - ❑ Results hold for the vast majority of subgroups we analyzed – no obvious compositional shift story
 - ❑ “Downside risk” seems to have declined (at least) as much as “upside potential”. A pessimistic story not very evident (yet!)
 - Firm employment growth volatility down by about 1/3
 - Regression analysis shows these two trends are related

Next steps

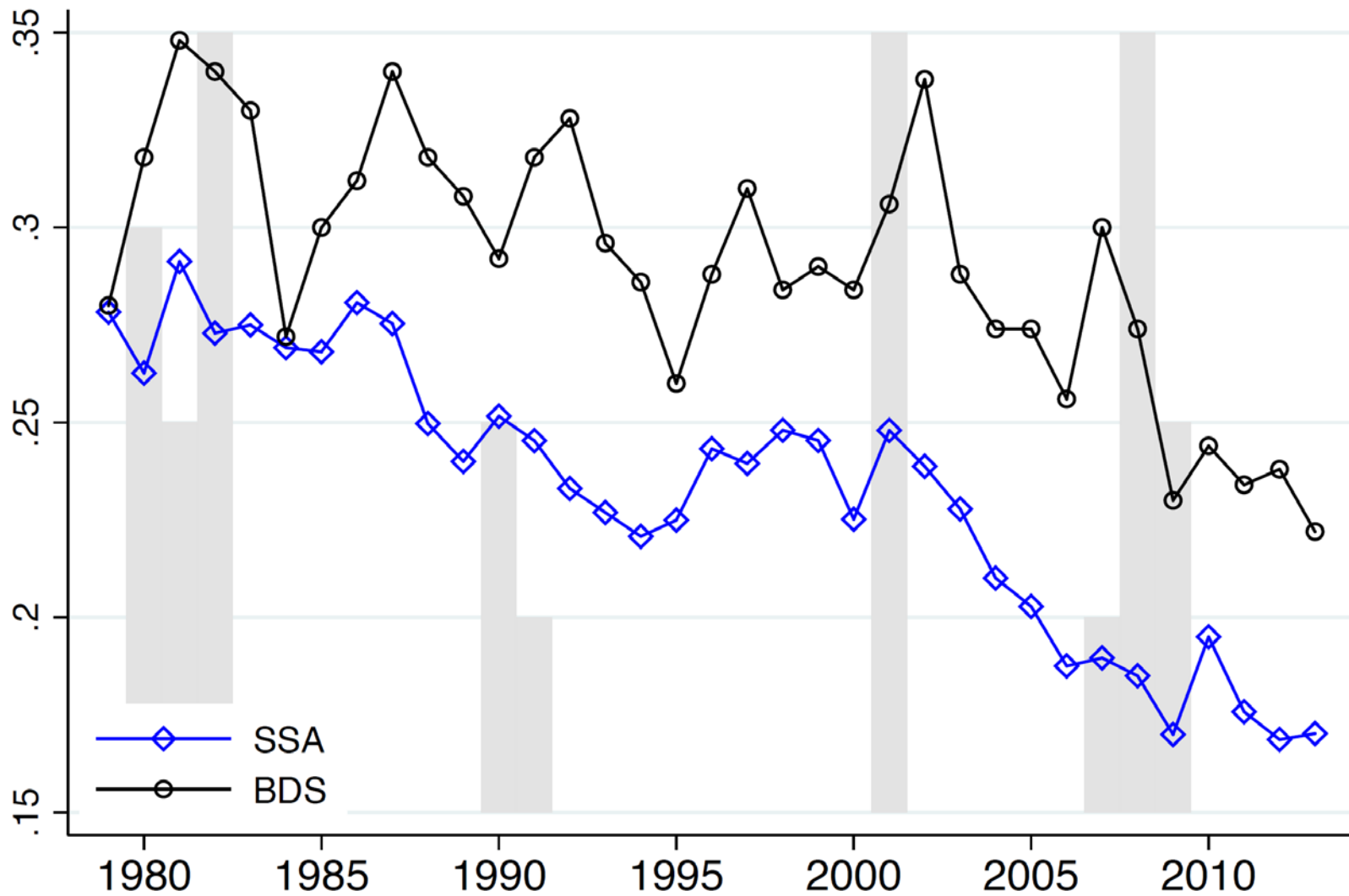
- ❑ Firm-to-worker impact: Go beyond controlling for simple sorting?
- ❑ Link to great **macro** moderation?
- ❑ Reconcile admin vs. survey evidence?
- ❑ Look at *firm* volatility back to 1947 ([Prelim.](#))
- ❑ Investigate international evidence (SITE conference) ([UK](#))

THANKS!

SSA aggregates up to NIPA (small differences due to accruals vs cash-flow accounting)

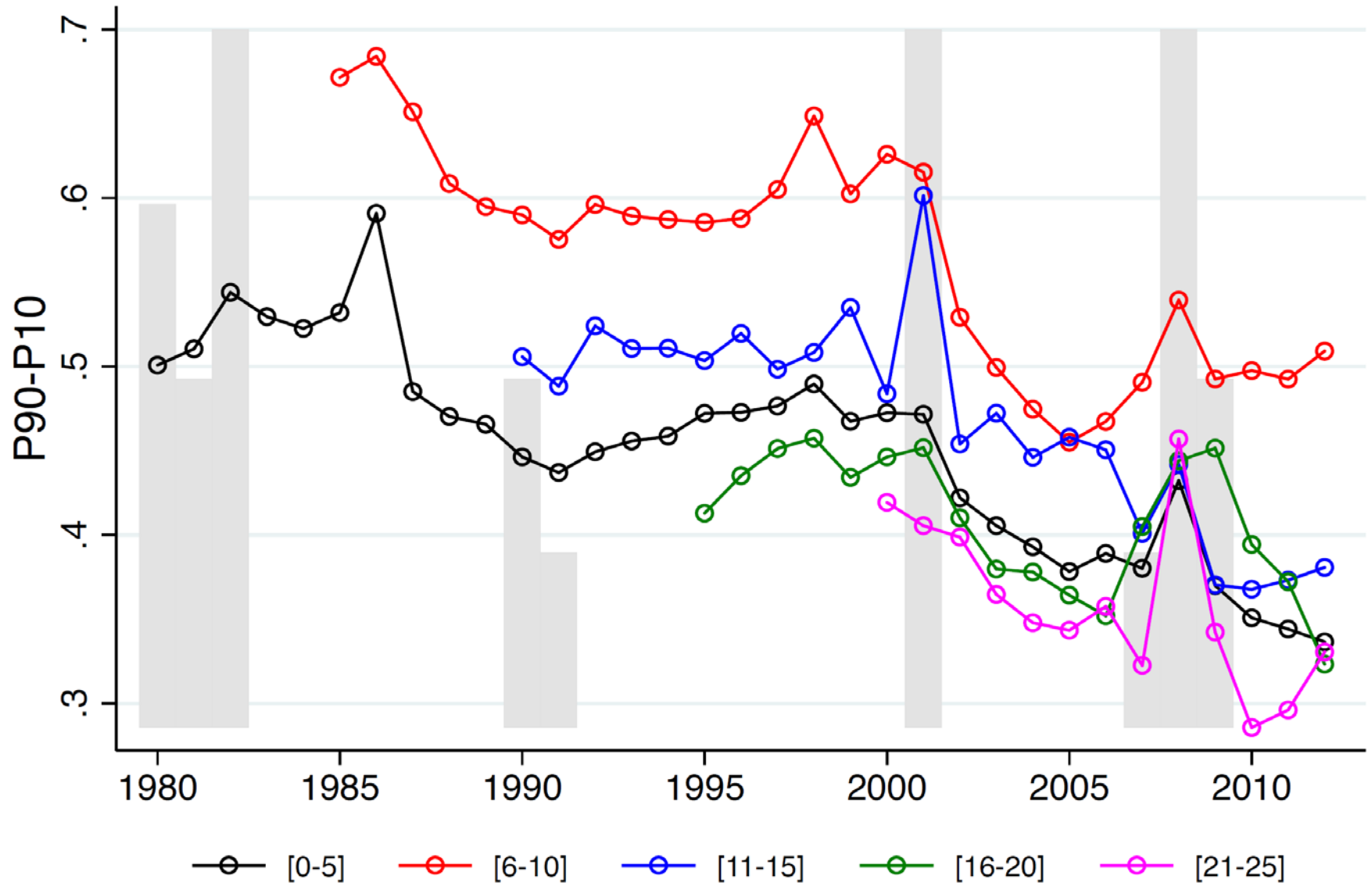


Job Reallocation Rate



That is robust to the usual checks – e.g. firm age

Dispersion of the Growth Rate of Employment



What is an **EIN** (Employer Identification Number)?

Any firm with an employee (so issues a W-2) must have an EIN

Bureau of Labor Statistics uses the EIN as its definition of a firm

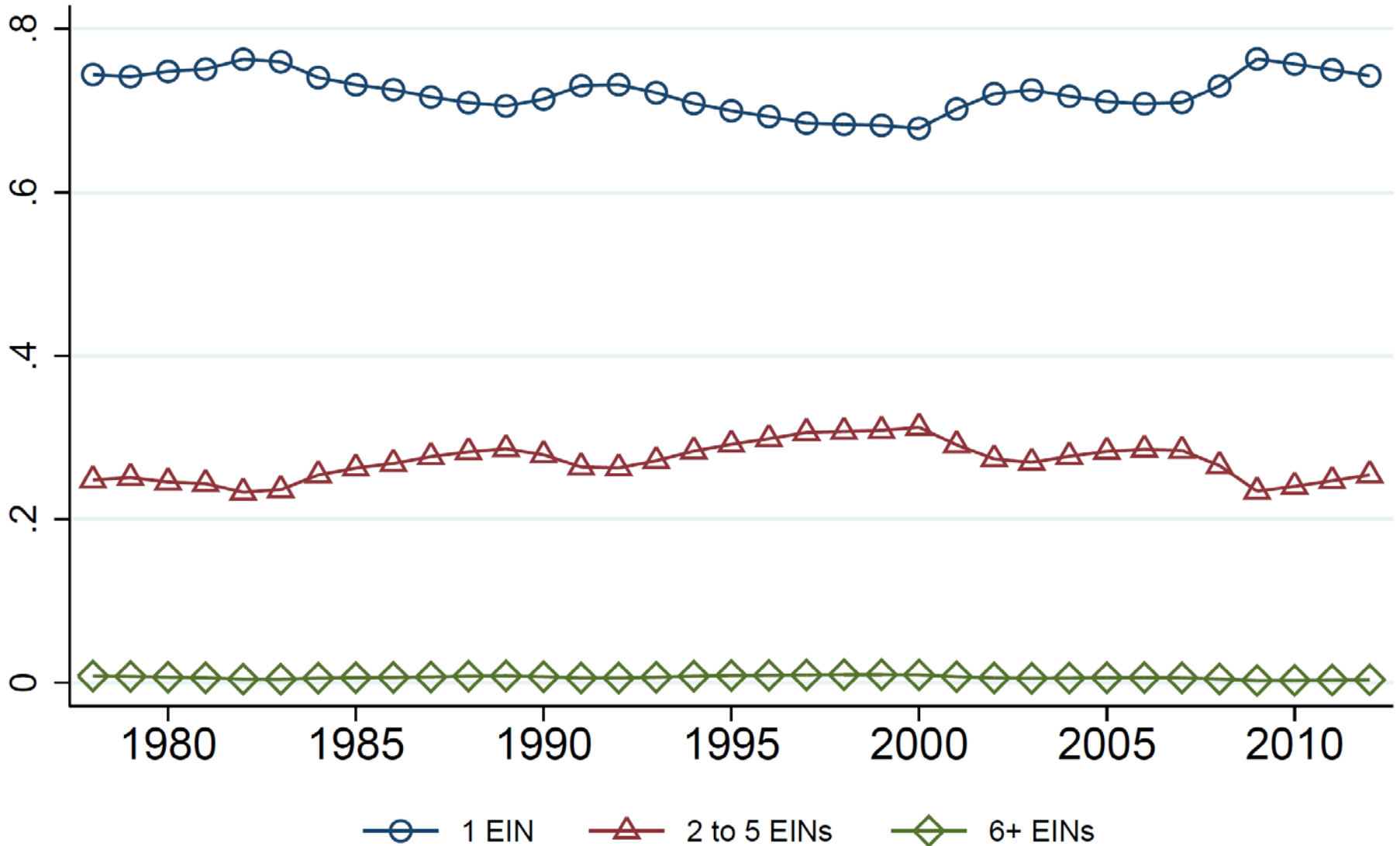
Many organizations have one (e.g. Facebook, Walmart Stores)

Others have many, e.g.

- Stanford has 4 EINs (1 for the university, 1 for each hospital and 1 for the bookstore)
- The 6165 public companies in D&B have 19,969 EINs

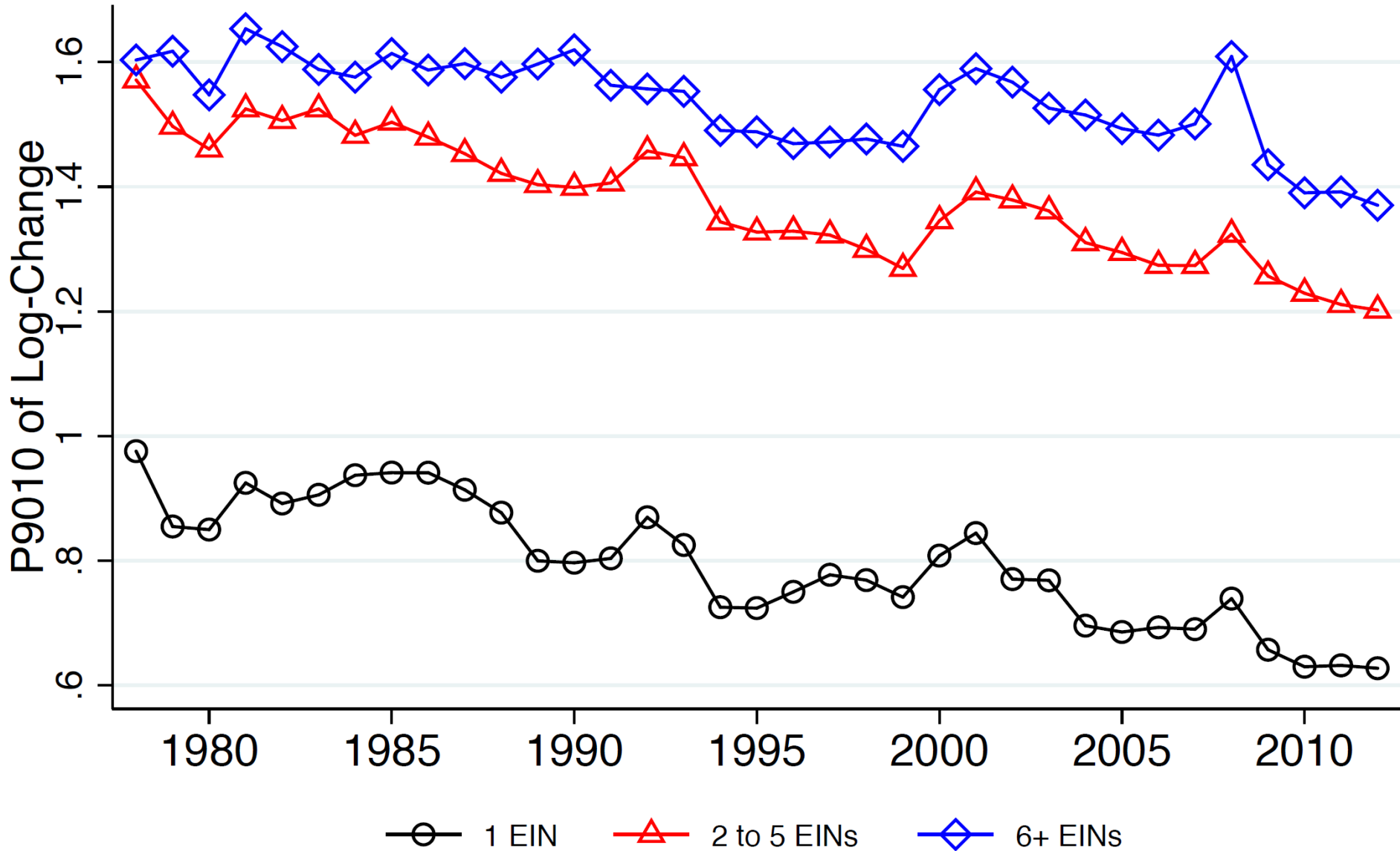
Shares of Workers by Number of EINs

Total Number of EINs in 1-year

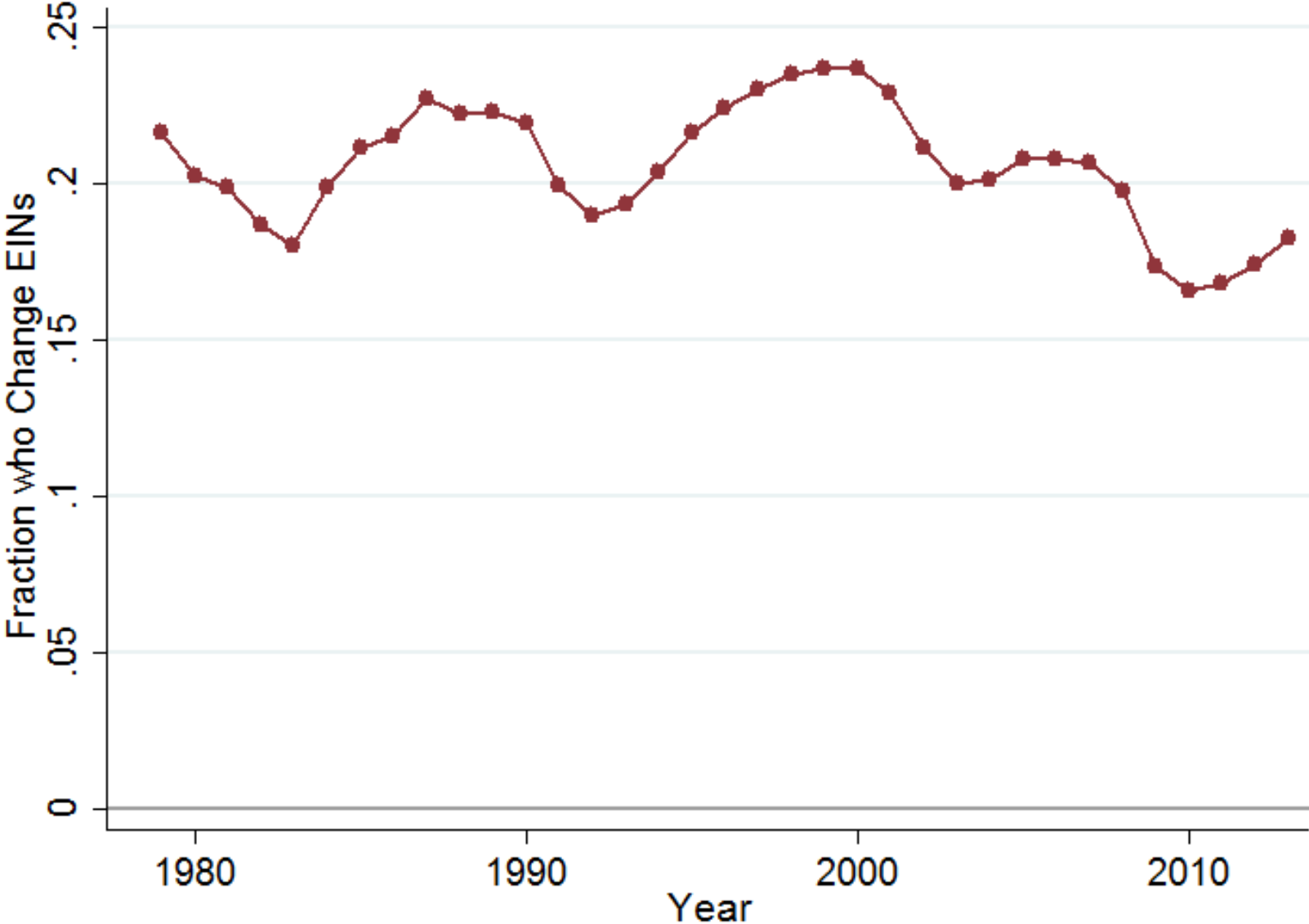


P9010 of 1-year Earnings Growth - by Number of EINs

Total Number of EINs in 1-year

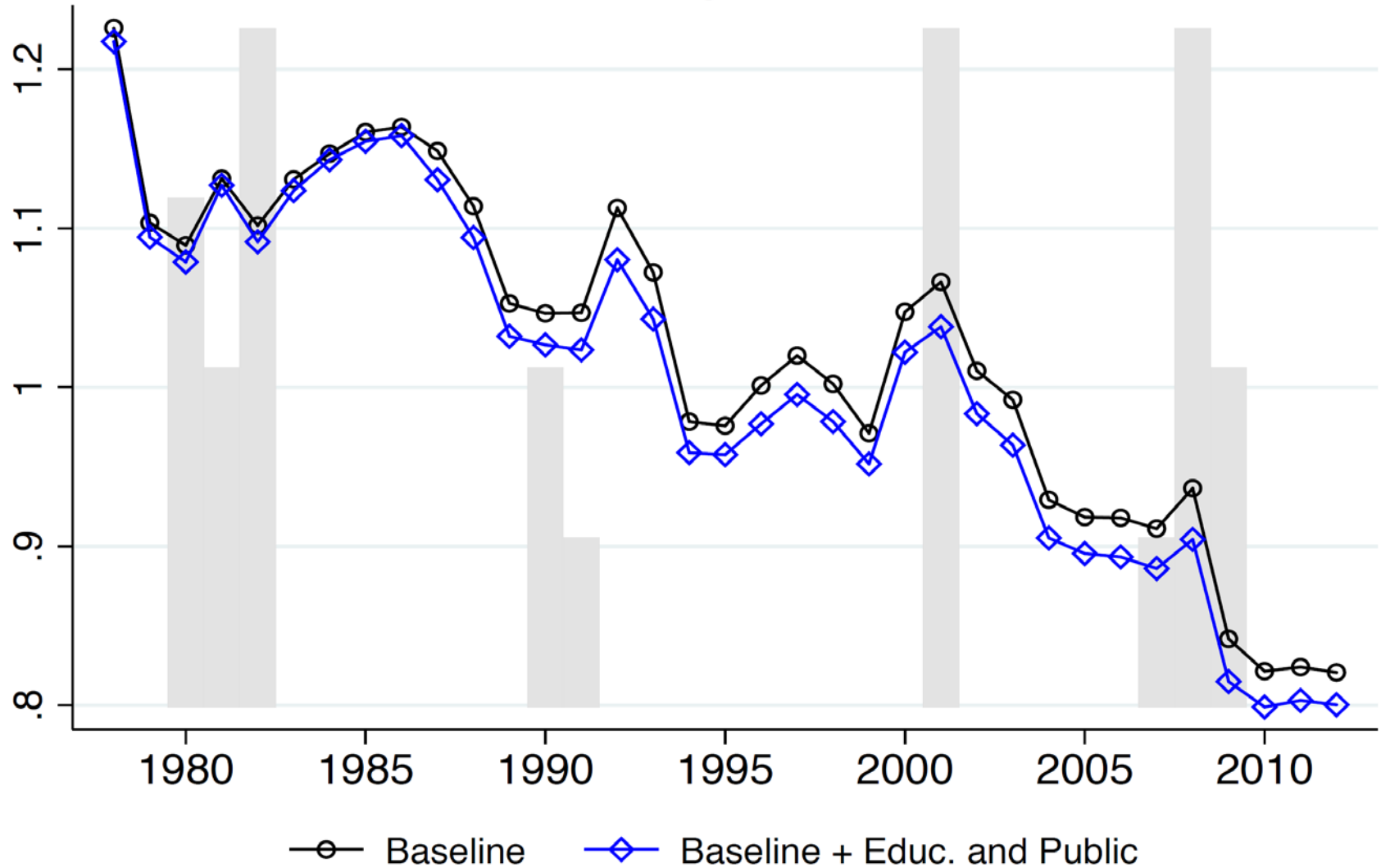


Job churn - SSN-EIN match change - is flat/falling, in the SSA annual data



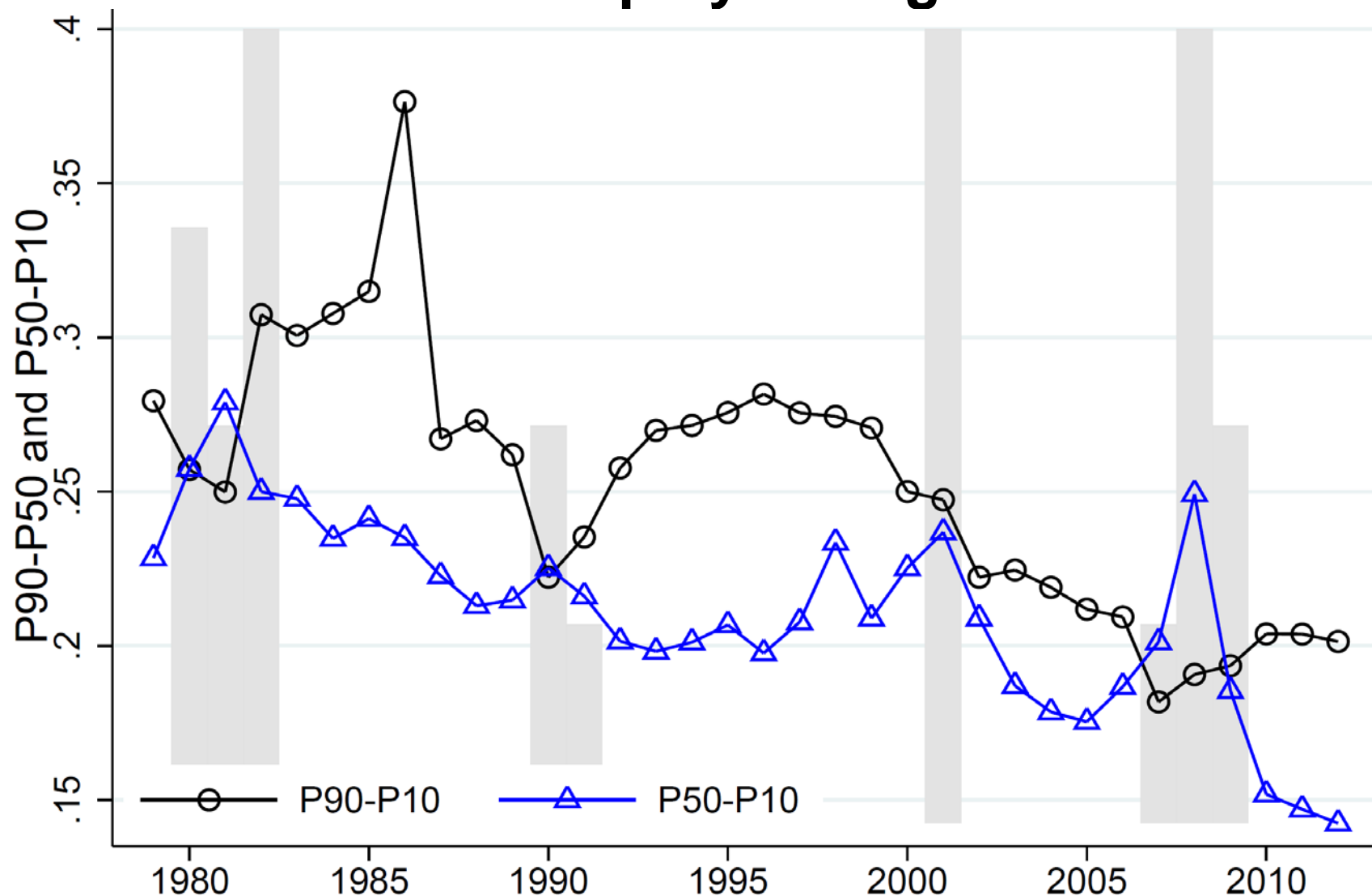
With and without Public and Education

Dispersion of Wage Growth -- P9010

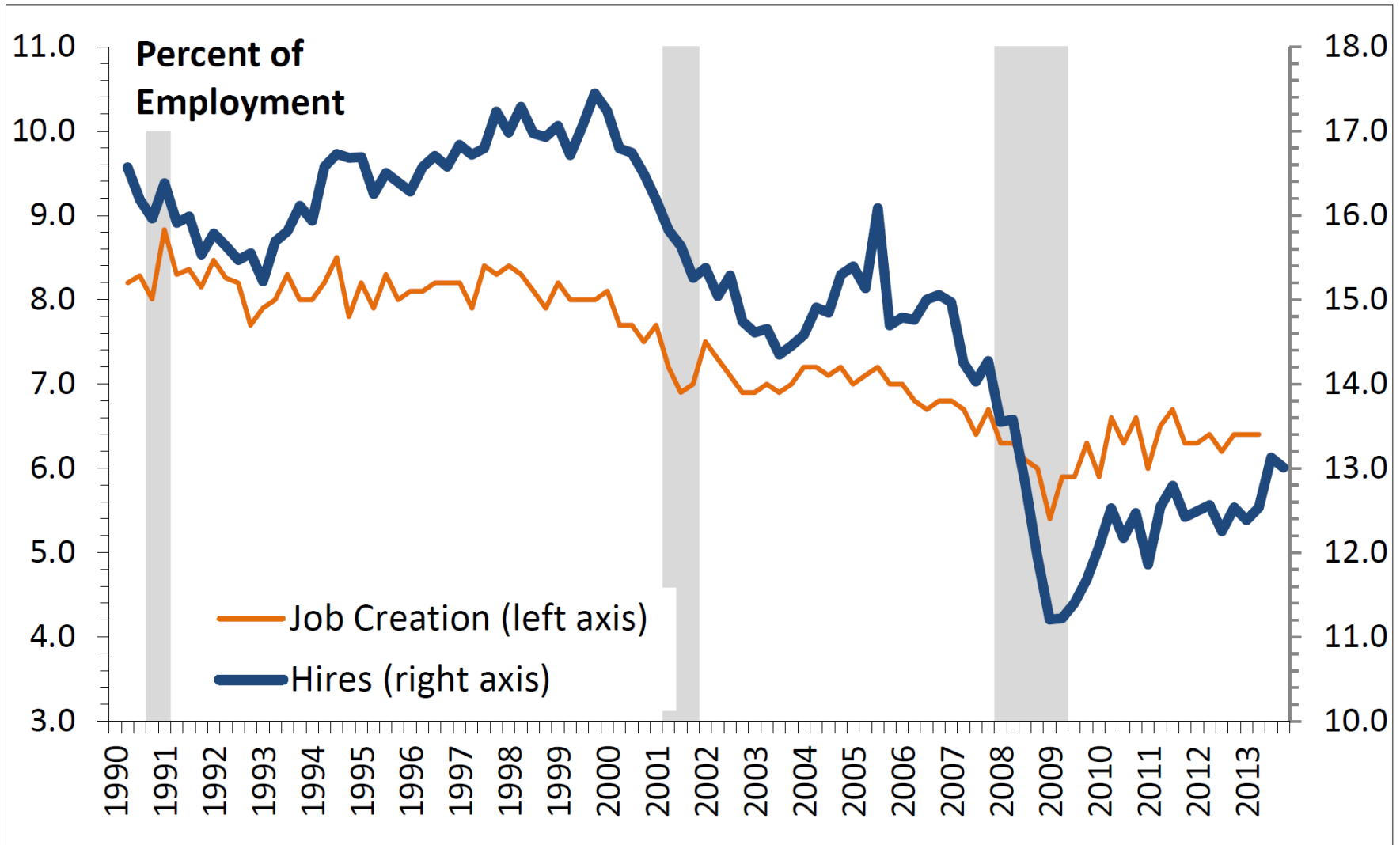


[Back](#)

And as with earnings see a rise in left skew in recessions in firm employment growth

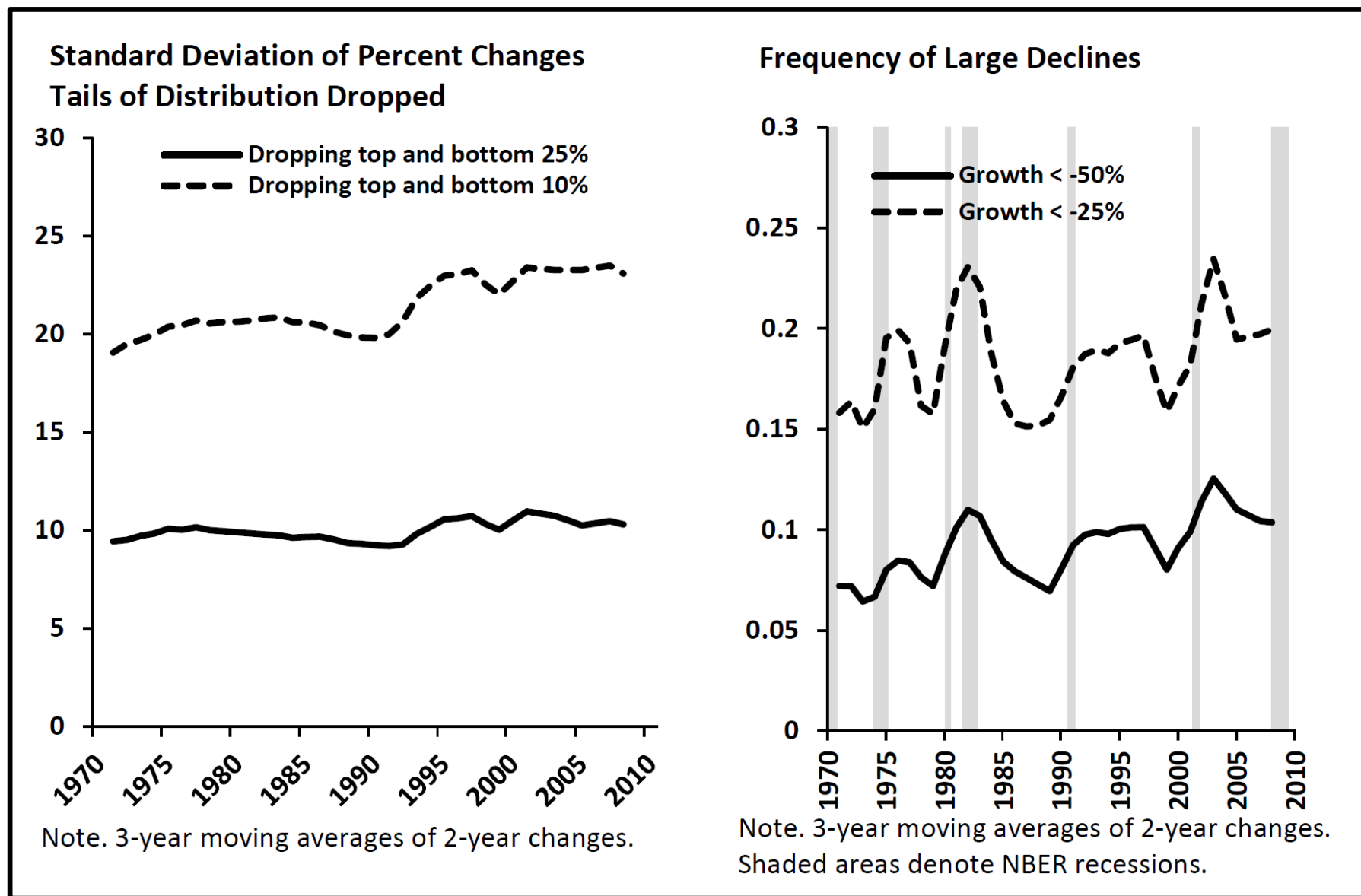


Papers show “declining dynamism” (falling firm creation and destruction) – BLS data



Source: Davis and Haltiwanger (2014)

PSID rising variance heavily driven by tails



Source: Dynan, Elmendorf and Sichel (2012)

PSID, 1968 characteristics by attrition status

	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)

[Back](#)

Lower response quality shows up in rising item (rather than survey) non-response

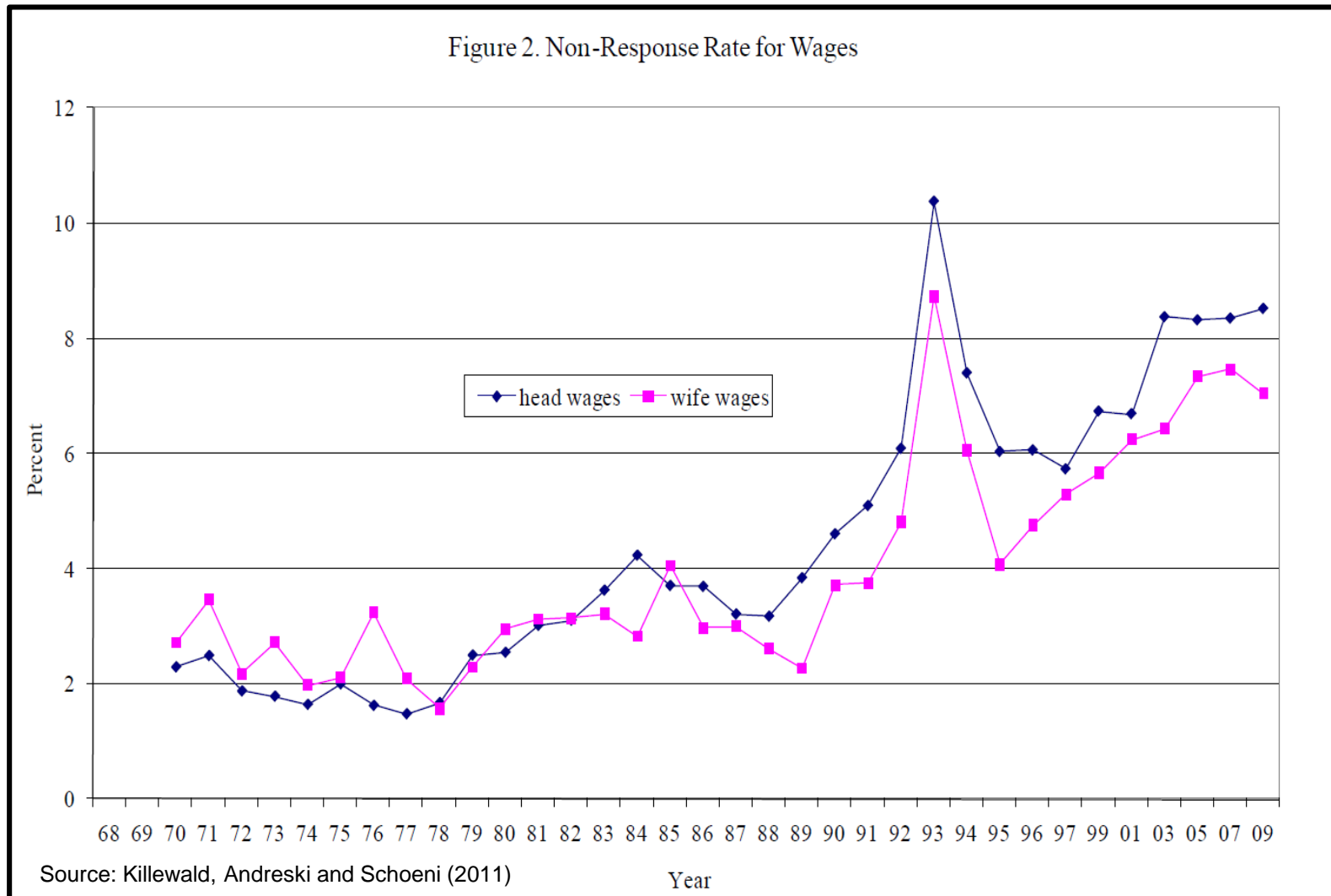
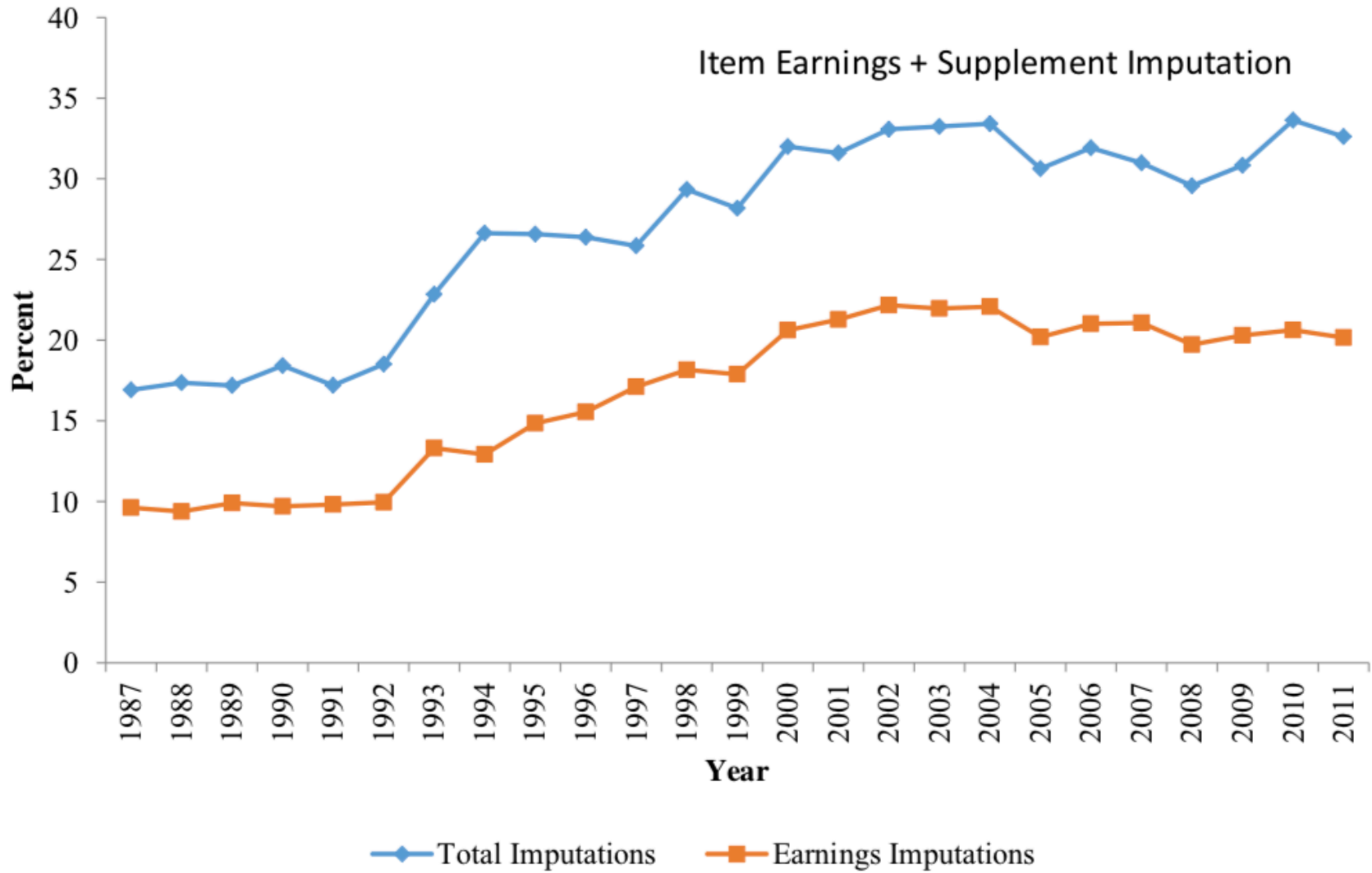
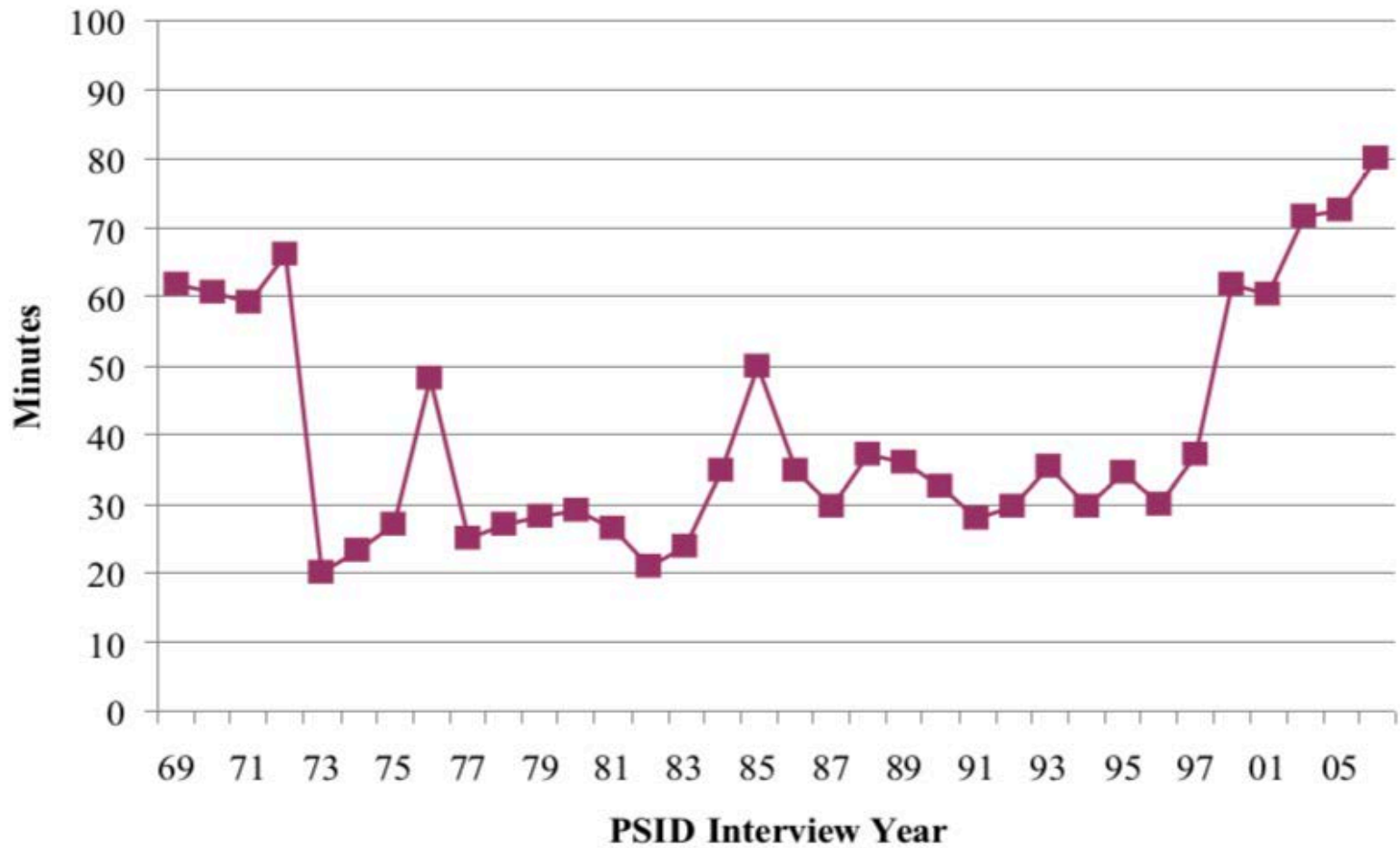


Figure 1: Trends in Item and Total (Item + Supplement) Earnings Imputations in the ASEC



Source: Bollinger et al (2014)

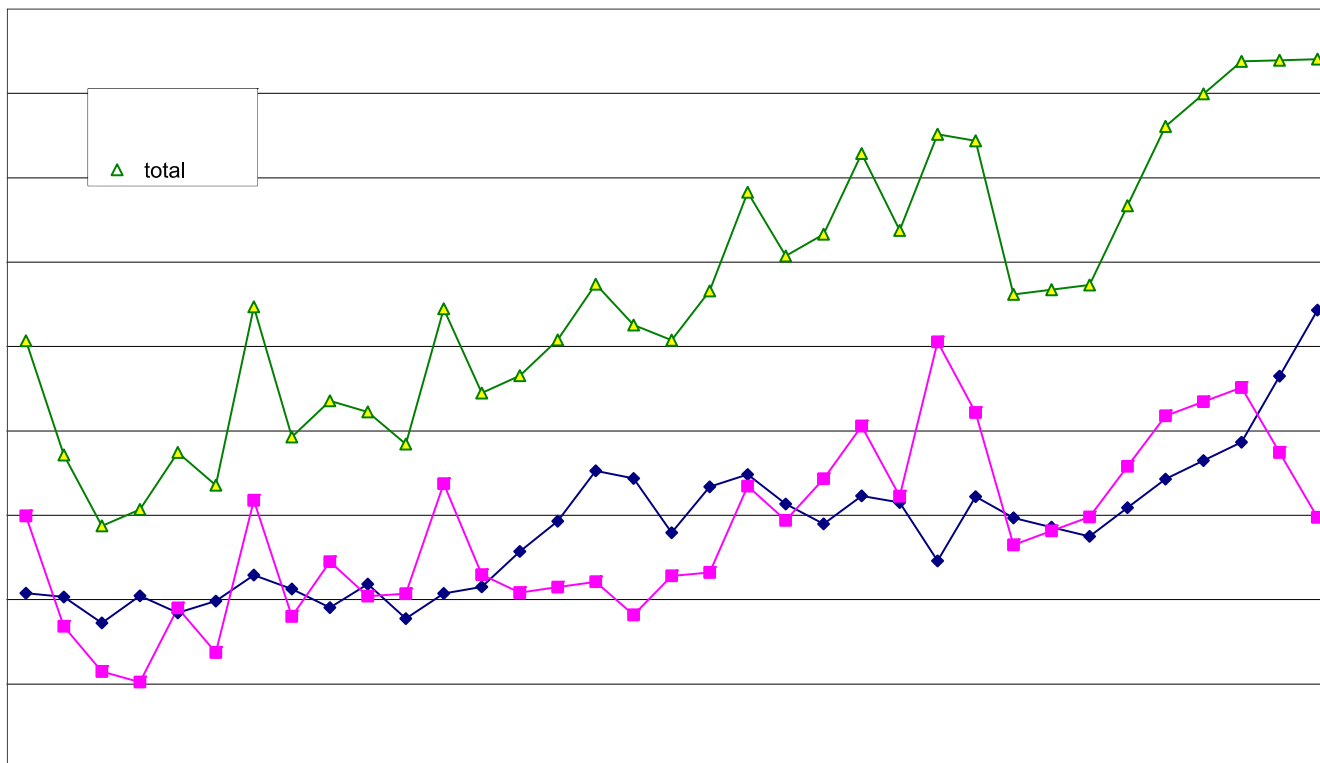
Figure 1. Mean interview length: PSID, 1969-2007



Source: Andreski-Schoeni, PSID Technical Paper #11-04

Rising earnings volatility in PSID (Moffitt-Gottschalk (2012))

Std Dev of 2-year log income change

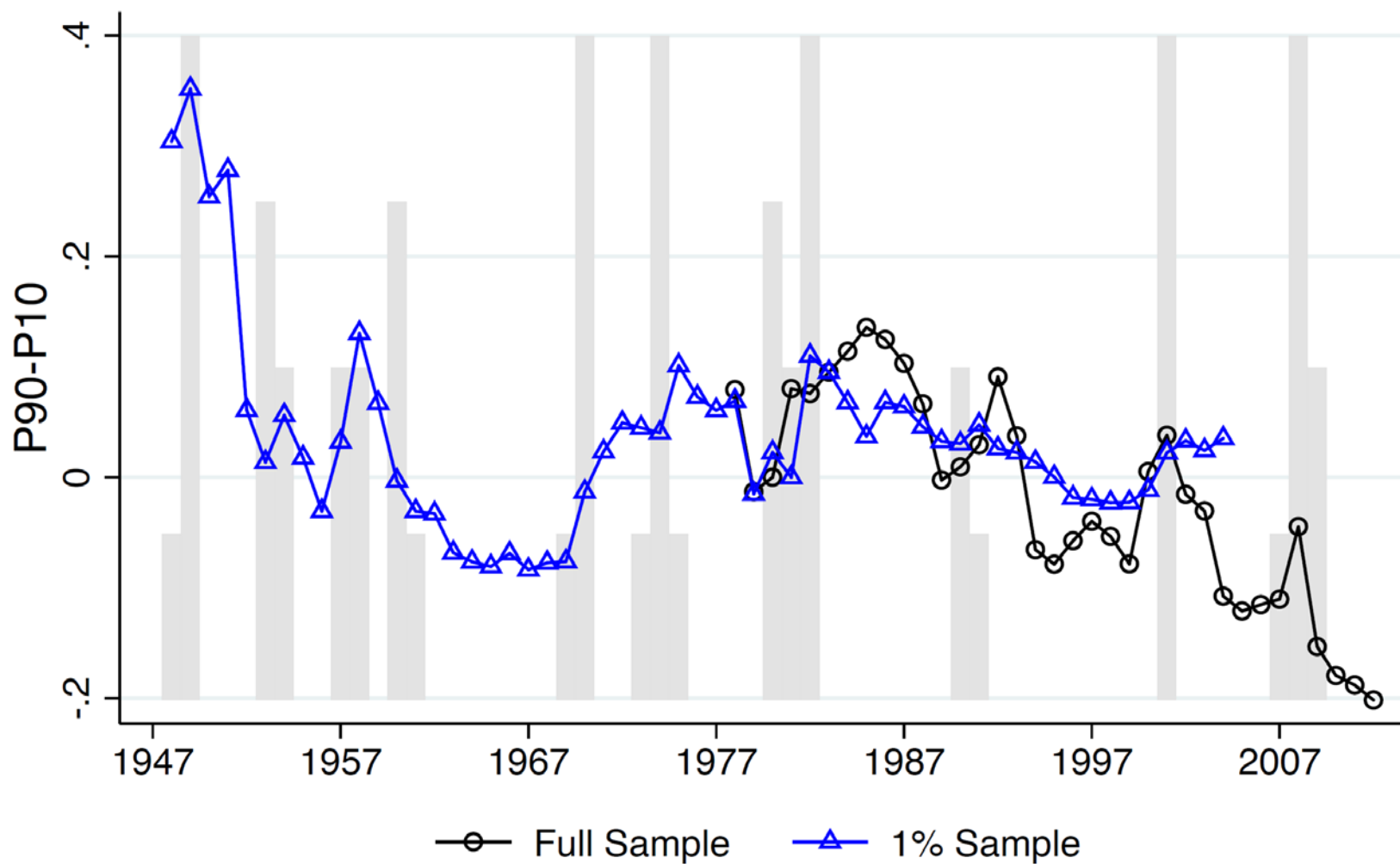


Notes: Moffitt-Gottschalk (2012, JHR)

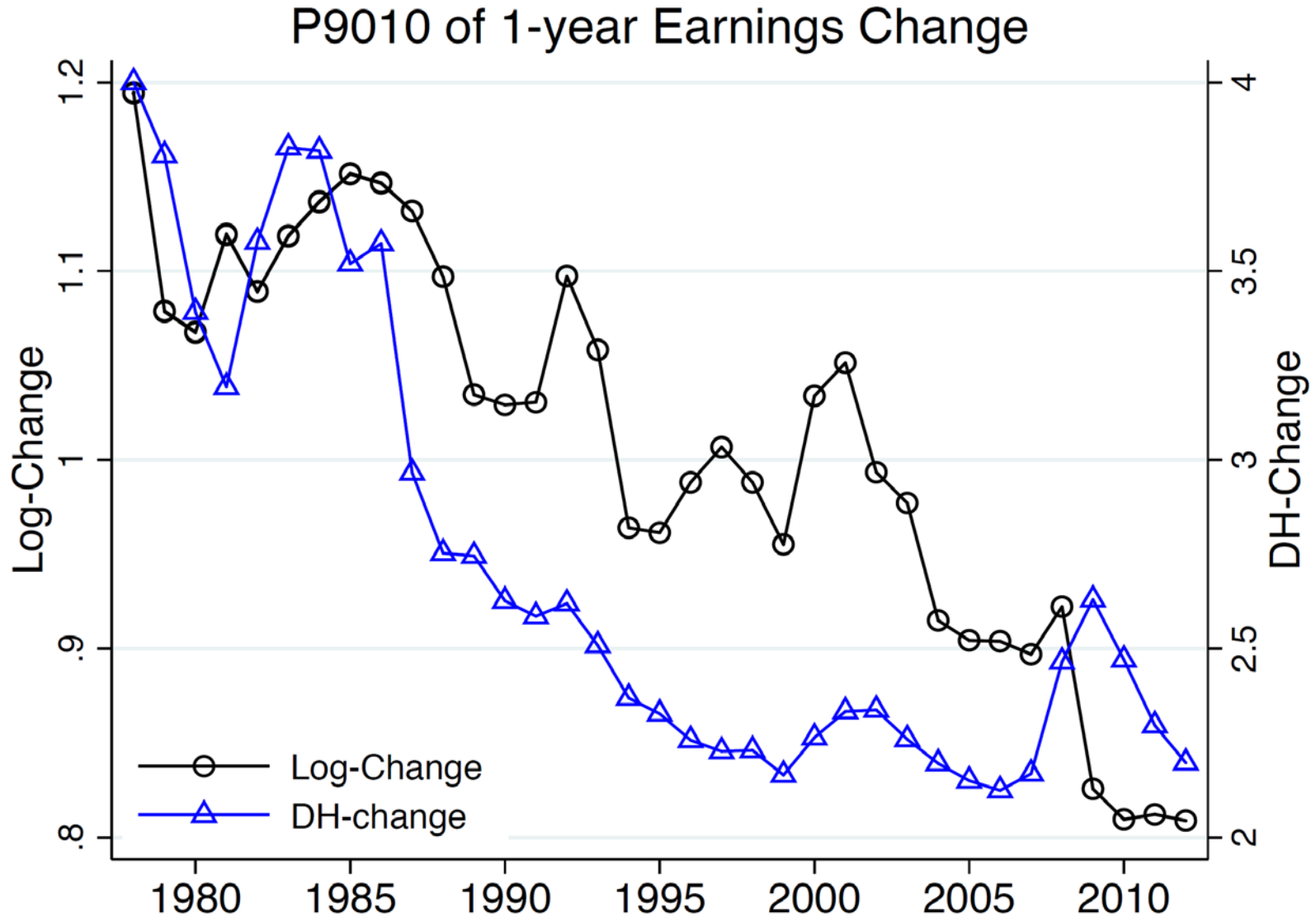
[Back](#)

The long view: 1947 to 2012

P9010 of Wage Growth Distribution -- Men
Rescaled to 1980

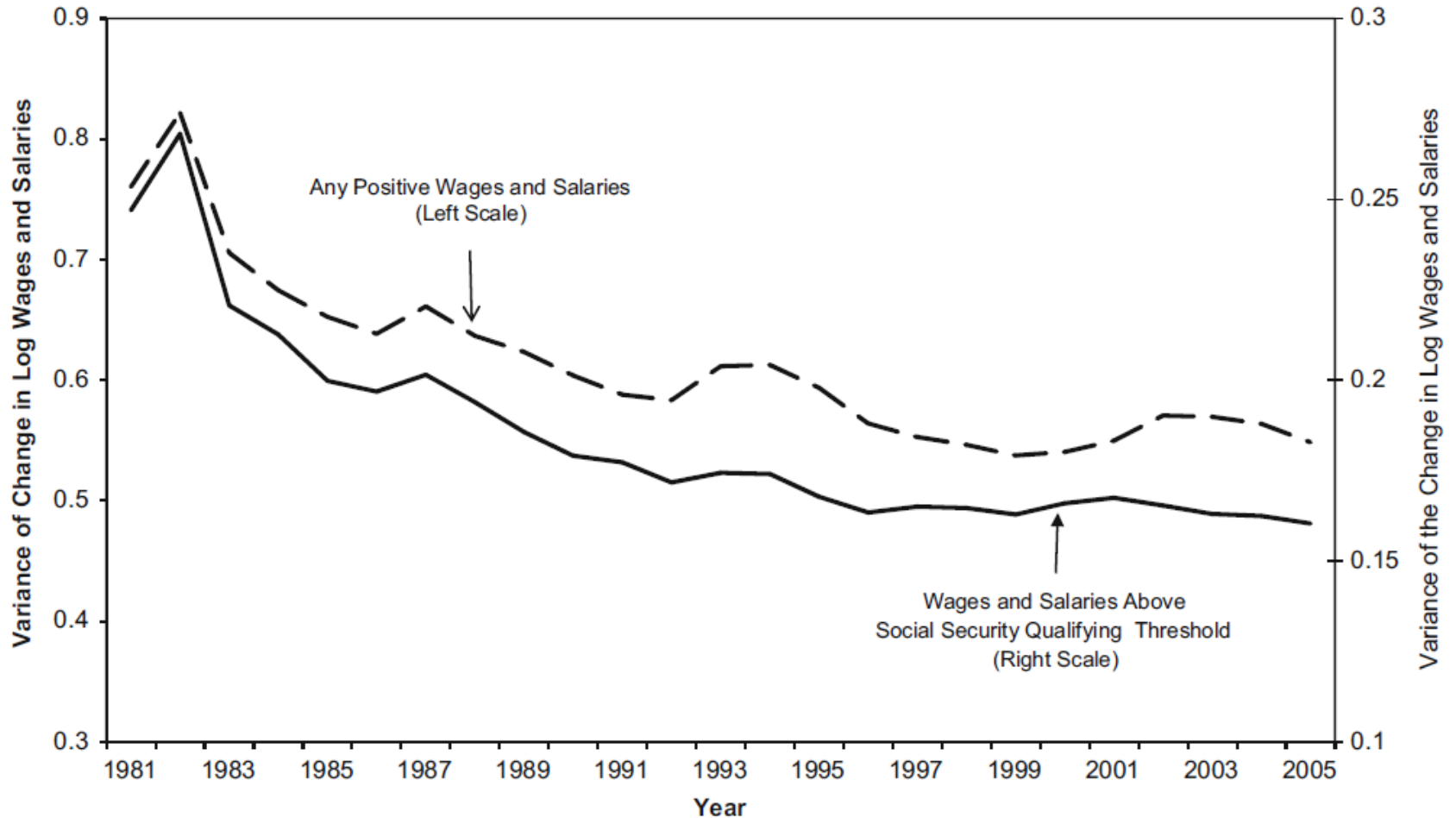


Volatility Declines **Allowing for Extensive Margin**

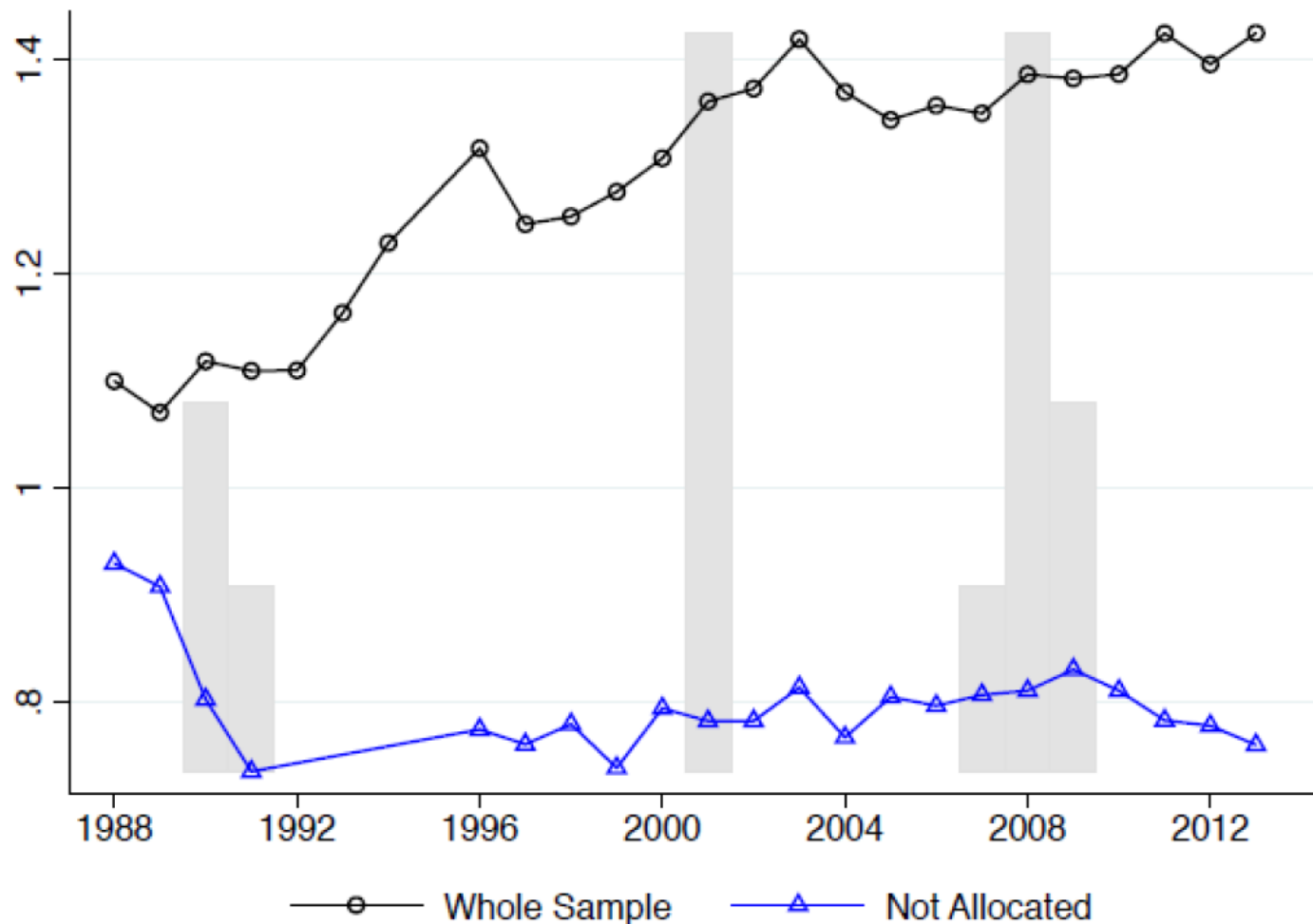


[Back](#)

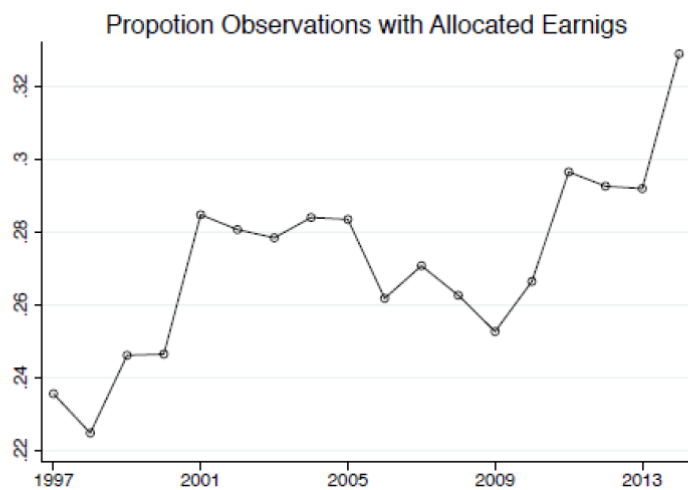
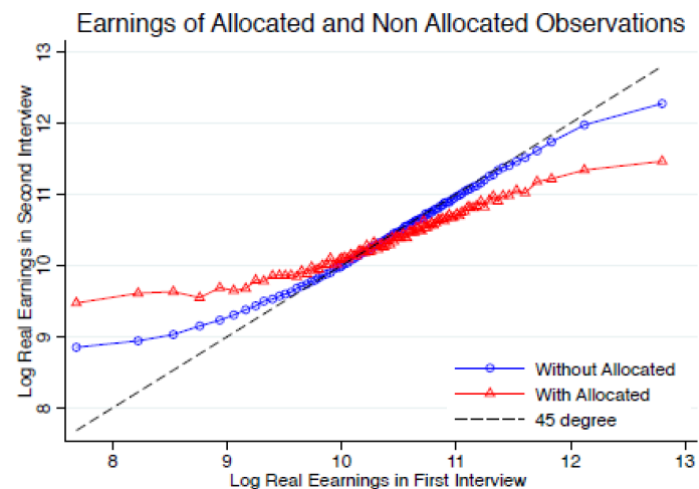
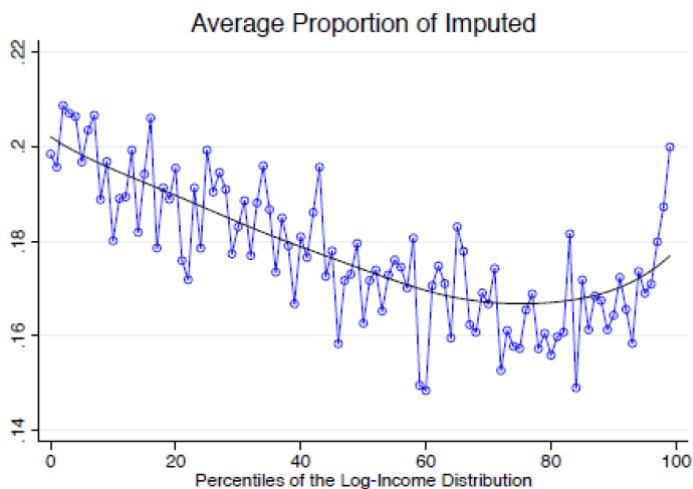
Sabelhaus and Song (2010)



CPS: The importance of “allocation”



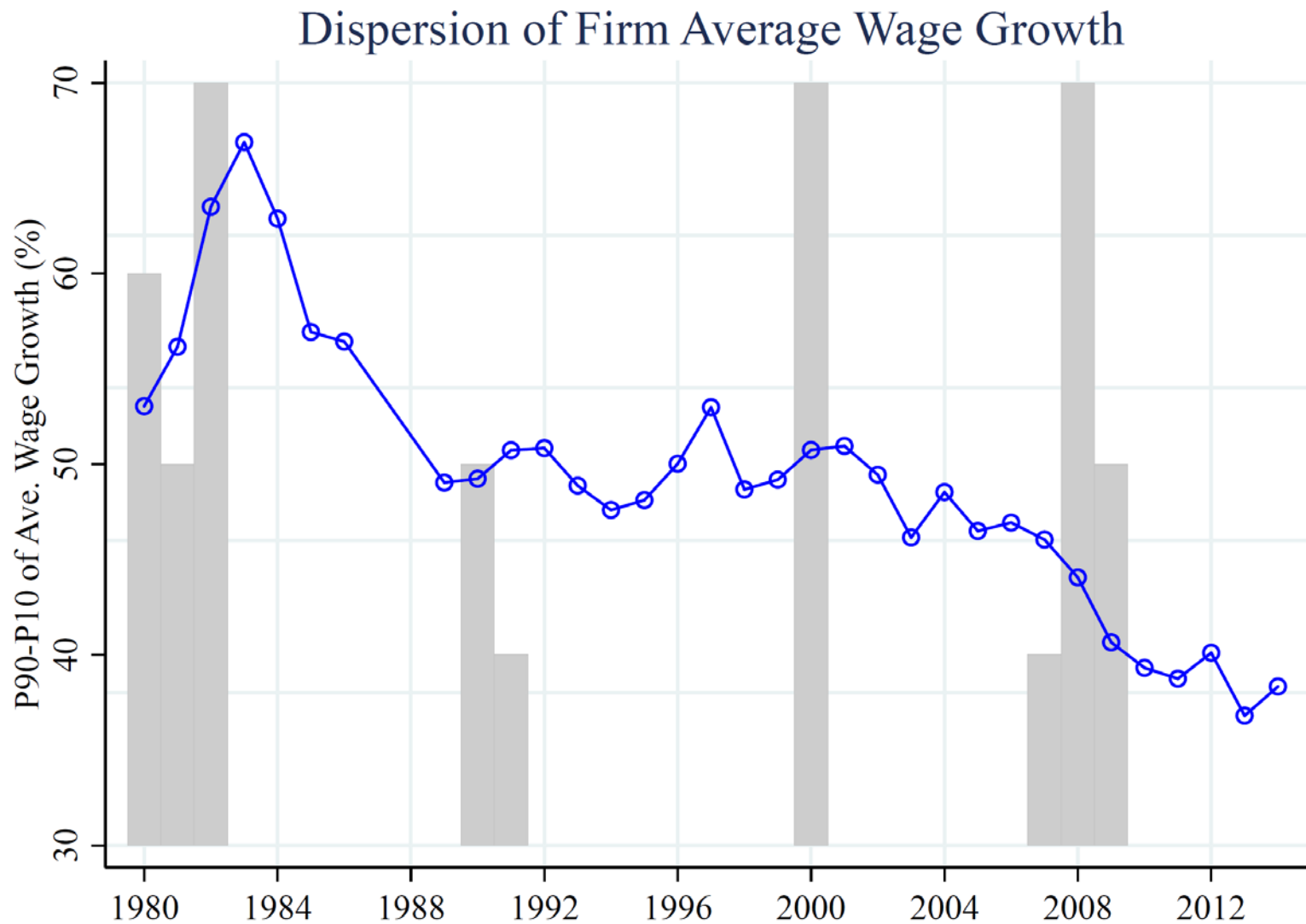
Explaining the difference



- See also Ziliak et al. (2001).

[Back](#)

Use LBD as an alternative data source



[Back](#)

Volatility or instability?

- GM (1994) emphasized the distinction between *earnings volatility* (the variance of earnings growth) and *earnings instability* (the variance of the transitory component)
- The two coincide under simple earnings process:

$$\log w_{it} = P_i + \varepsilon_{it}$$

- “Volatility” is:

$$\underbrace{\text{var}(\Delta \log w_{it})}_{\text{"volatility"}} = \underbrace{\text{var}(\varepsilon_{it}) + \text{var}(\varepsilon_{it-1})}_{\text{"instability"}}$$

Volatility or instability?

- Consider instead the earnings process:

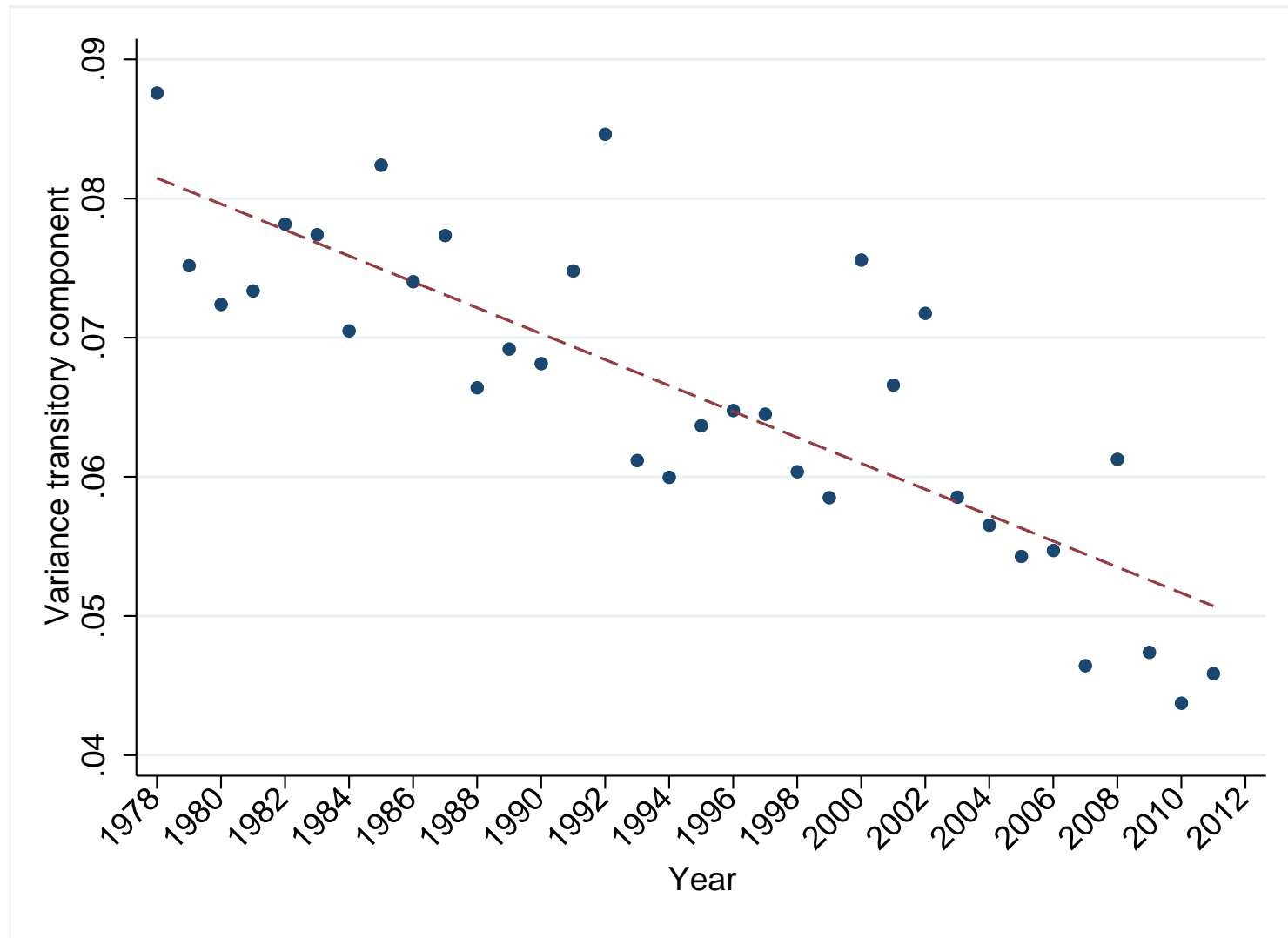
$$\begin{aligned}\log w_{it} &= P_{it} + \varepsilon_{it} \\ P_{it} &= P_{it-1} + \zeta_{it}\end{aligned}$$

- “Volatility” is now:

$$\underbrace{\text{var}(\Delta \log w_{it})}_{\text{"volatility"}} = \underbrace{\text{var}(\varepsilon_{it}) + \text{var}(\varepsilon_{it-1})}_{\text{"instability"}} + \underbrace{\text{var}(\zeta_{it})}_{\text{"structural"}}$$

- Can use first-order autocovariance of growth rates to estimate “instability” (Meghir and Pistaferri, 2004)

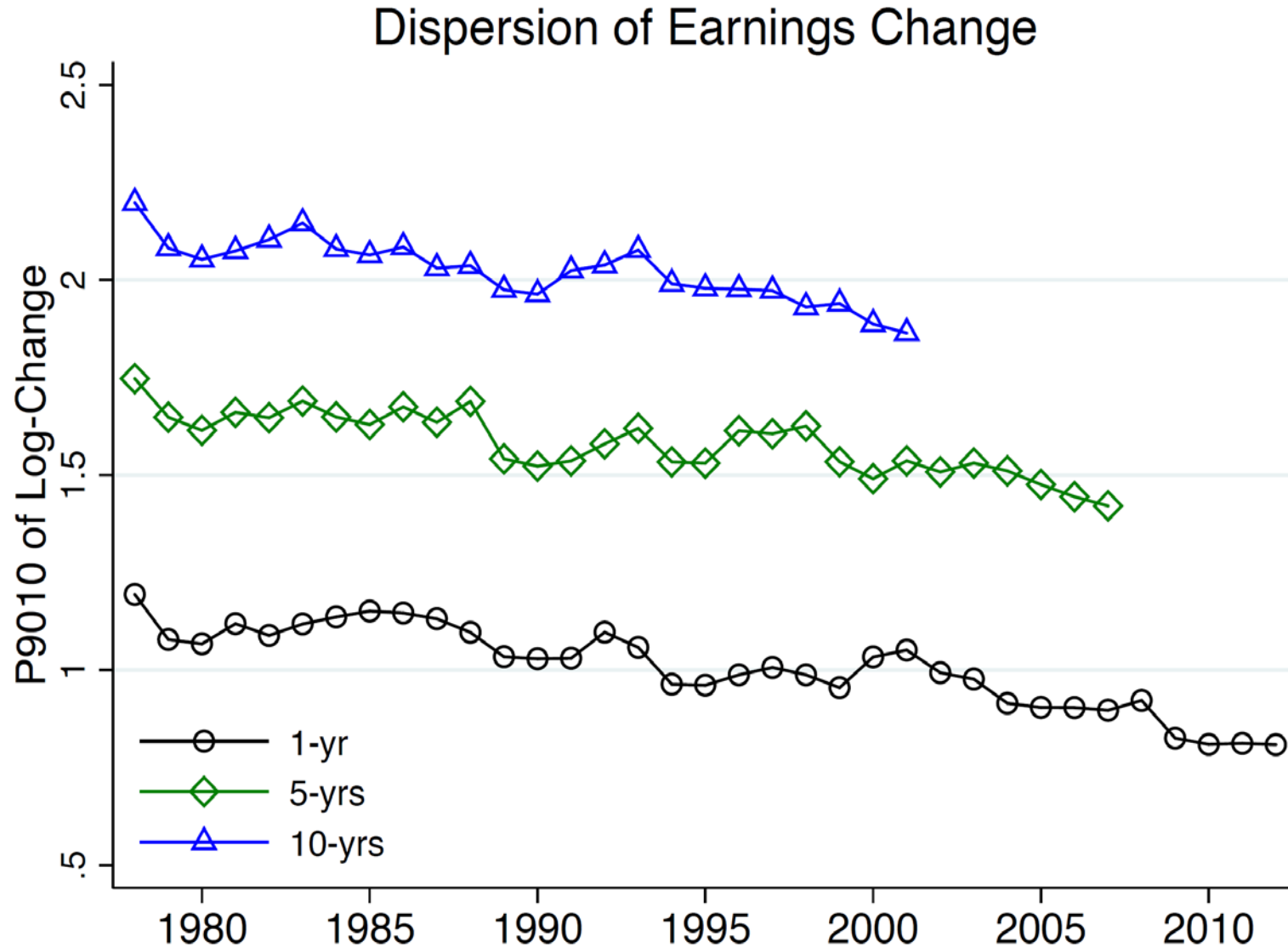
Variance of transitory component – “Instability”



- Decline in “instability” explains $\frac{3}{4}$ of the decline in “volatility”

[Back](#)

Long-run earnings volatility



Relating workers' earnings to the firm's outcome

- **Simple example:** (y : log earnings, i : worker, j : firm, Z : firm outcome measure)

$$y_{i,jt} = \gamma_{i,j} \times Z_{j,t} + \dots + \varepsilon_{i,t}$$

$$\text{var}(\Delta y_{i,jt}) = \underbrace{\gamma_{i,j}^2}_{\text{transmission rate}} \times \underbrace{\text{var}(\Delta Z_{j,t})}_{\text{firm outcome volatility}} + \dots + \text{var}(\Delta \varepsilon_{i,t})$$

- Earnings volatility could decline because:
 1. employers become less volatile, or
 2. transmission from employers to workers declines,
 3. (Or both..)

DISPERSION OF WORKERS WAGE GROWTH AND SECTORAL DISPERSION BY 2-DIGIT SIC

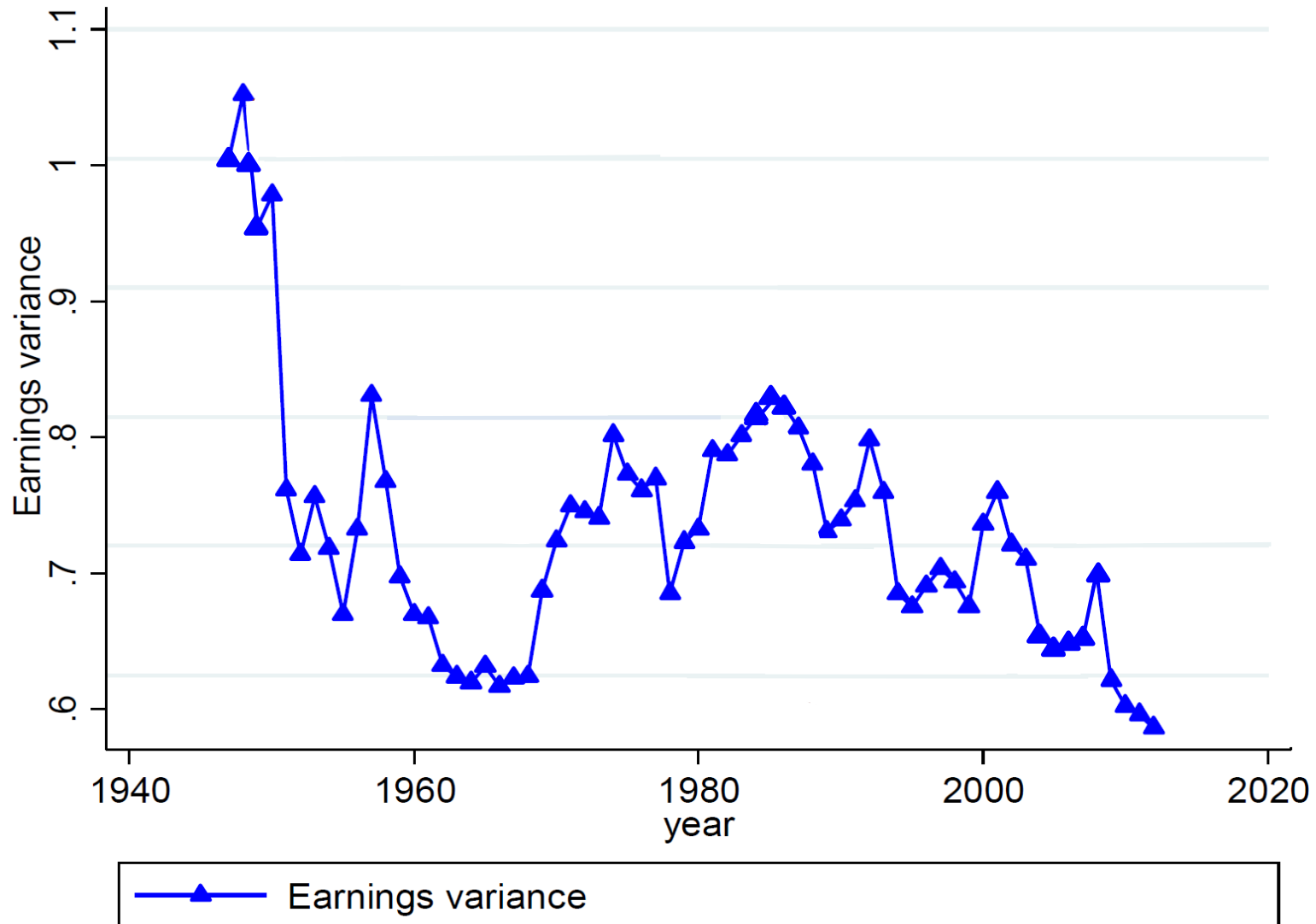
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Moments of Workers Earnings Growth							
	<i>log – changes</i>				<i>dh – changes</i>			
Dependent Variable	$P9010_{j,t}^w$	$P9010_{j,t}^w$	$P9050_{j,t}^w$	$P5010_{j,t}^w$	$P9010_{j,t}^w$	$P9010_{j,t}^w$	$P9050_{j,t}^w$	$P5010_{j,t}^w$
$P9010_{j,t}^e$ Employment Growth	1.235*** (0.116)	0.227*** (0.0850)			0.602*** (0.111)	0.151** (0.0626)		
$P9050_{j,t}^e$ Employment Growth			0.133*** (0.0473)				0.0823* (0.0439)	
$P5010_{j,t}^e$ Employment Growth				0.346** (0.138)				0.140** (0.0621)
R^2	0.322	0.890	0.916	0.831	0.389	0.902	0.886	0.828
N	2160	2160	2160	2160	2124	2124	2124	2124
Time/SIC FE	N	Y	Y	Y	N	Y	Y	Y

[Back](#)

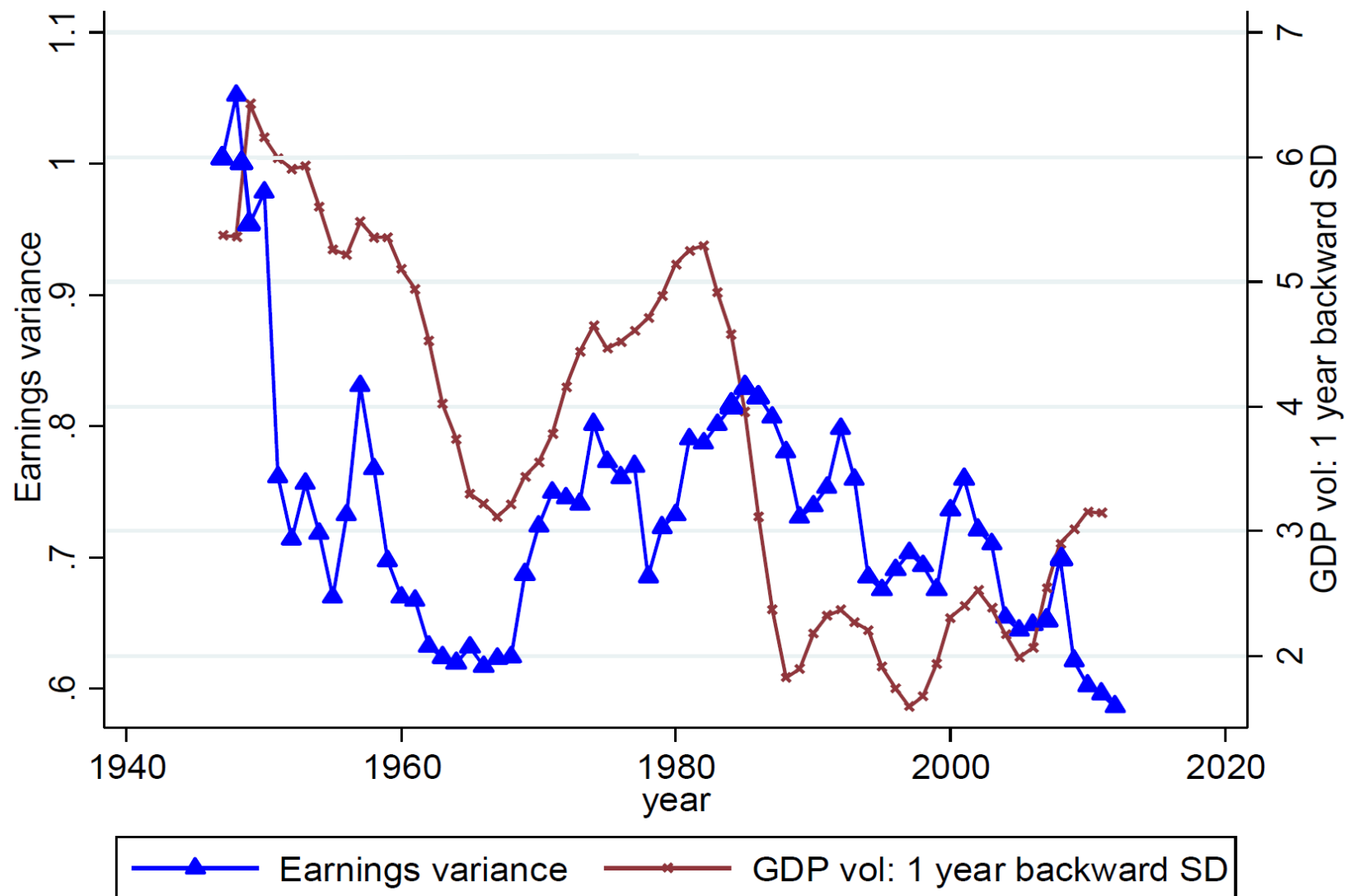
TABLE I – DISPERSION OF WORKERS WAGE GROWTH AND FIRMS EMPLOYMENT GROWTH BY 1-DIGIT SIC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PANEL A							
Dependent Variable	$P9010_{j,t}^w$ of Workers Earnings Growth						
$P9010_{j,t}^e$ Employment Growth	1.143*** (0.205)	0.425*** (0.090)	0.486*** (0.116)	0.411*** (0.113)	0.380*** (0.090)	0.353*** (0.099)	0.347** (0.153)
R^2	0.570	0.908	0.909	0.904	0.906	0.908	0.911
N	315	315	315	297	297	297	297
PANEL B							
Dependent Variable	$P5010_{j,t}^w$ of Workers Earnings Growth						
$P5010_{j,t}^e$ Employment Growth	1.149*** (0.136)	0.462*** (0.106)	0.547*** (0.141)	0.467*** (0.113)	0.459*** (0.0997)	0.416*** (0.105)	0.472** (0.158)
R^2	0.544	0.820	0.823	0.813	0.815	0.817	0.824
N	315	315	315	297	297	297	297
PANEL C							
Dependent Variable	$P9050_{j,t}^w$ of Workers Earnings Growth						
$P9050_{j,t}^e$ Employment Growth	1.040*** (0.195)	0.332*** (0.093)	0.291** (0.110)	0.293** (0.120)	0.272** (0.108)	0.275** (0.113)	0.216 (0.158)
R^2	0.370	0.898	0.899	0.895	0.895	0.896	0.898
N	315	315	315	297	297	297	297
Time/SIC FE	N	Y	Y	Y	Y	Y	Y
Controls	None	None	Firm Age/Size	Gender	Indv. Age	Educ.	All

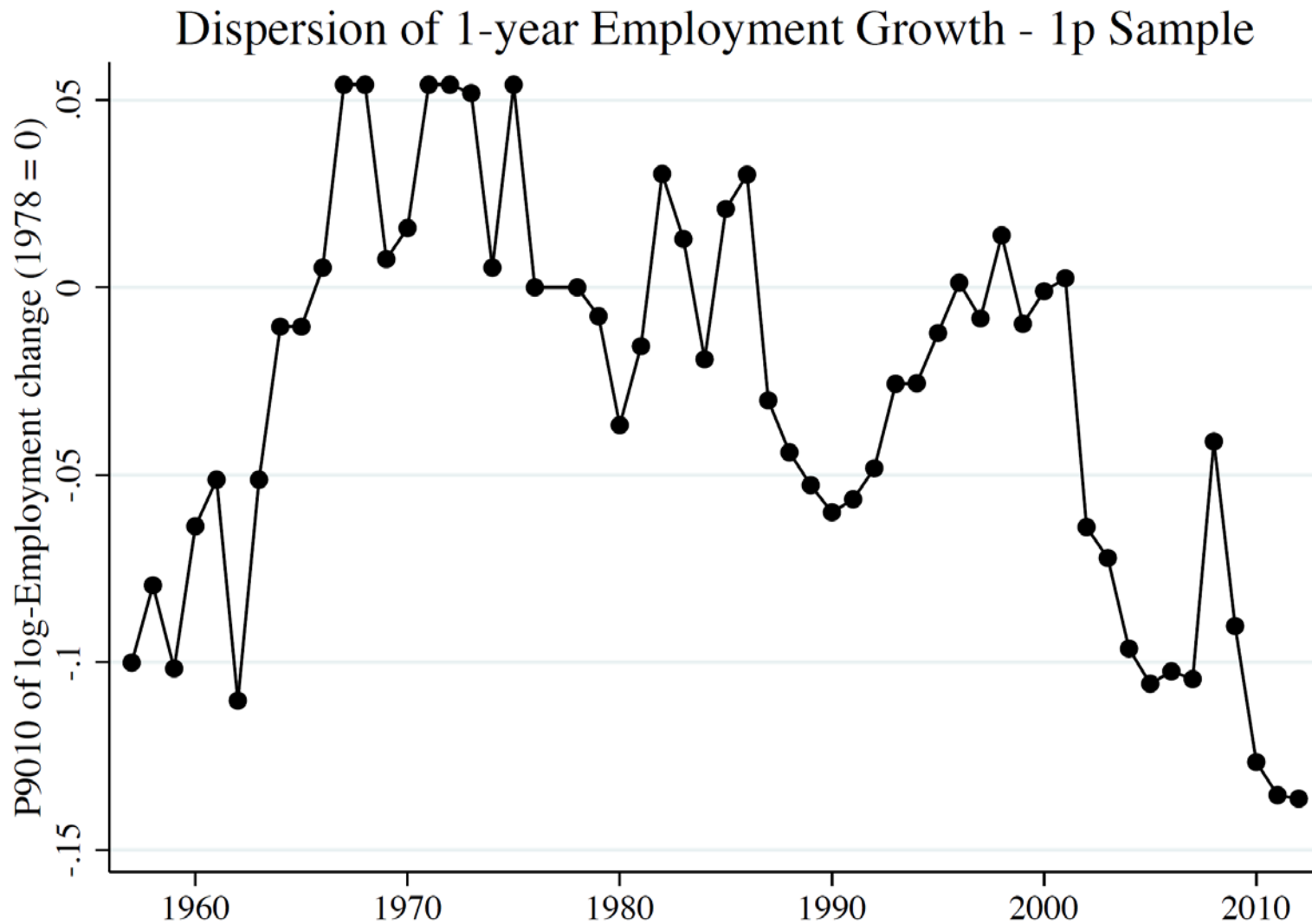
Earnings volatility, 1947-2012 (1% sample, CWHS)



Earnings volatility, 1947-2012 + Macro vol



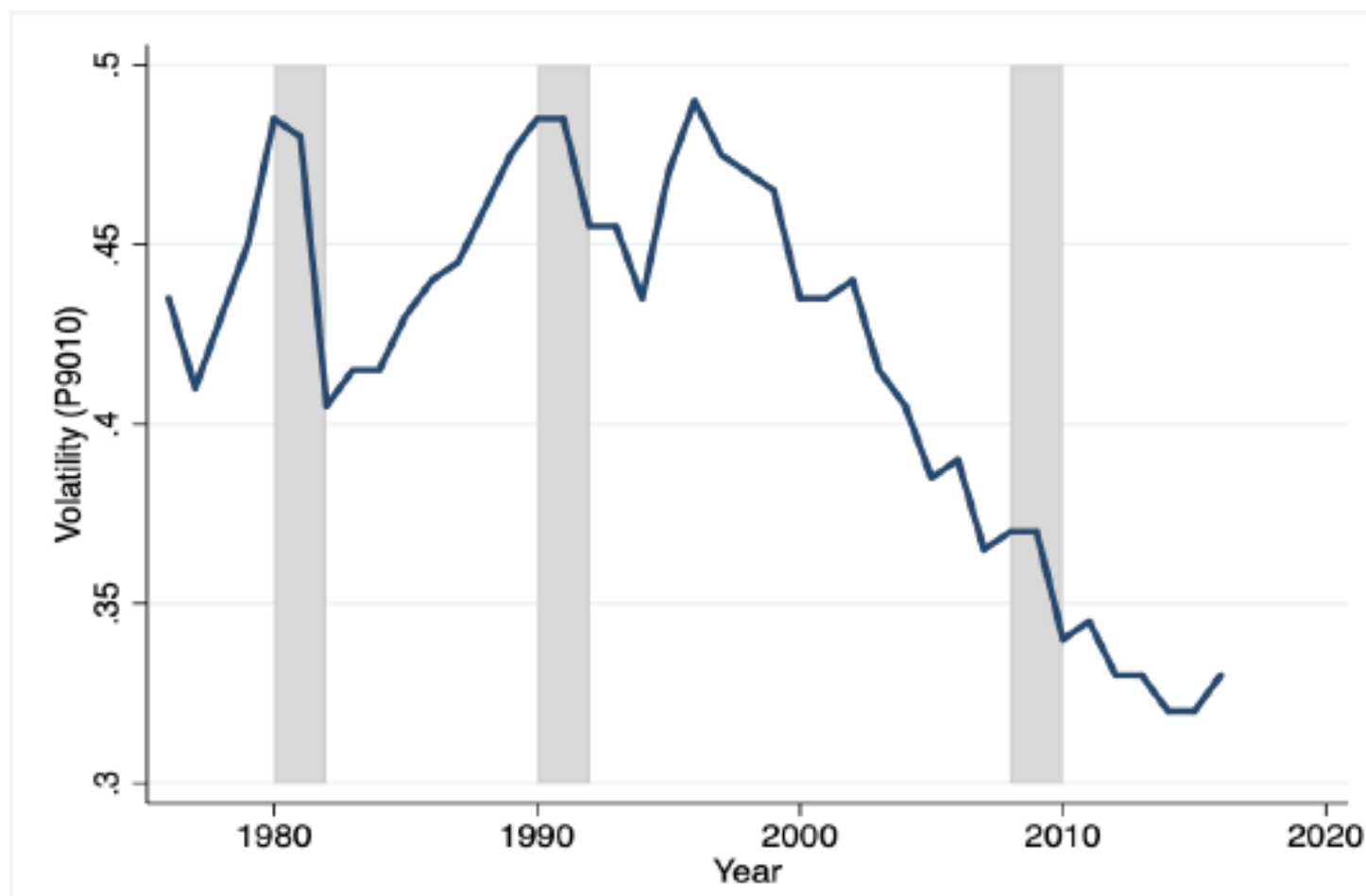
Employment volatility, 1957-2012



[Back](#)

What about other countries?

- Evidence from UK admin data (NES+ASHE) is fairly similar (Bell et al., 2019), at least since the mid 1990's



[Back](#)