The Nature of Countercyclical Income Risk

Fatih Guvenen

Minnesota and NBER

Serdar Ozkan

Federal Reserve Board

Jae Song

Social Security Administration

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Earnings of US Male Workers

From 2007 to 2009:

- Average change in labor earnings (of male workers): – 6.5%
  - Largest drop in postwar period

At the same time:

- One-in-four had earnings rise by 15+% (log points)
- One-in-ten had earnings rise by 50+%
- One-in-ten had earnings fall by 60+%
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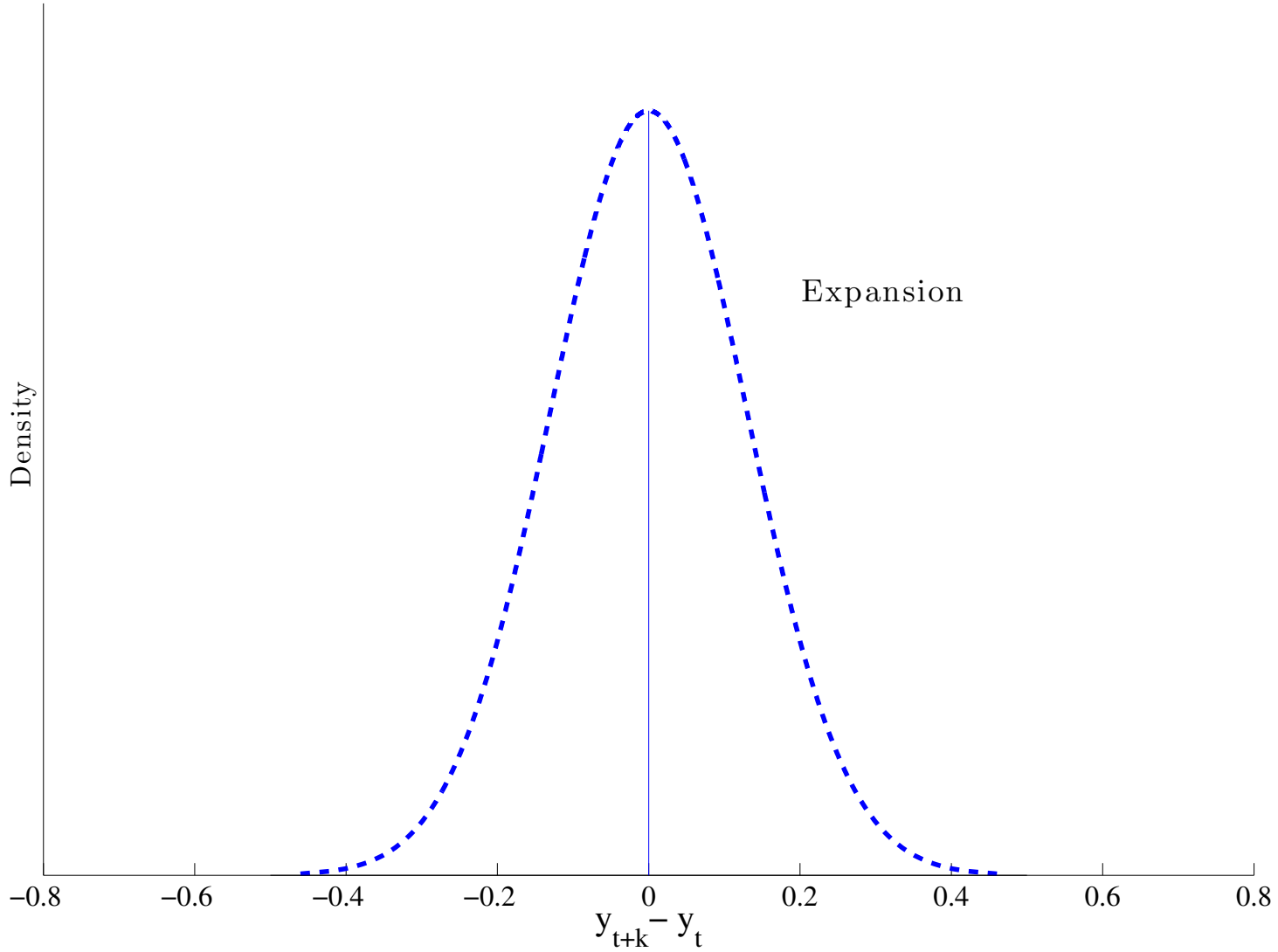
This Paper: Two Questions

1. Ex-Post: How does the distribution of income shocks change over the business cycle?
   - e.g., are idiosyncratic shocks cyclical?

Recessions: Shock to Variance?



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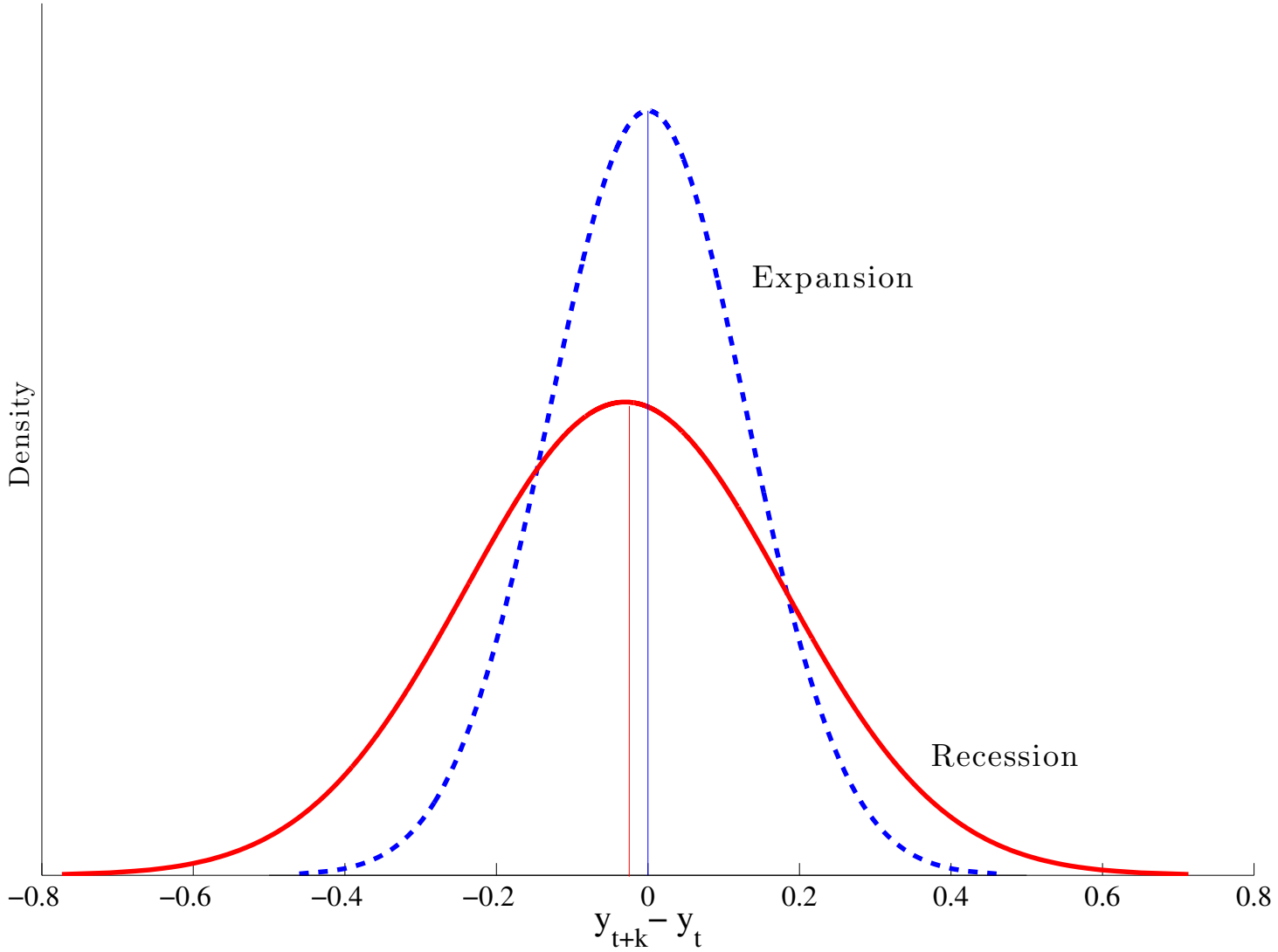

Countercyclical Variance

- Constantinides and Duffie (1996): countercyclical variance can generate interesting and plausible asset pricing behavior.
- Storesletten et al (2004):
  - Specify an AR(1) with time-varying innovation variance.
  - Estimate σ_η^2 to be three times higher in recessions.
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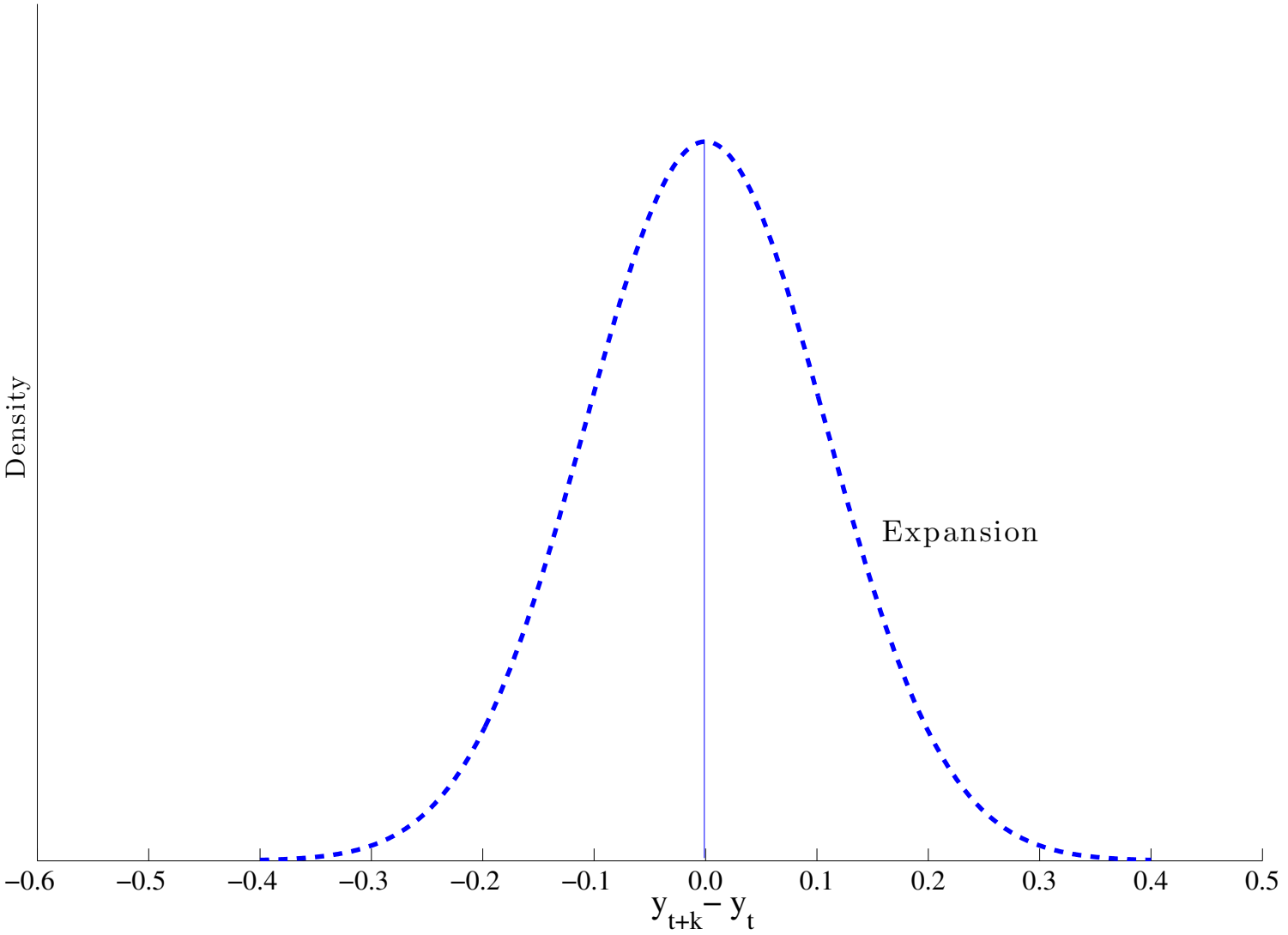

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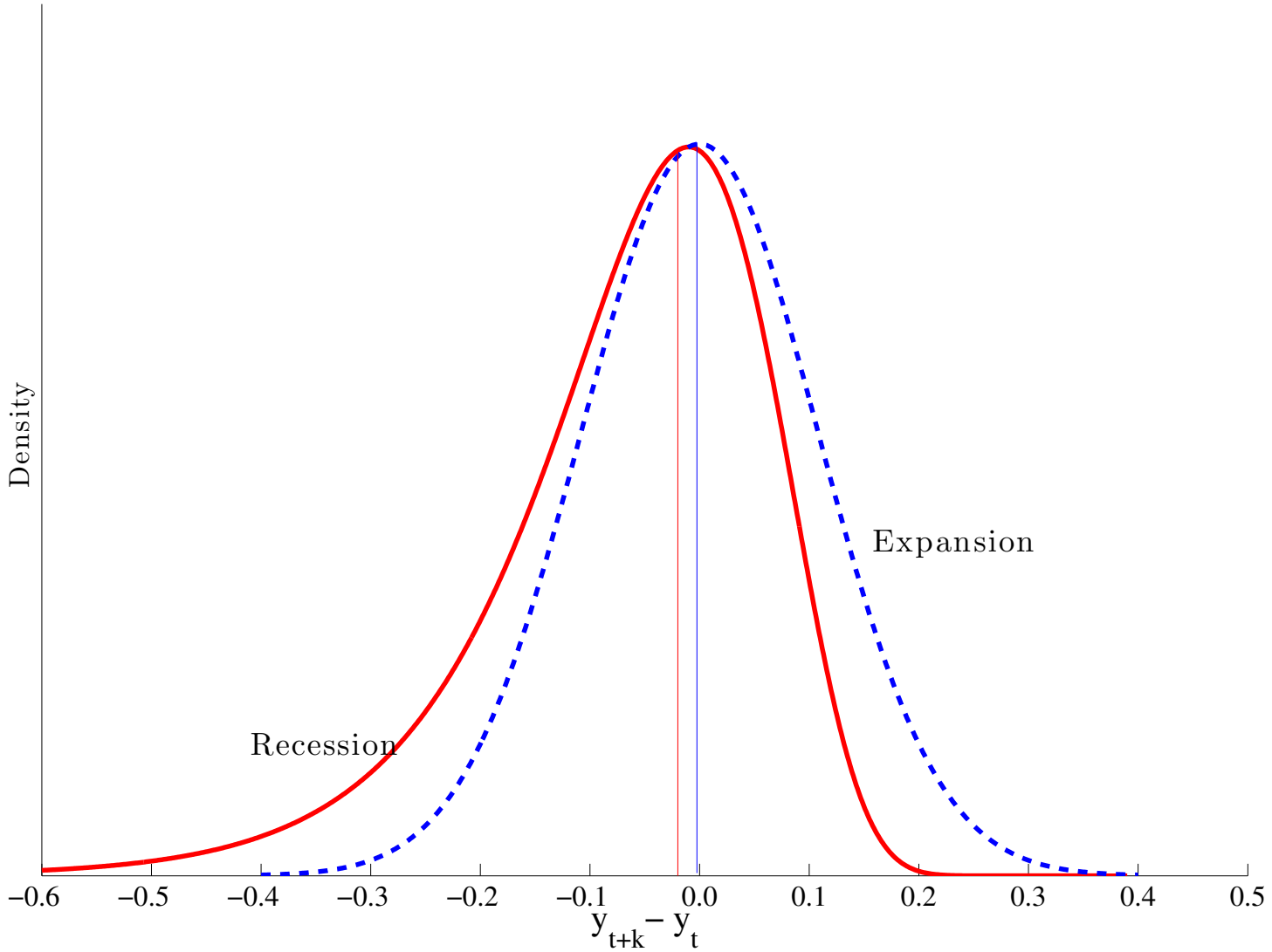

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   - Very difficult to answer without a very large data set.
2. Ex-Ante: Are there any observable characteristics that predict outcomes over the business cycle?

Data: 10% Random Sample from SSA

- SSA's **Master Earnings File**:
  - contains all US individuals with a Social Security number.
  - Draw a representative sample of US males covering 33 years: 1978 to 2010
  - Labor earnings data from W-2 forms.
    - ⋆ Self-employed excluded.
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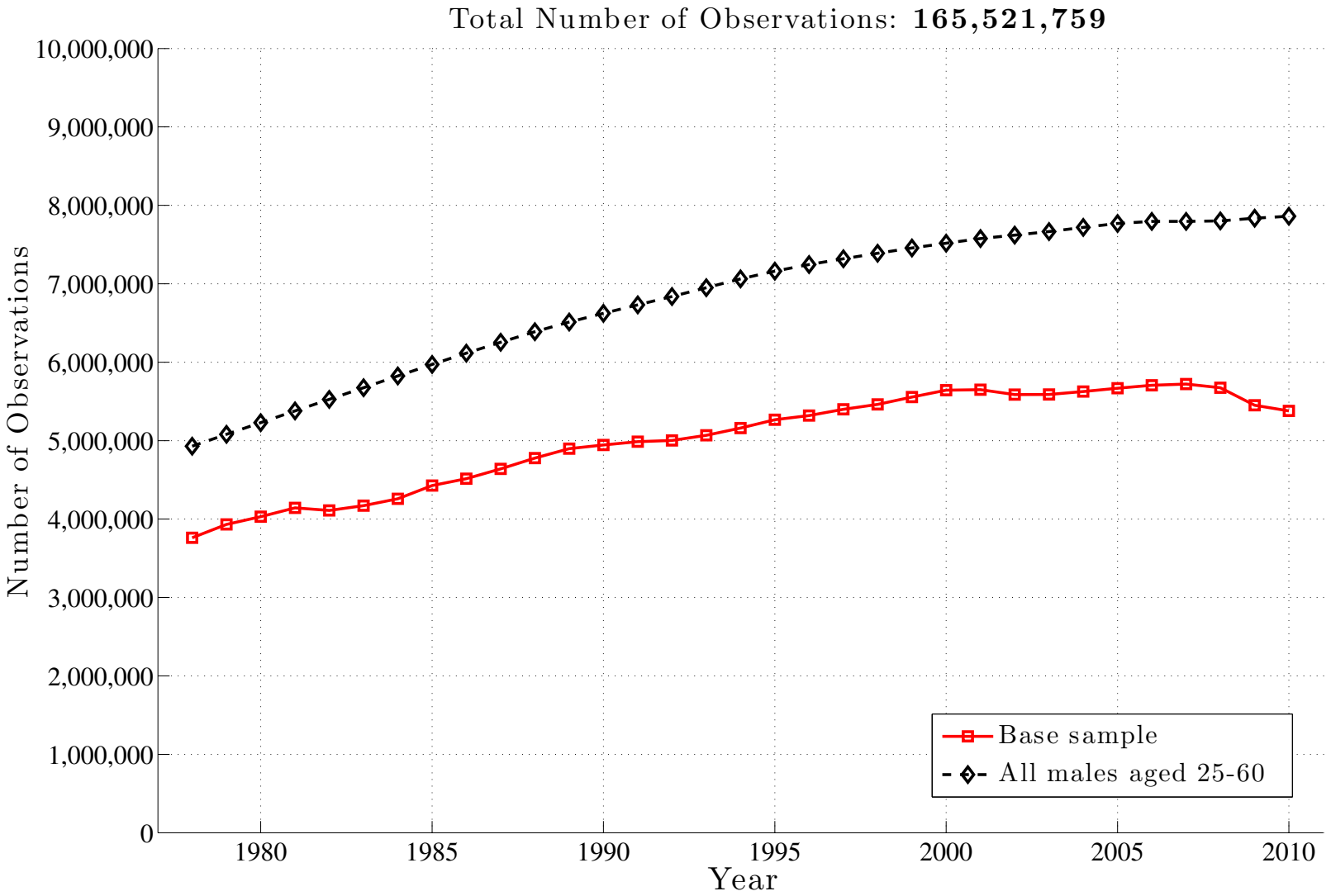
Number of Observations



Compared to Survey Data

- Very large sample size. Allows us to study variation between and within very finely defined groups.
  - E.g., one such group contains individuals who (as of 2006)
    - ⋆ are between 35 and 39.
    - ⋆ had average income between $32,000 and $33,400.
    - ⋆ had income growth rate between 1.30% to 1.49% per year.
- No survey response error (possible under-reporting).
- No sample attrition.
  - Allows us to control for compositional changes over the cycle.
- No top-coding:
  - In PSID, CPS, etc., using extreme observations is tricky.
  - Here, income observations in tens of millions of dollars per year.

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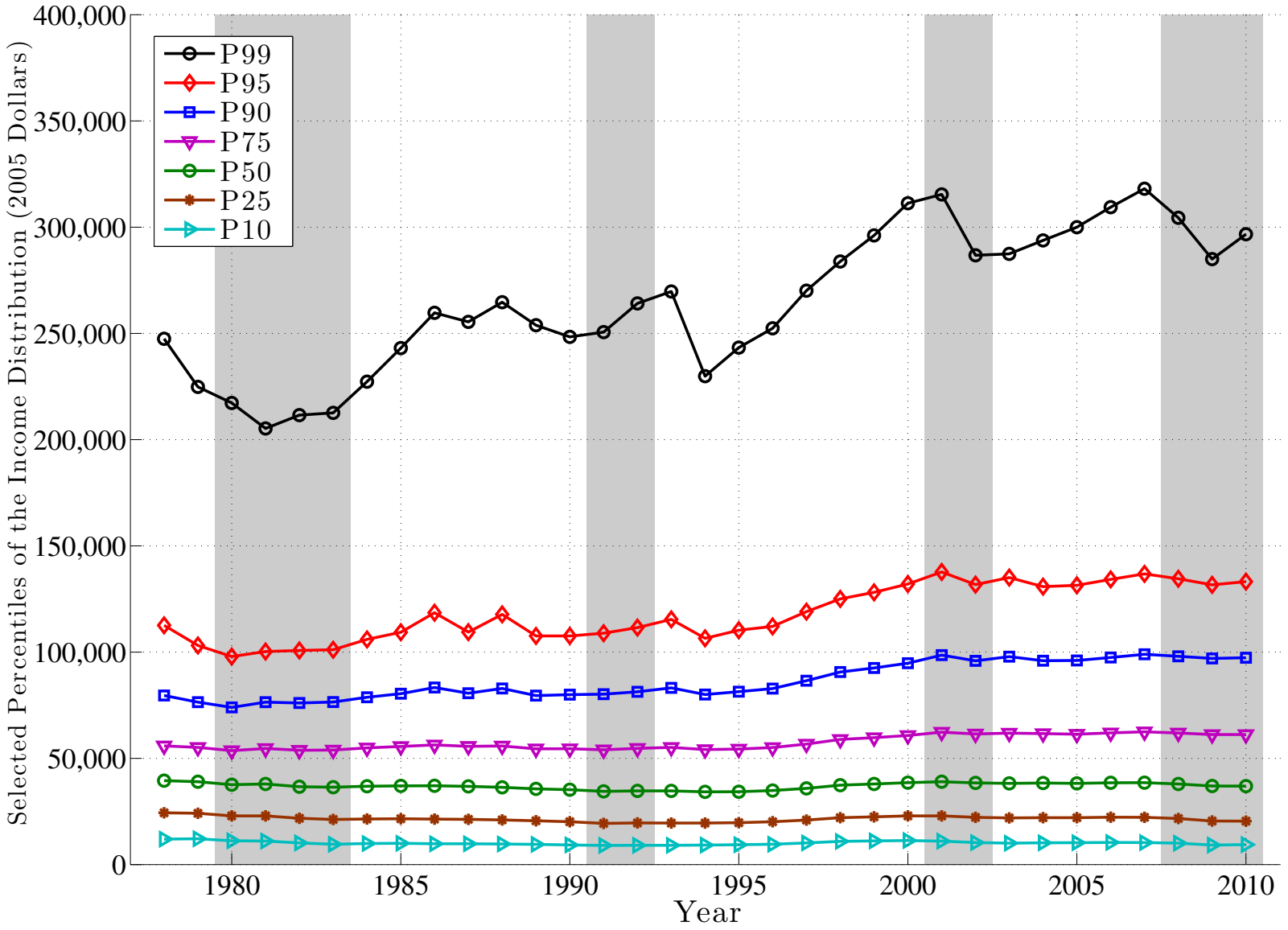
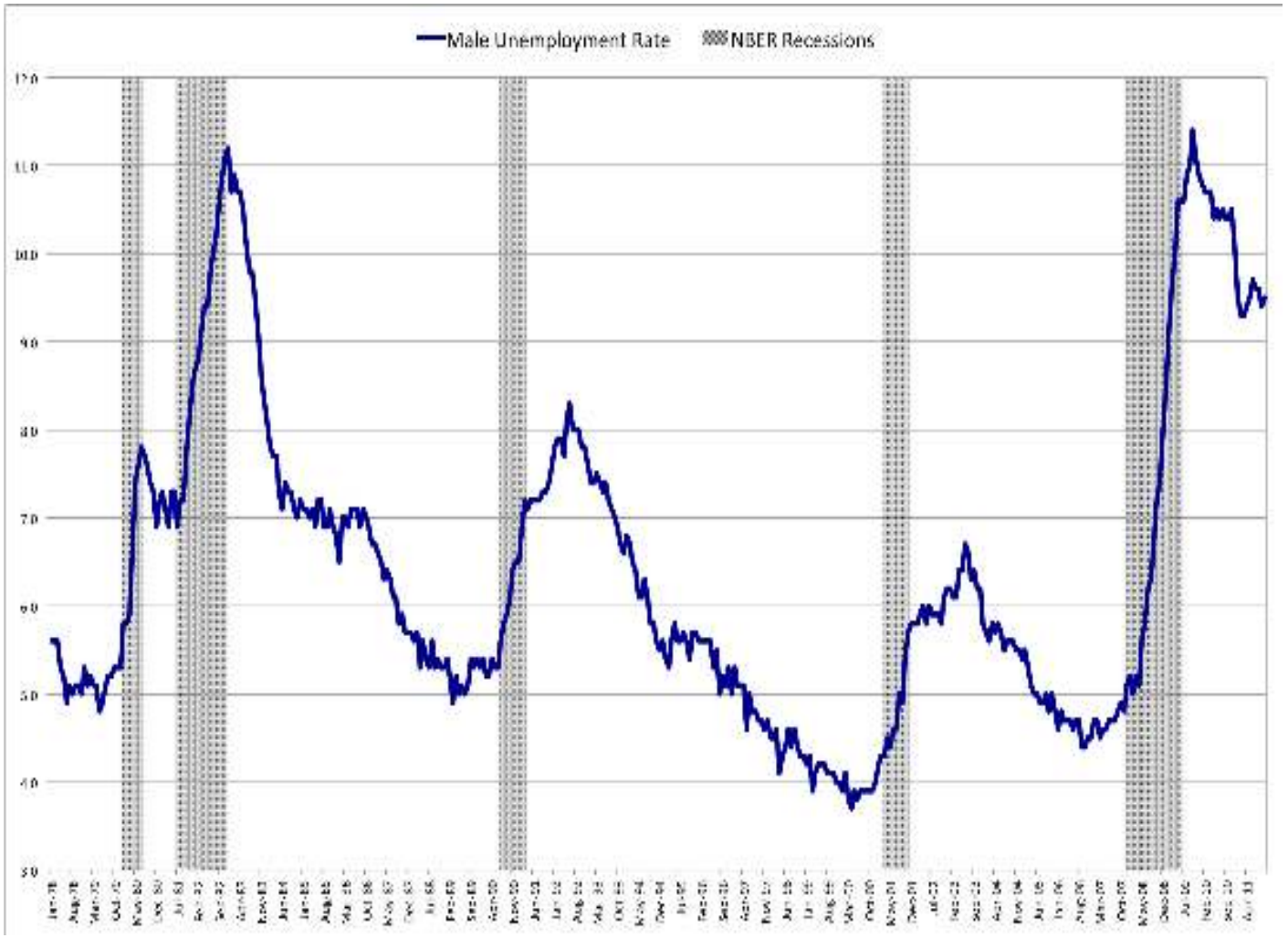
Percentiles of Labor Earnings Distribution

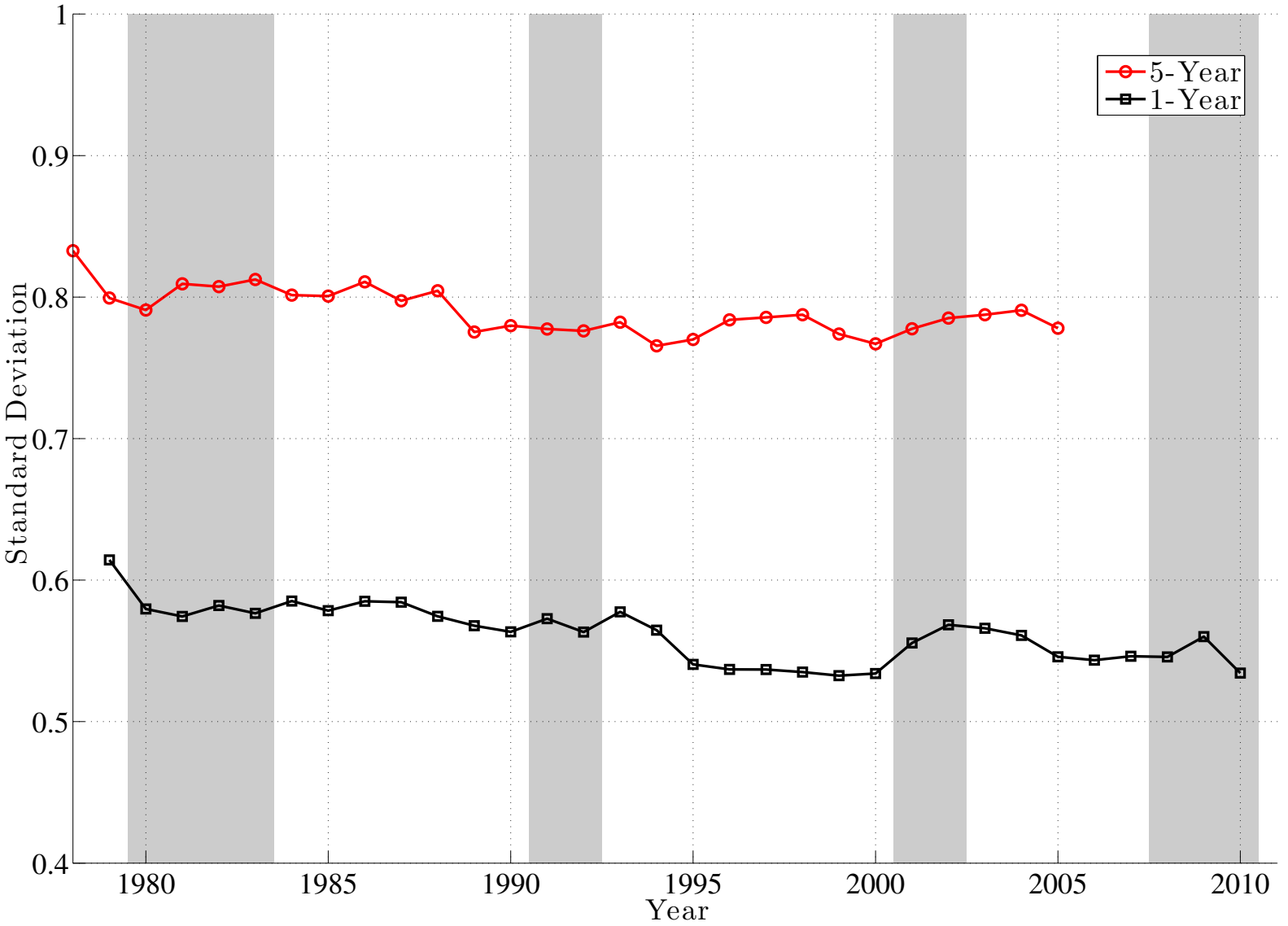


Business Cycles: Bird's Eye View

Male Unemployment Rate



Variance of Δy^i and $\Delta_5 y^i$



Decomposing Income Shocks

An Empirical Framework

$$y_t^i = \underbrace{f(\mathbf{V}_t^i) \times \lambda_t}_{\text{factor structure}} + \underbrace{\left[z_t^i + \varepsilon_t^i\right]}_{\text{stochastic component}} \tag{1}$$

$$z_t^i = z_{t-1}^i + \eta_t^i,$$

where $\varepsilon_t^i \sim F(\varepsilon|\mathbf{V}_t^i, \lambda_t)$ $\quad$ $\eta_t^i \sim G(\eta|\mathbf{V}_t^i, \lambda_t)$

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- $\mathbf{V}_t^i$: Vector of individual-specific characteristics.
- λ_t : Aggregate shock.

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Within-Group Dispersion

$$y^i_{t+k} - y^i_t = f(\mathbf{V}^i_t)(\lambda_{t+k} - \lambda_t) + [\eta_{t+k} + ... + \eta_{t+1})] + (\varepsilon^i_{t+k} - \varepsilon^i_t). \quad (2)$$

For some t compute:

$$\Rightarrow \text{var}(y^i_{t+k} - y^i_t | \mathbf{V}^i_t) = \underbrace{\left(\sum_{s=1}^{k} \text{var}(\eta_{t+s} | \mathbf{V}^i_t) \right)}_{k \text{ terms}} + \underbrace{(\text{var}(\varepsilon_t | \mathbf{V}^i_t) + \text{var}(\varepsilon_{t+k} | \mathbf{V}^i_t))}_{2 \text{ terms}}.$$

- $k = 1$: mostly transitory variance
- Large k: more persistent variance

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Within-Group Variation

A Graphical Construct

- Divide the population into 7 age groups: 25–29, 30–34,..., 55–60.
- For every worker, compute $\overline{Y}^i_{t-1} \equiv (\frac{1}{5}) \sum_{s=1}^{5} \left(\frac{\widetilde{Y}^i_{t-s}}{d_{t-s}} \right)$.
- For a given episode starting in t, within each age group:
  - rank individuals according to $\overline{Y}_{t-1}$.
- Against each quantile of $\overline{Y}_{t-1}$ on the x-axis:
  - plot conditional distribution $\mathbb{F}\left(y_{t+k} - y_t | \overline{Y}_{t-1}\right)$ on the y-axis.

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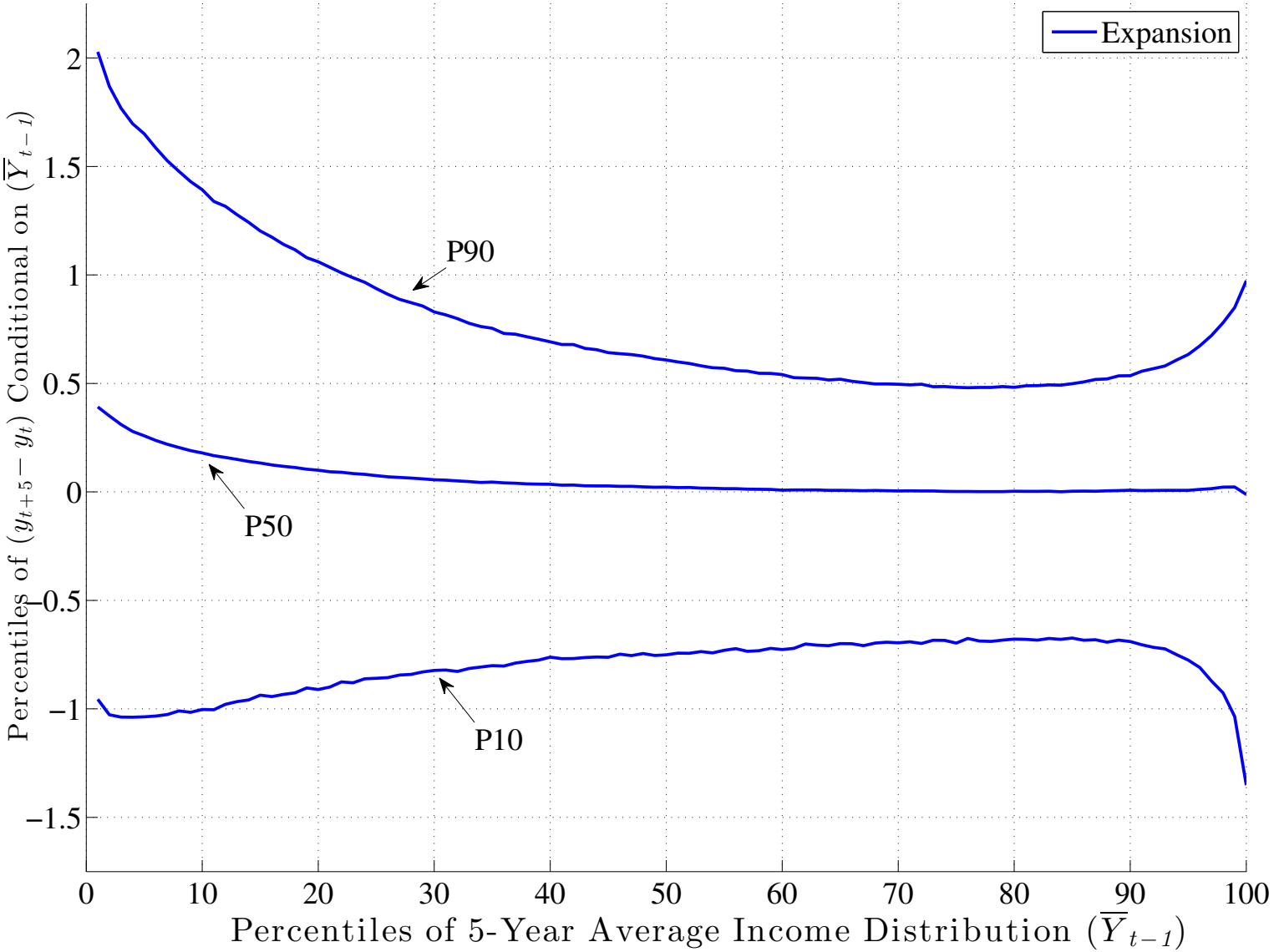

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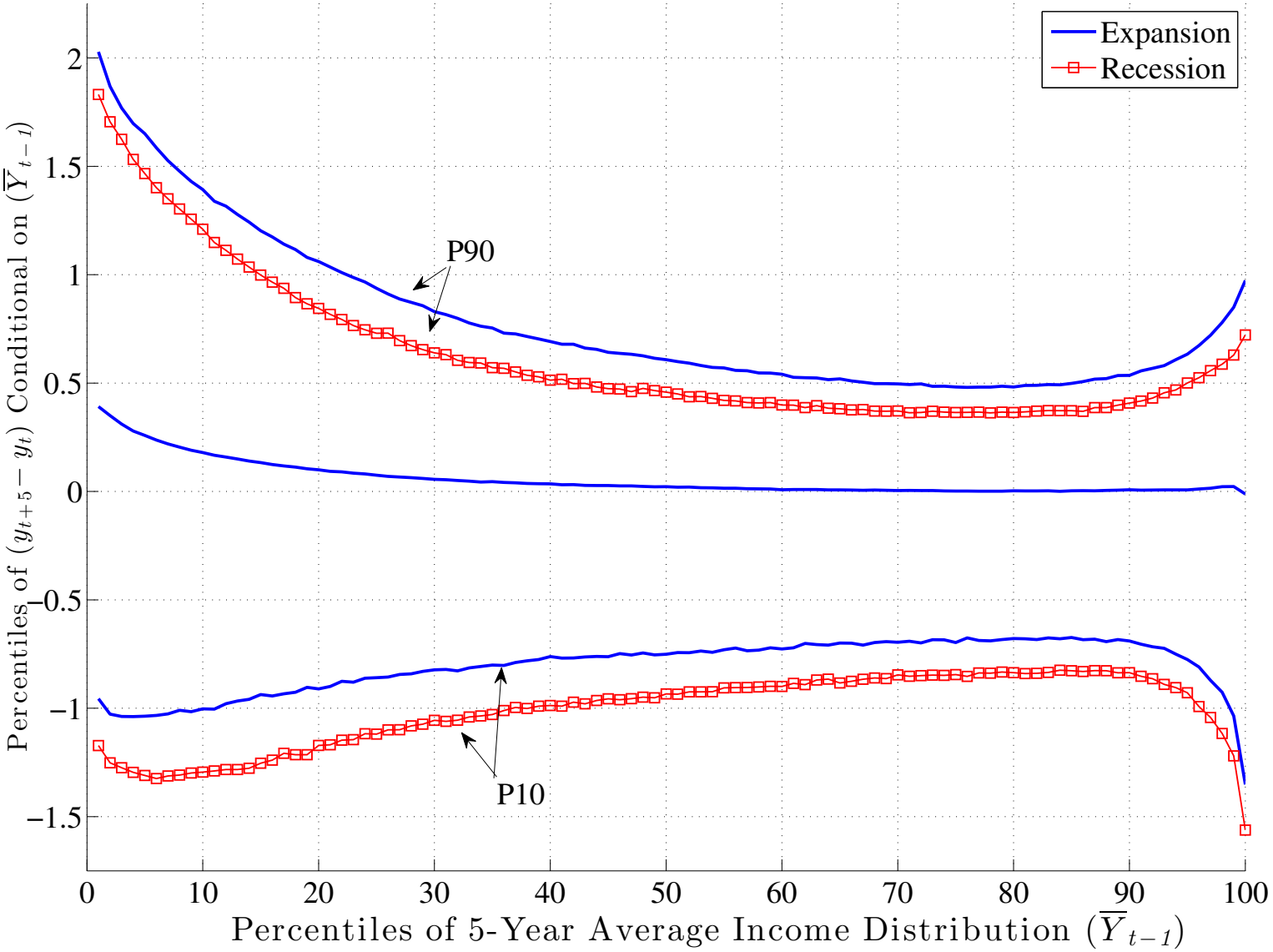

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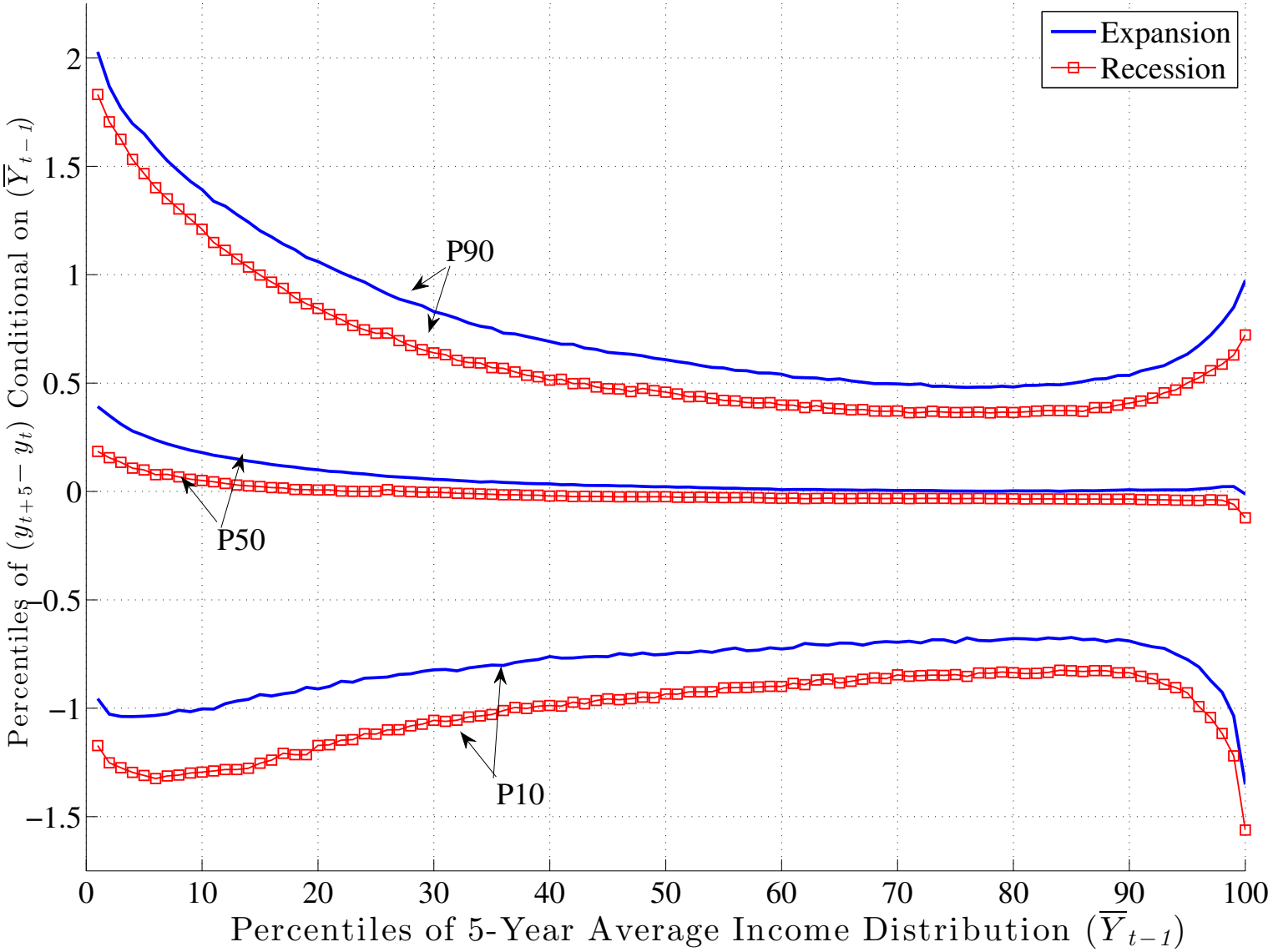
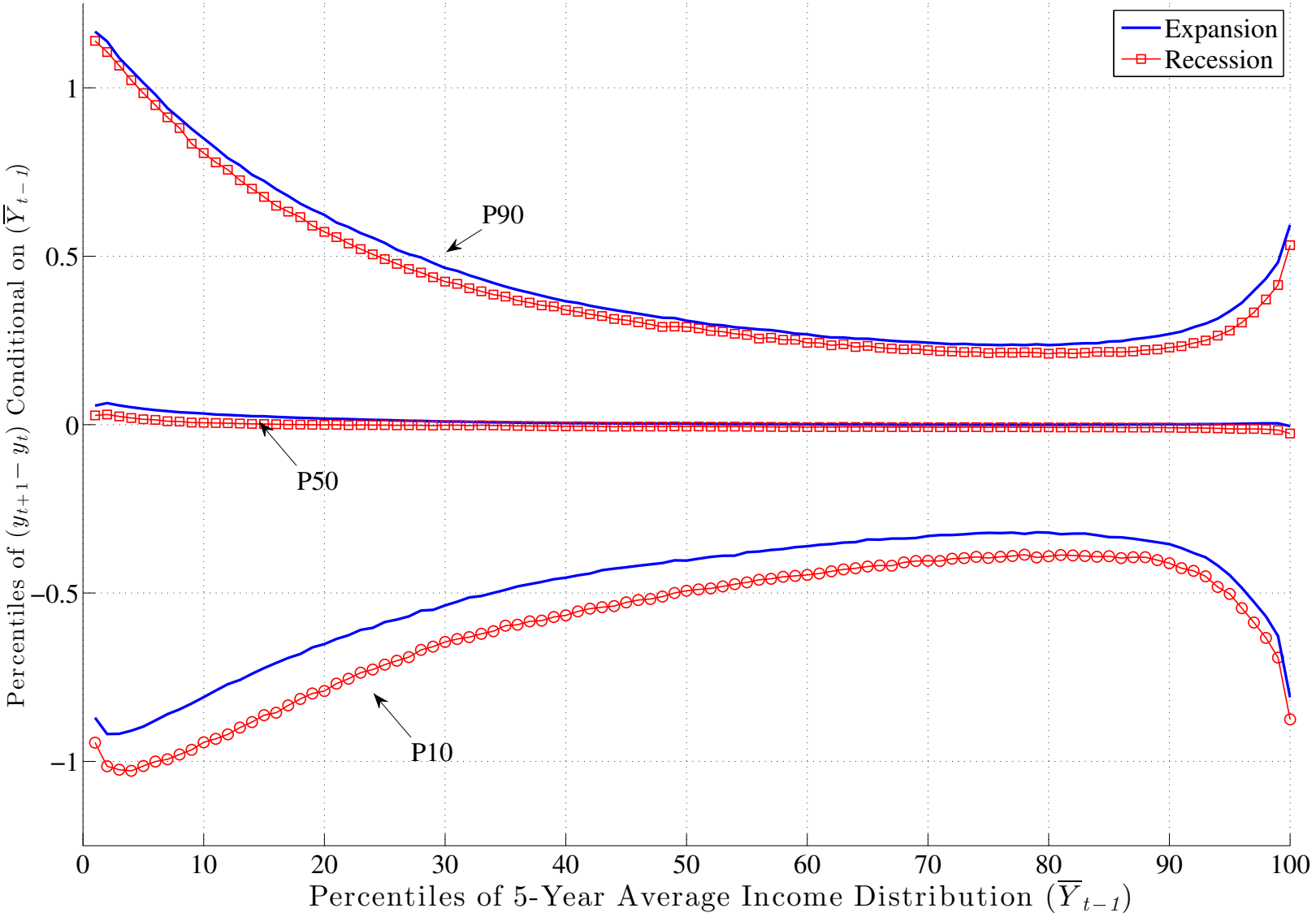
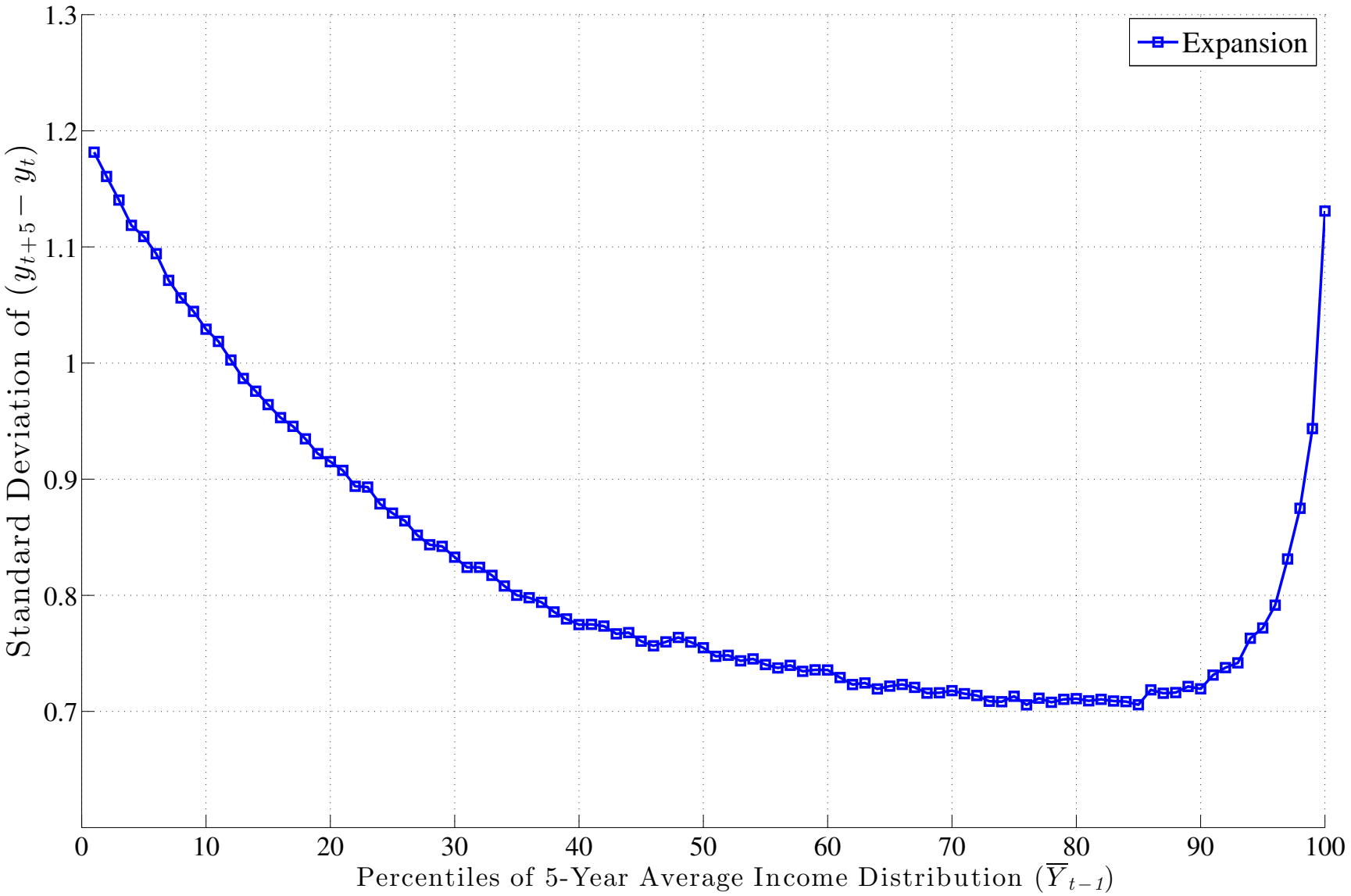


Distributions of Transitory Shocks



Standard Deviation of Persistent Shocks



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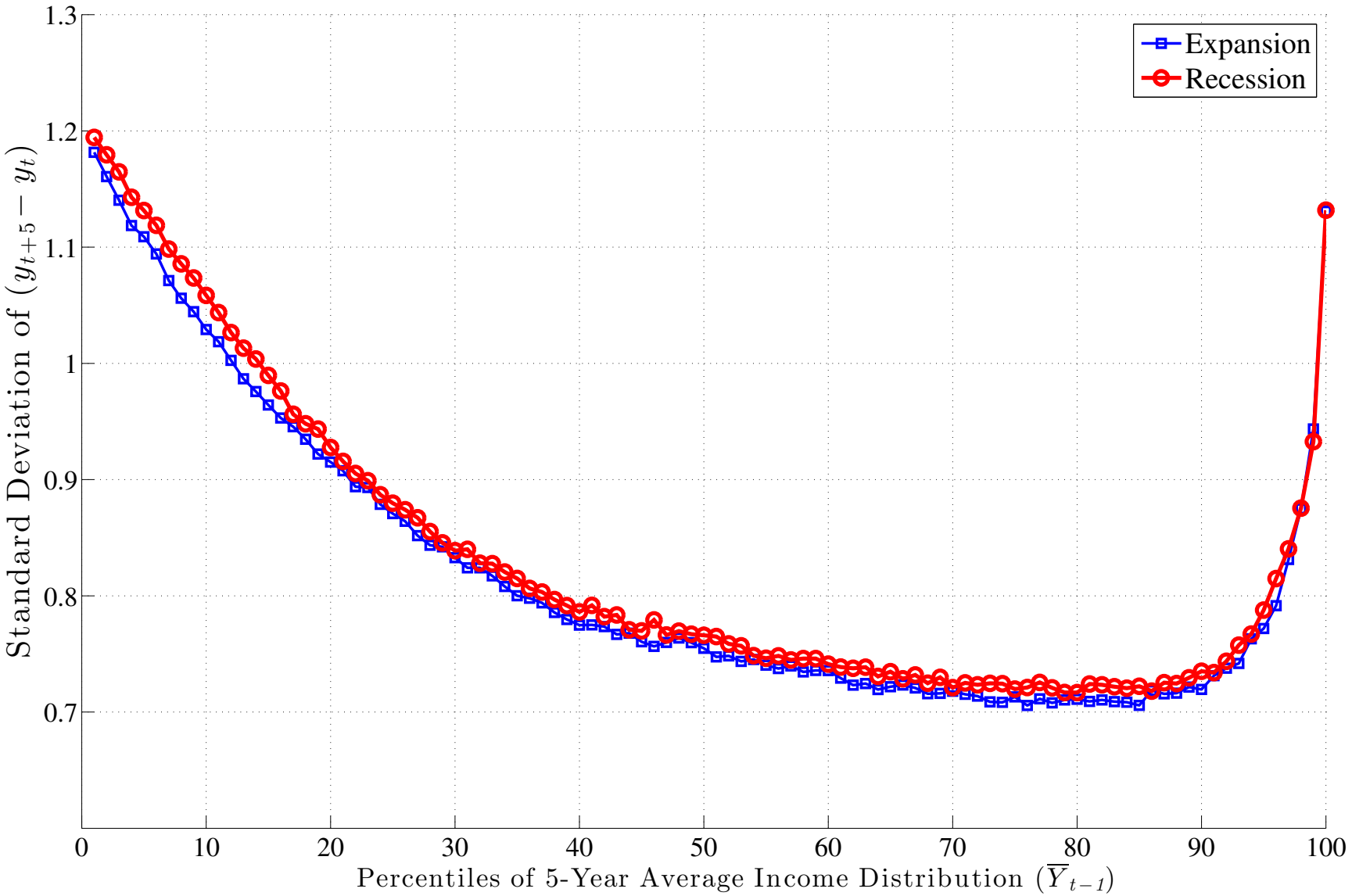
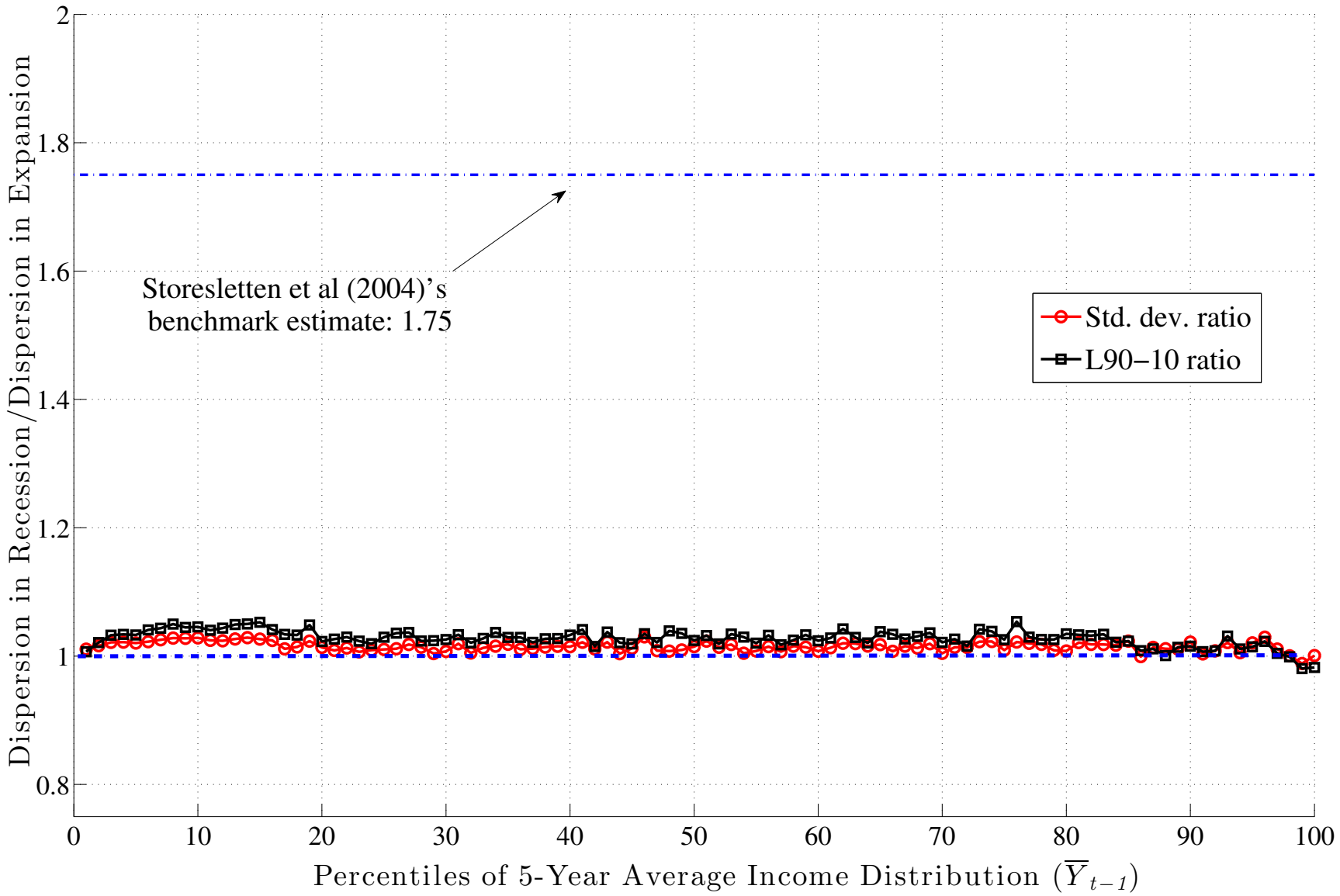
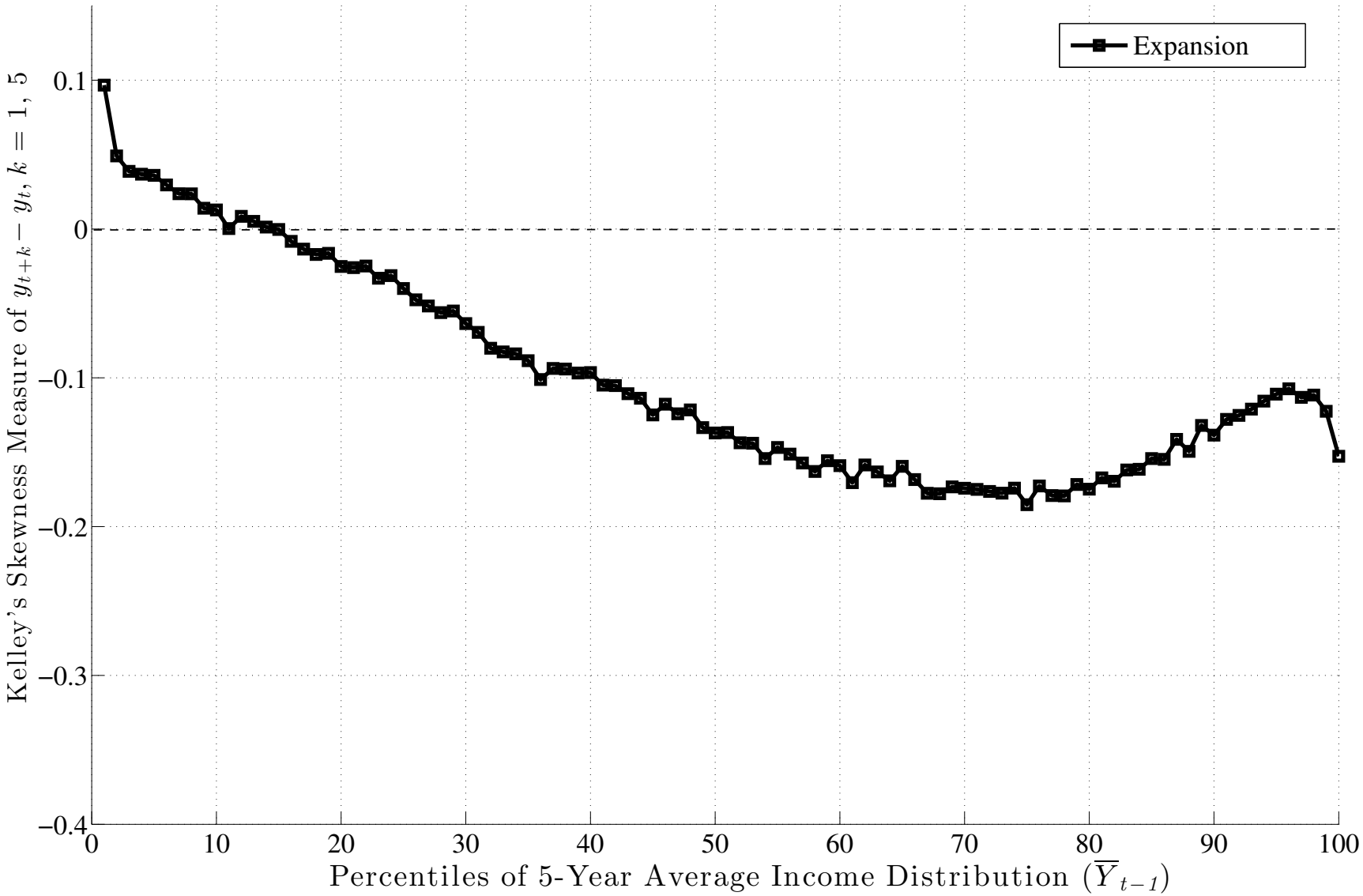


Countercyclical Variance?



Countercyclical Skewness: $\frac{P9050-P5010}{P9010}$



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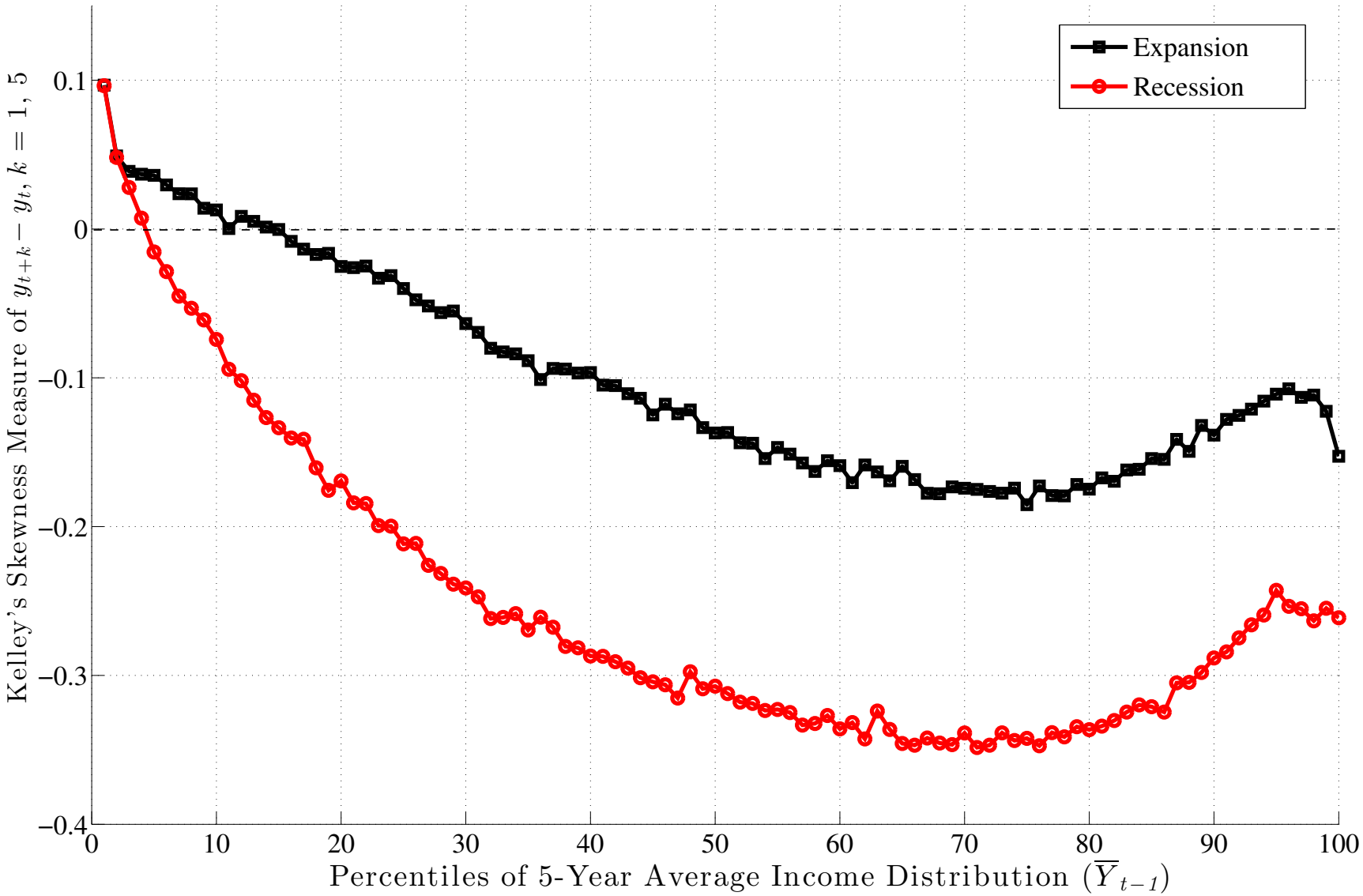
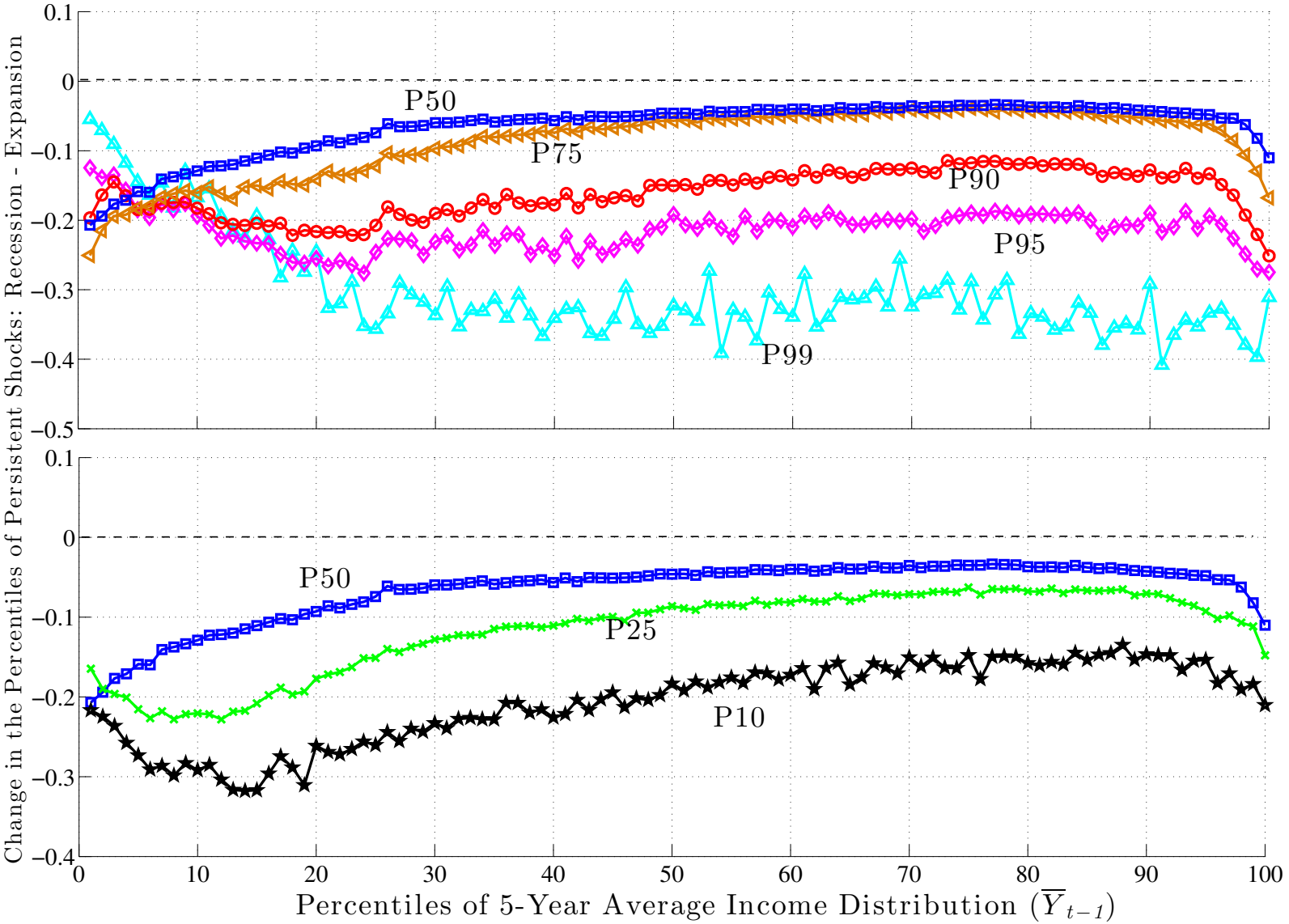


Compression at Top. Expansion at Bottom



Idiosyncratic Shocks: Taking Stock

- Recessions are:
  - mostly about countercyclical left-skewness.
  - Not countercyclical variance.
- The top end of shock disribution collapses. The bottom end expands.
- More pessimistic conclusion than Storesletten et al (2004).
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Between-Group Variation

Between-Group Dispersion

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$$+ \underbrace{\mathbb{E}(\varepsilon^i_{t+k} - \varepsilon^i_t | \mathbf{V}^i_t)}_{=0}$$

$$\mathbb{E}(y^i_{t+k} - y^i_t | \mathbf{V}^i_t) = f(\mathbf{V}^i_t)(\lambda_{t+k} - \lambda_t). \tag{3}$$

Between-Group Dispersion with $\mathbf{V}_t \equiv \overline{Y}_{t-1}$

- Against each quantile of $\overline{Y}_{t-1}$, plot:
  - $\mathbb{E}_i \left(y^i_{t+k} - y^i_t | \overline{Y}^i_{t-1} \right)$ on the y-axis.
- But, this measure must exclude observations with $Y^i_t = 0$ or $Y^i_{t+k} = 0$. Also plot:
  - $\log \mathbb{E}_i \left(Y^i_{t+k} | \overline{Y}_{t-1} \right) - \log \mathbb{E}_i \left(Y^i_t | \overline{Y}_{t-1} \right)$.

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What Can This Graph Tell Us?

- With countercyclical permanent shocks only, the graph will be flat.
- With a factor structure favoring high-income individuals, it will be upward-sloping.
- With mean-reverting shocks only (e.g., AR(1)), it will slope downward.

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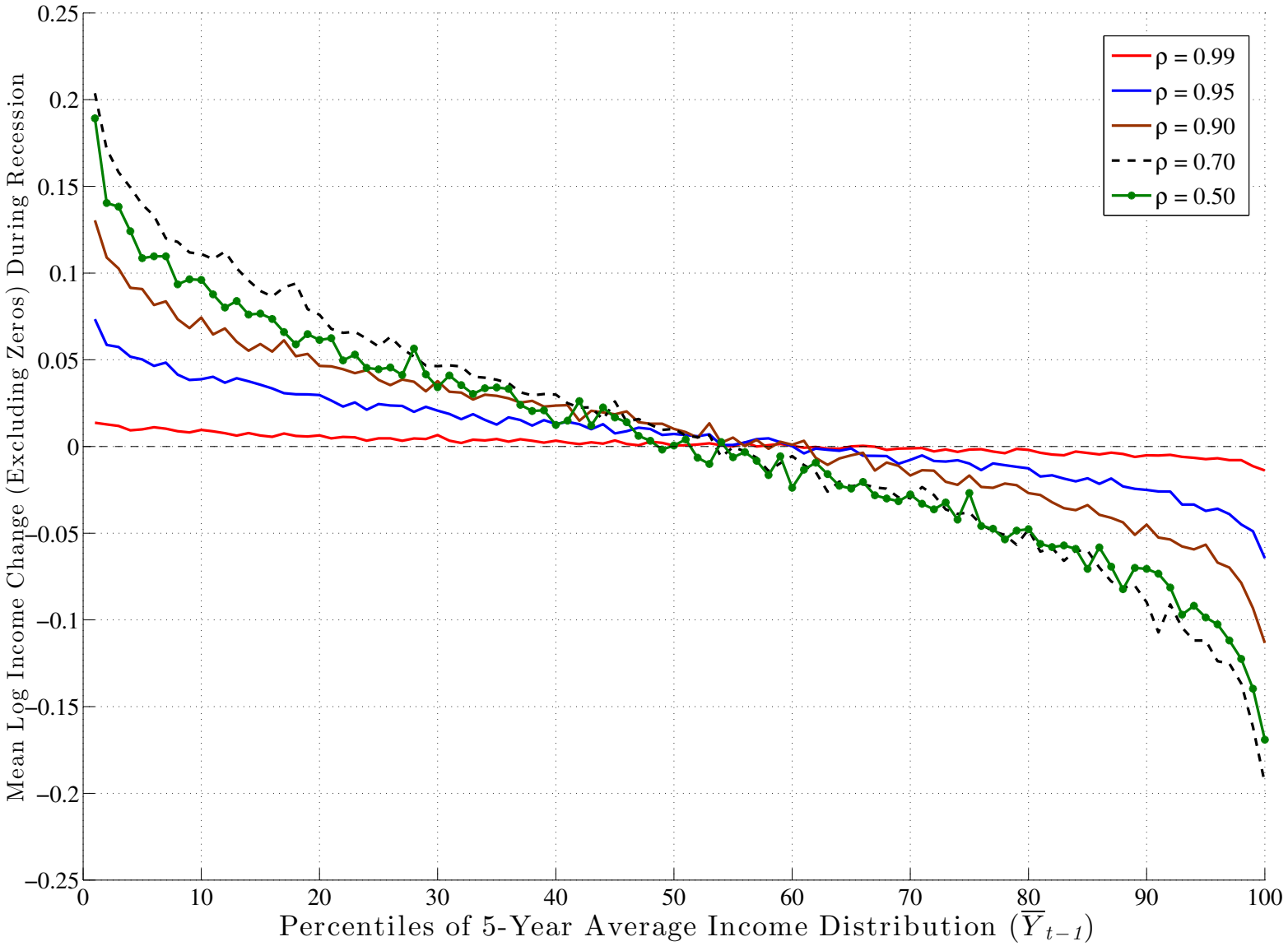
Caution: Mean Reversion



Empirical Results: Recessions

Four Recessions: Prime Age Males

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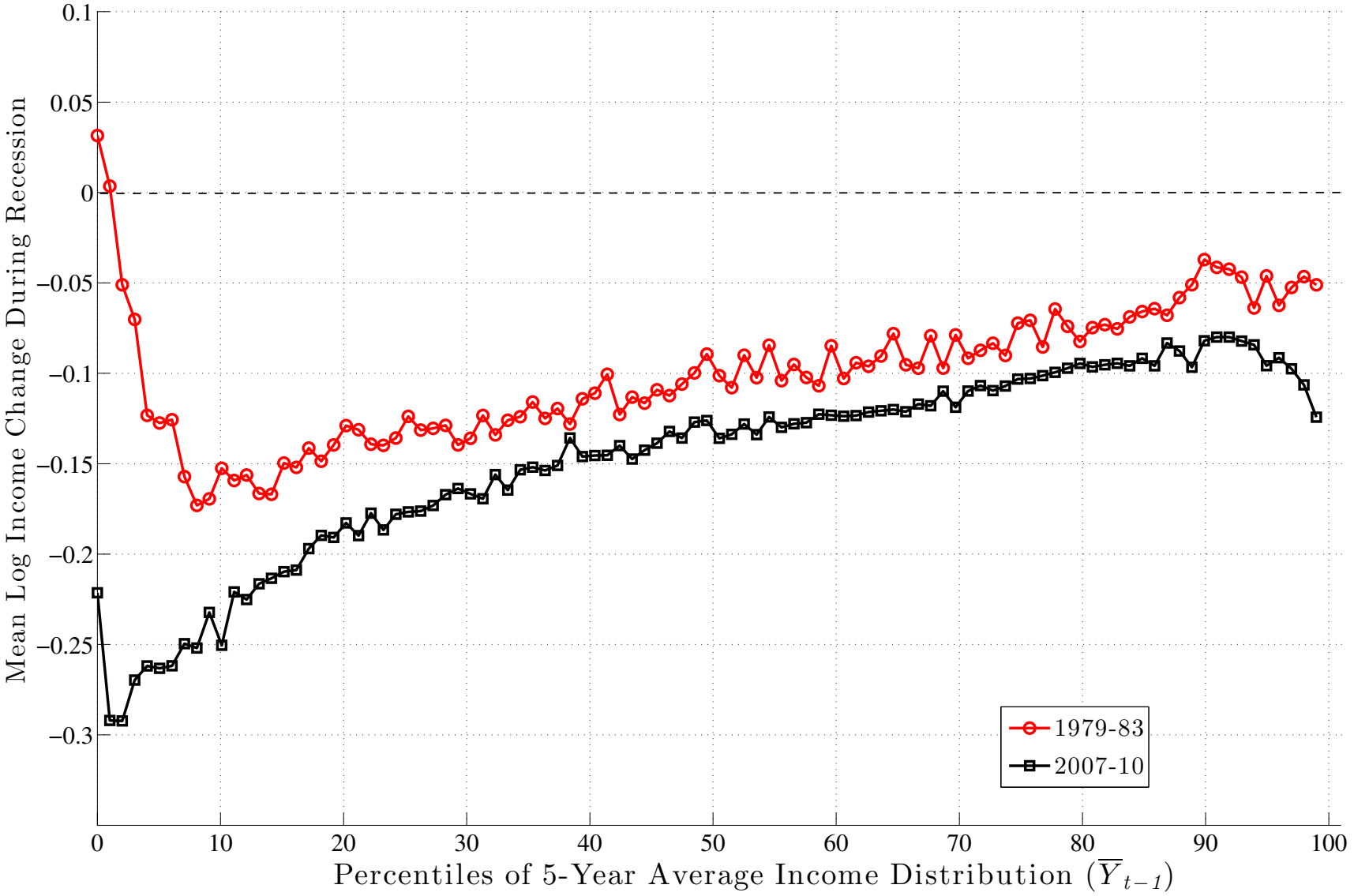

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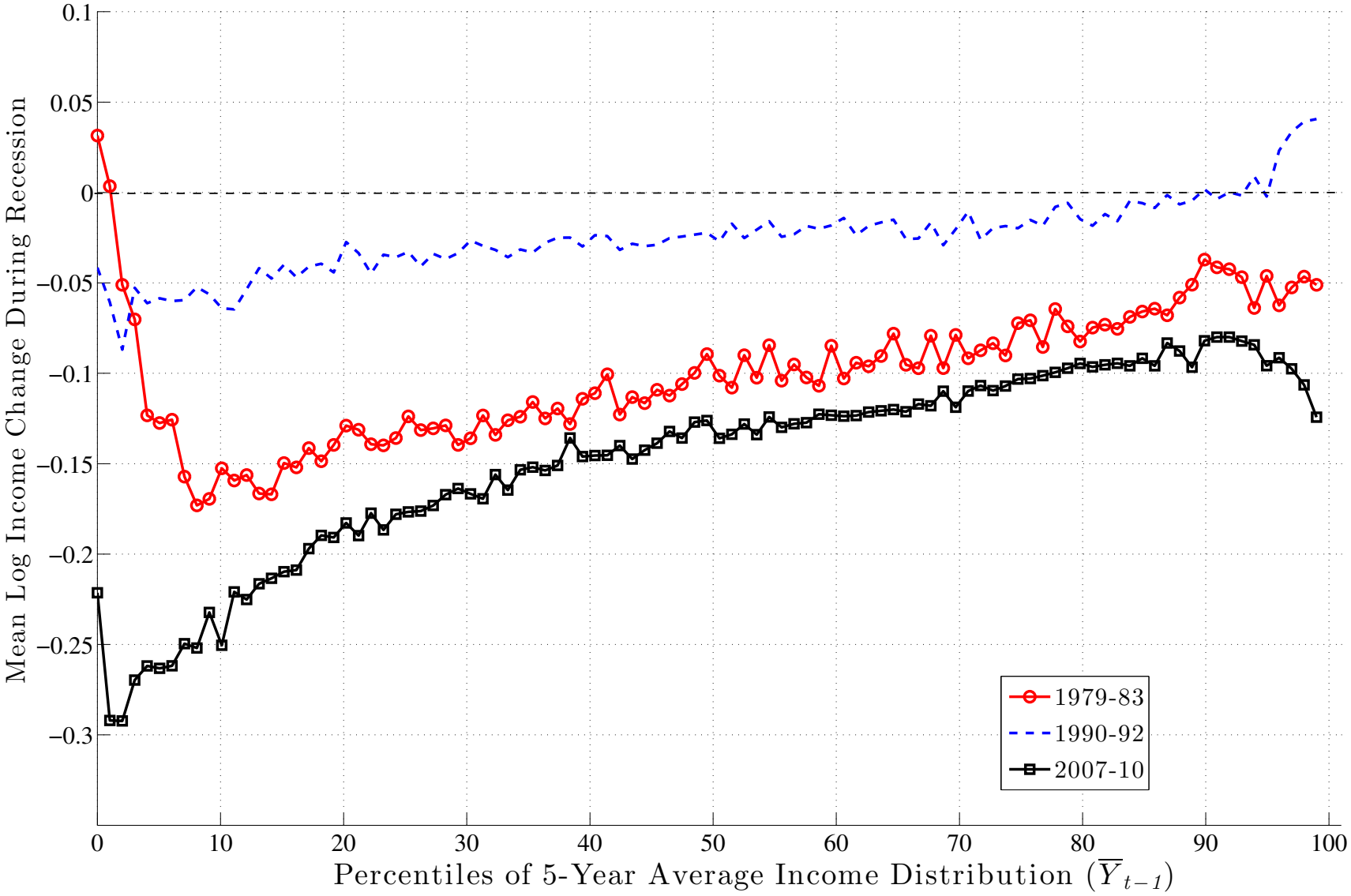
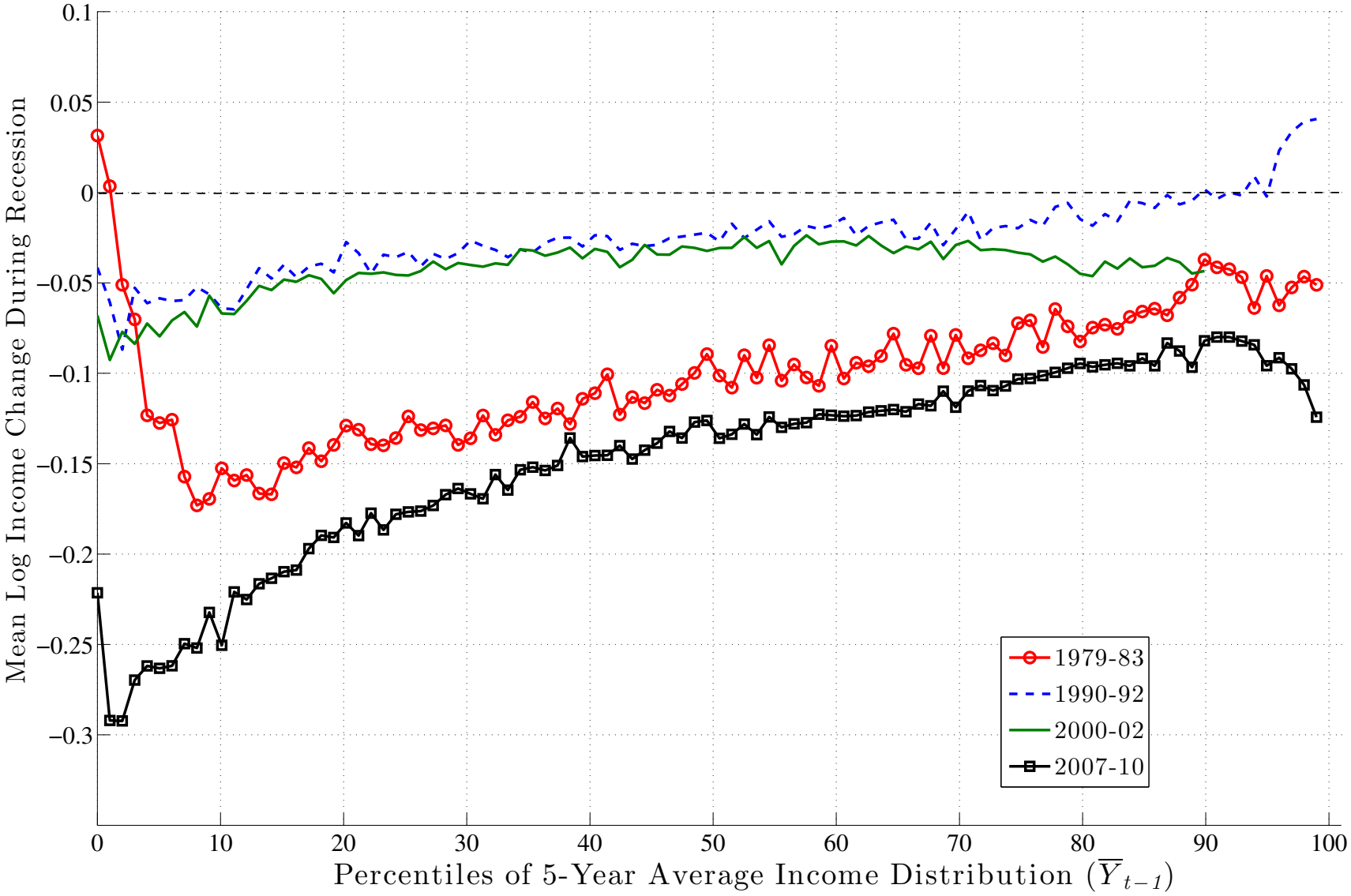
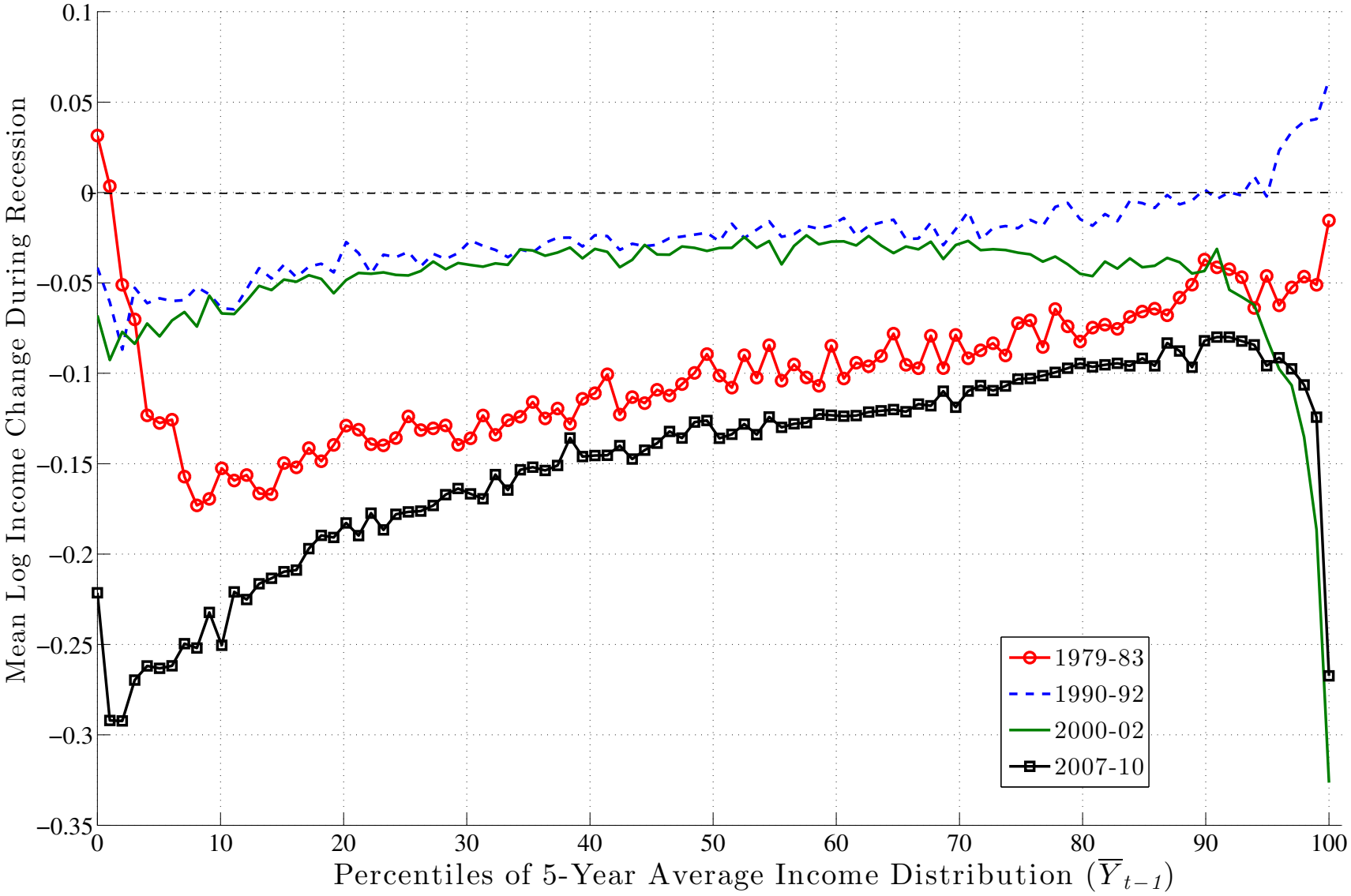


Four Recessions: Prime Age Males

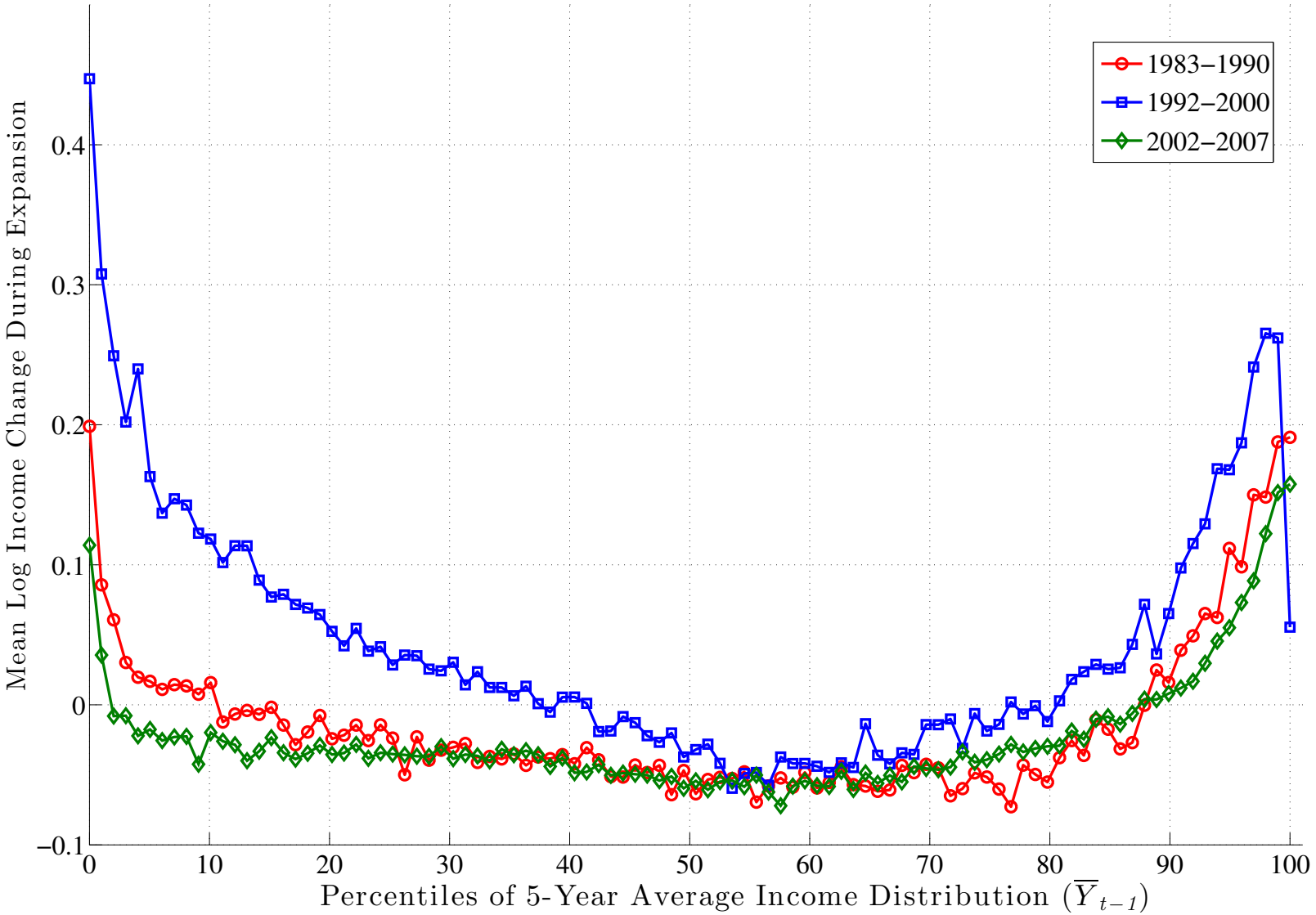


How About the Top 1%?

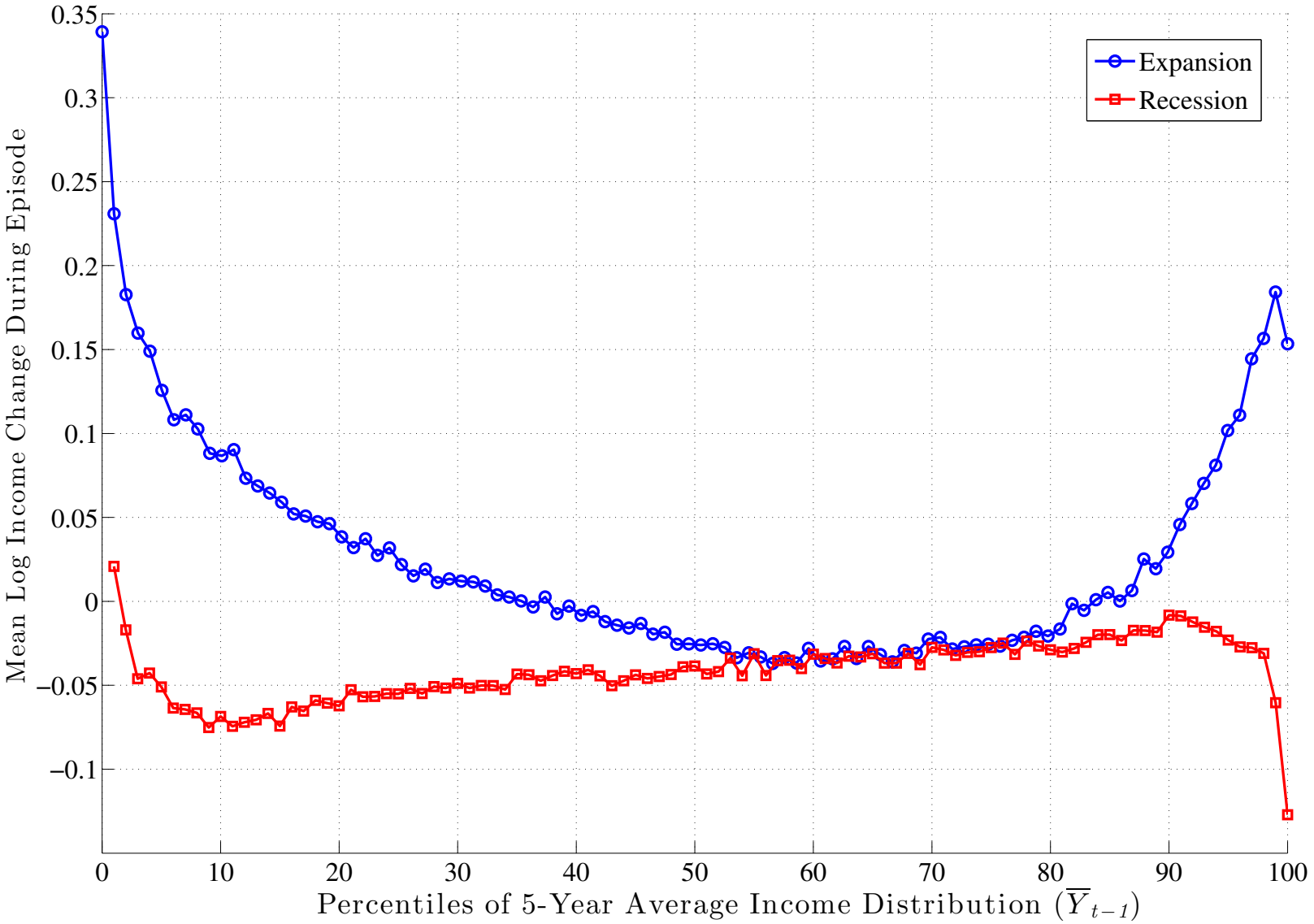


Empirical Results: Expansions

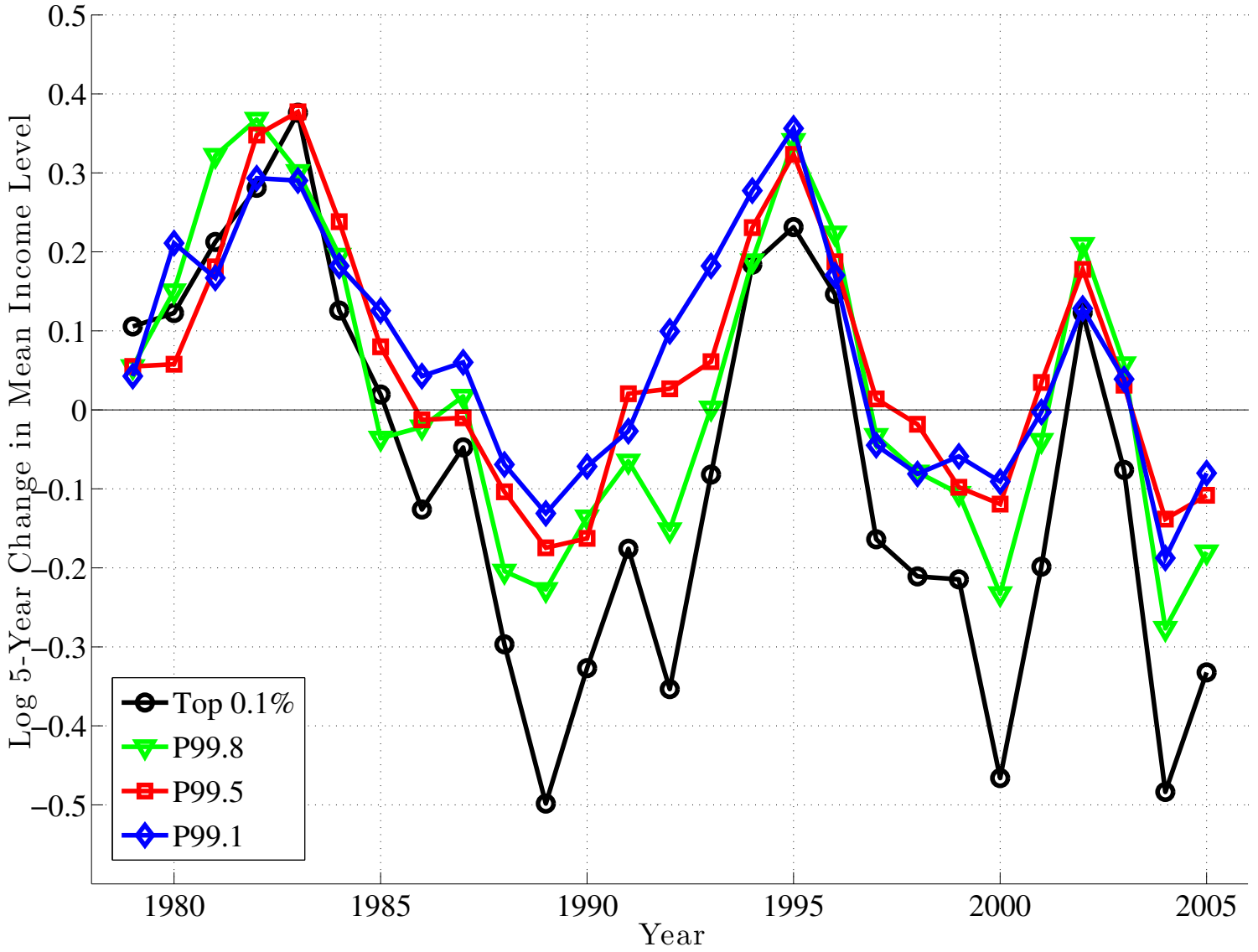
Three Expansions: Prime-Age Males



Putting Together: Expansions vs Recessions



5-Year Income Growth, Top 1%



Conclusions

- Idiosyncratic shocks: During recessions
  - Top half of the shock distribution gets compressed.
  - Bottom half gets wider.
  - $\Rightarrow$ Shock distributions become more negatively skewed.

- Substantial predictable component of fortunes over the business cycle.

- Very large and persistent decline in earnings for the top 1% during the last three recessions.

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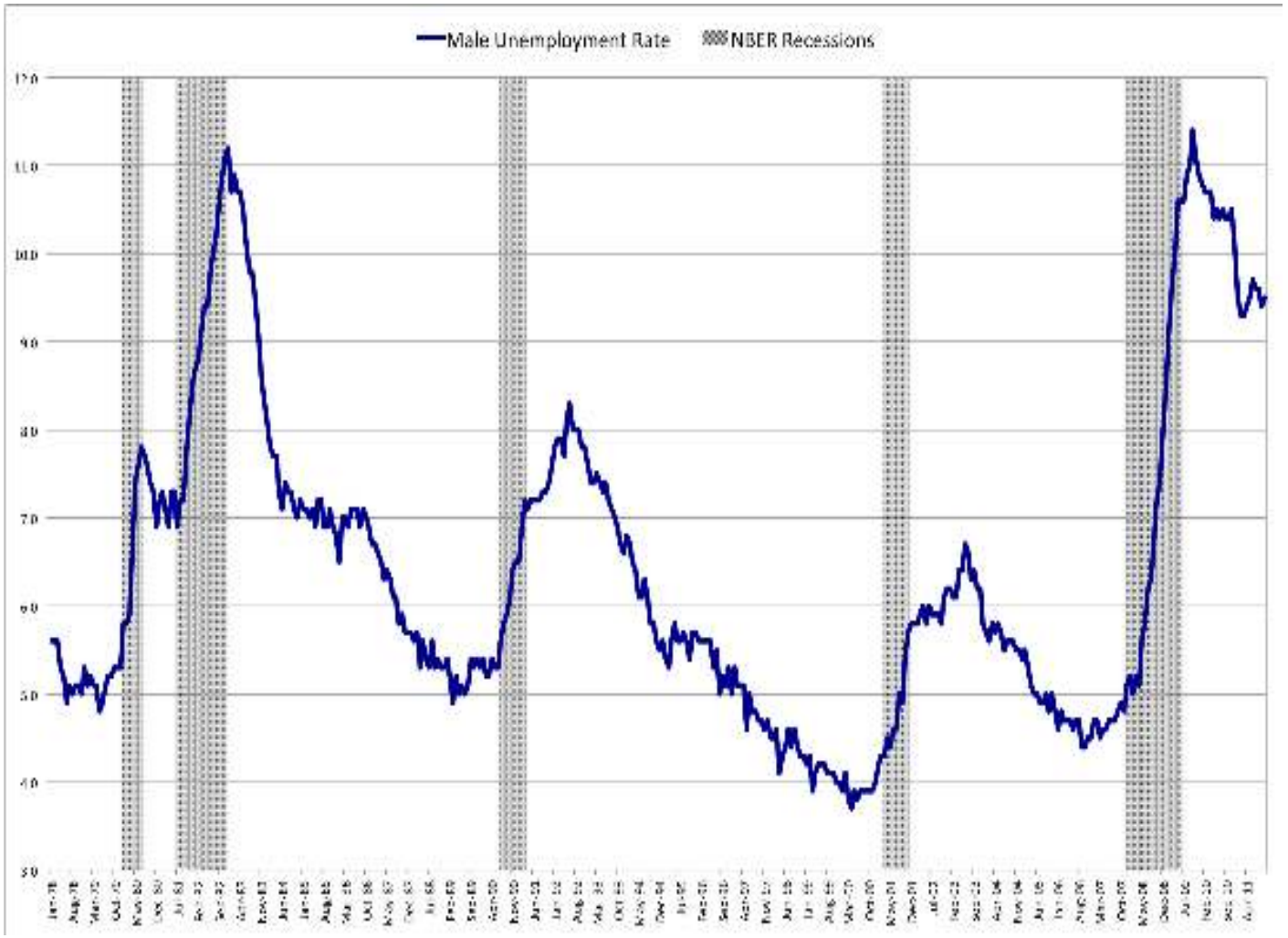
Current and Future Work

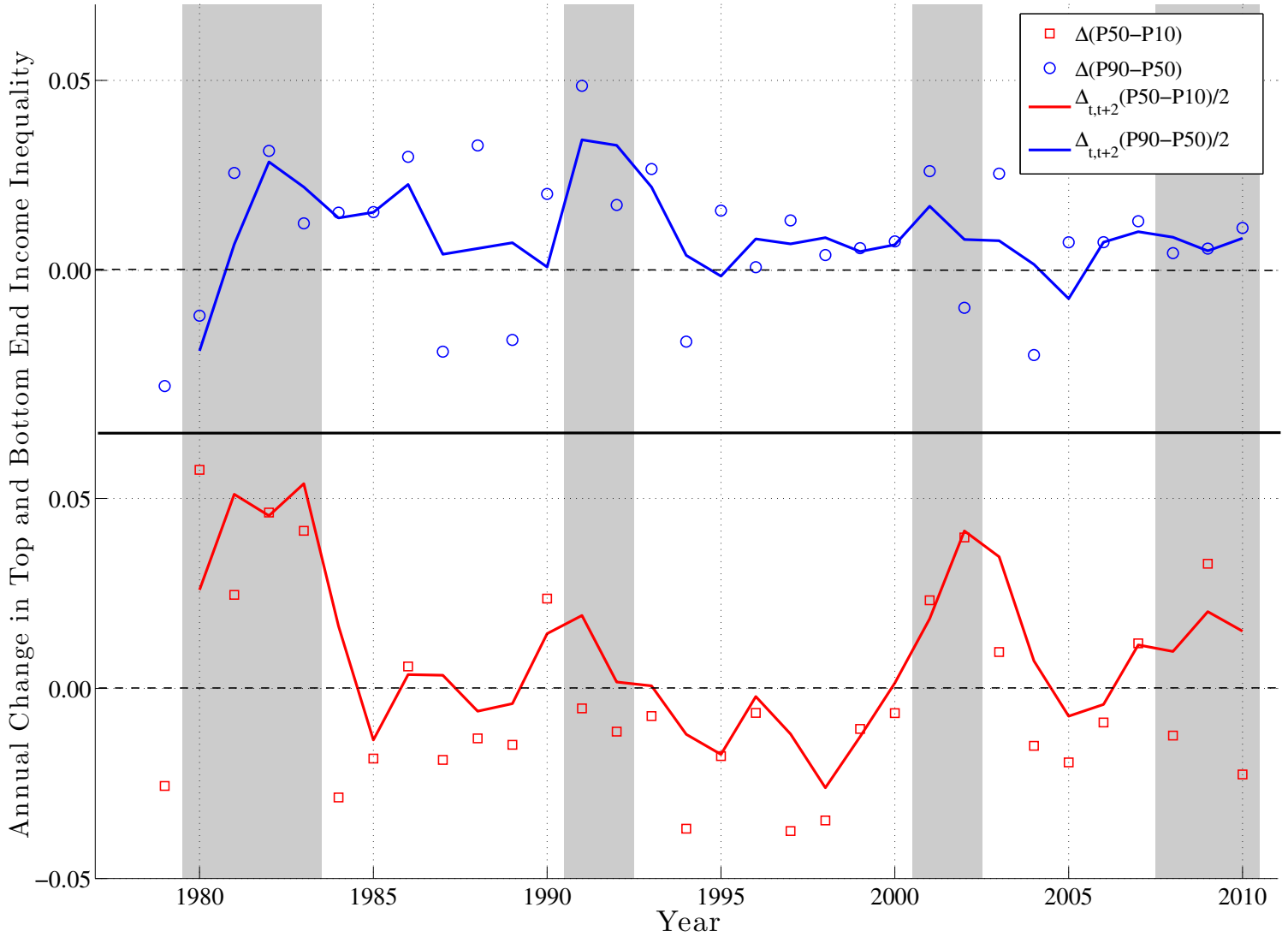
- The Distribution of Lifetime Incomes (with Greg Kaplan)
- The Lifecycle of Top 1 Percenters (with Greg Kaplan)
- Worker Betas (with Sam Schulhofer Wohl and Serdar Ozkan)
- Earnings Dynamics (with Serdar Ozkan and Fatih Karahan)
- Worker and Firm Effects in Increasing Inequality (with Nick Bloom)

Male Unemployment Rate



1. Question: Is earnings inequality countercyclical?

Change in P90-50 and P50-10 of $\log(Y^i)$



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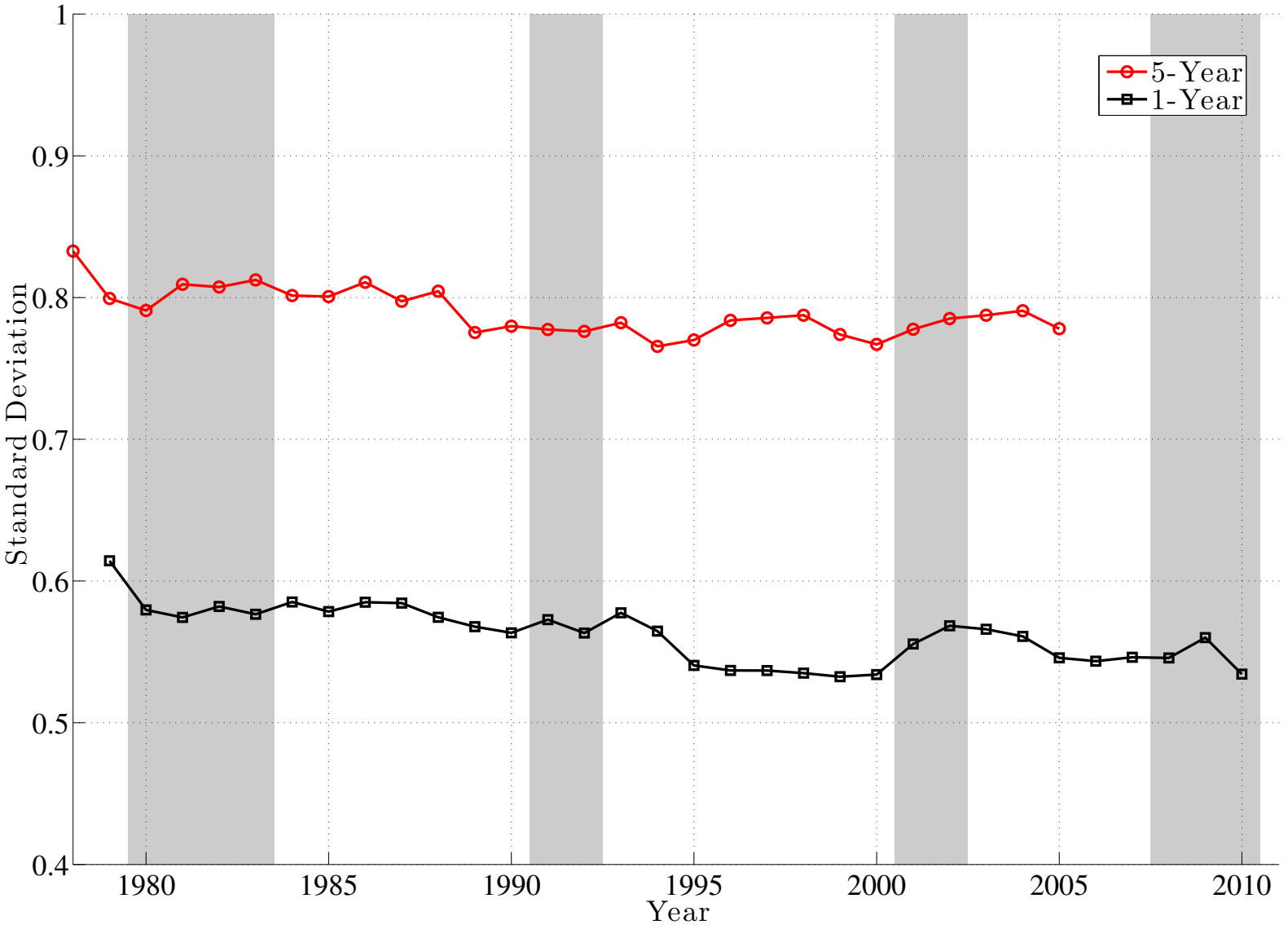
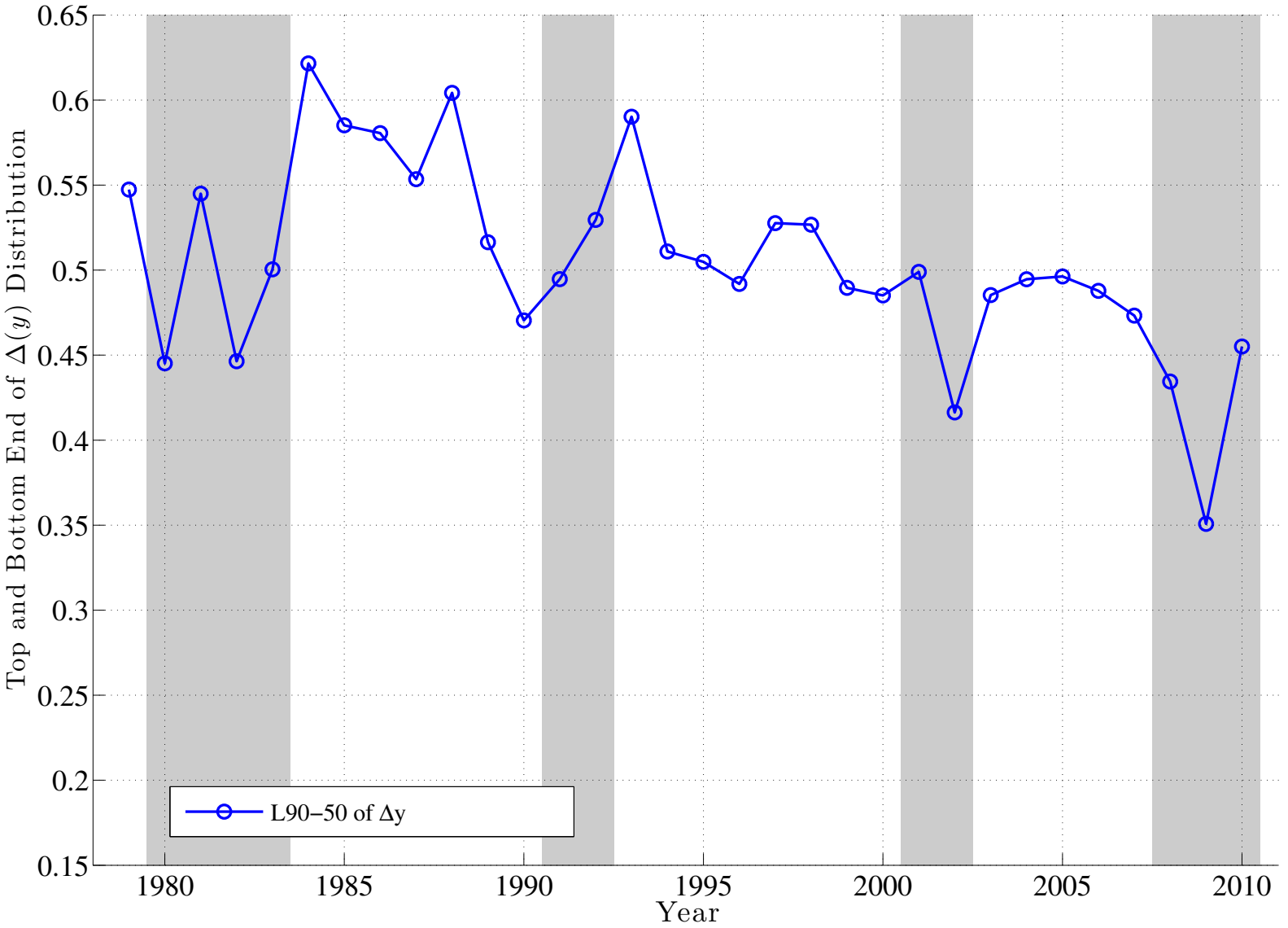
Variance of Δy^i and $\Delta_5 y^i$



P90-P50 and P50-P10 of $\Delta \text{LOG}(Y^i)$



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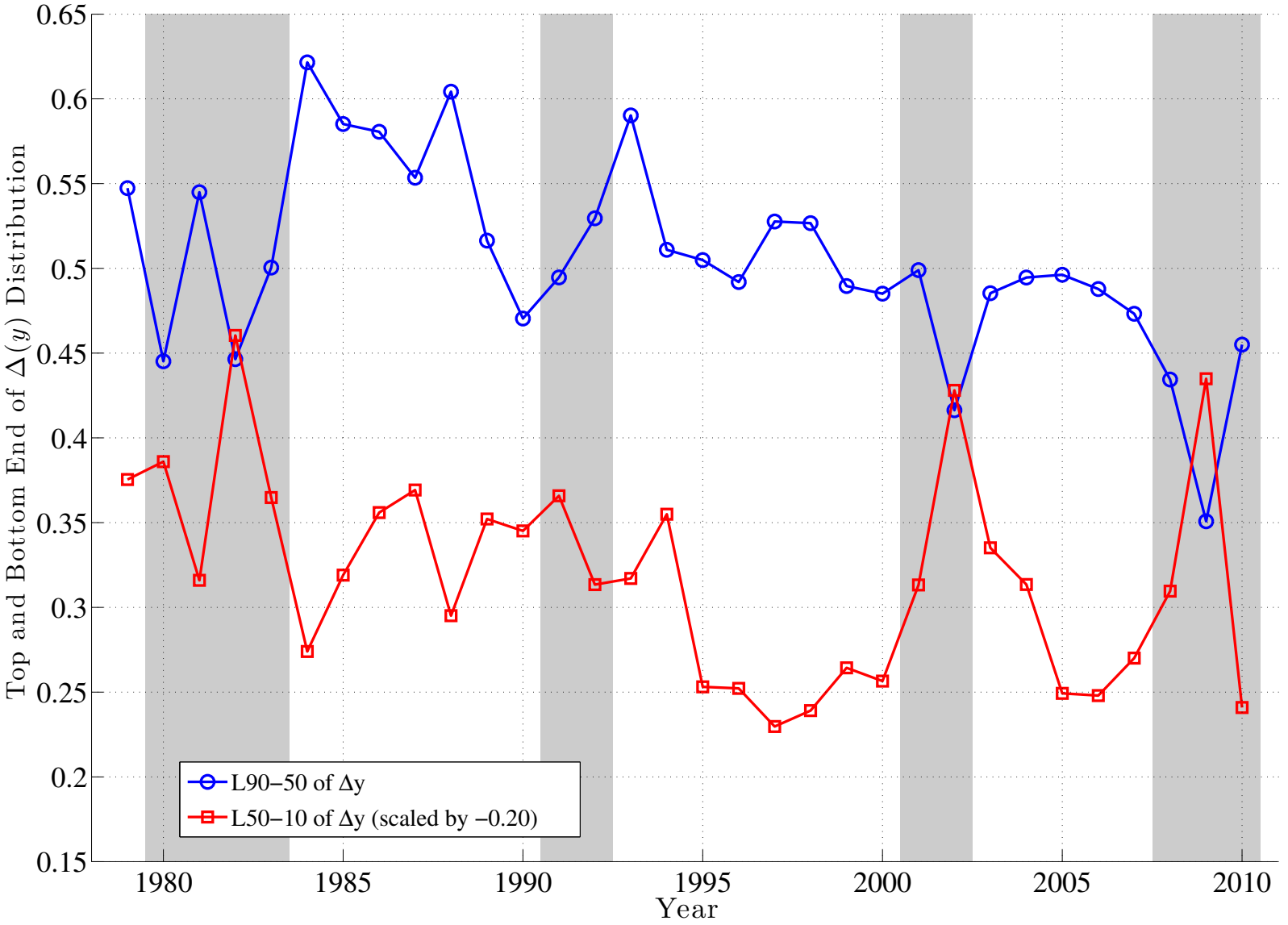
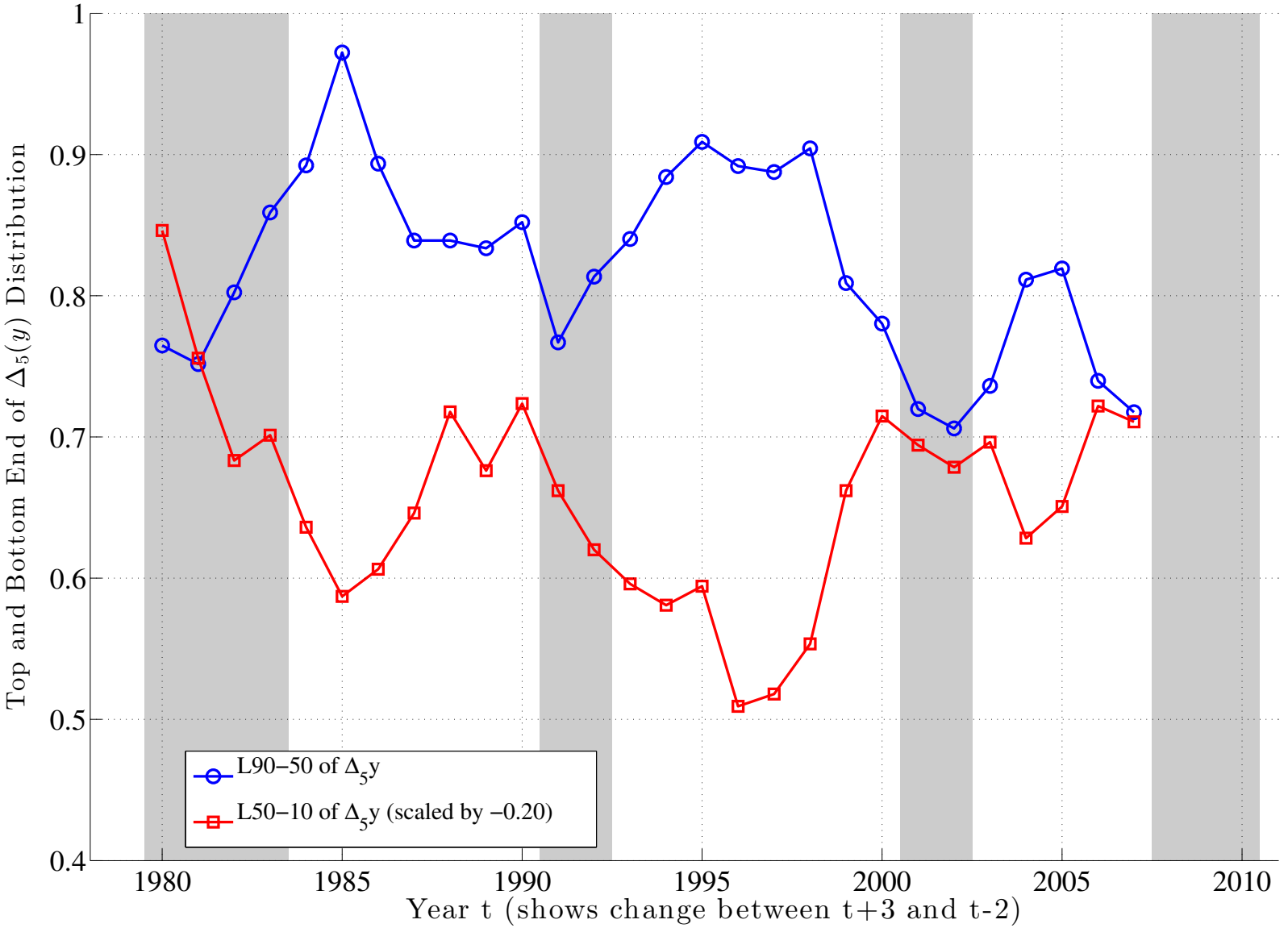


P90-P50 and P50-P10 of $\Delta_5 \log(Y^i)$



1. Question: Is cross-sectional inequality countercyclical?
   - Answer: Yes.
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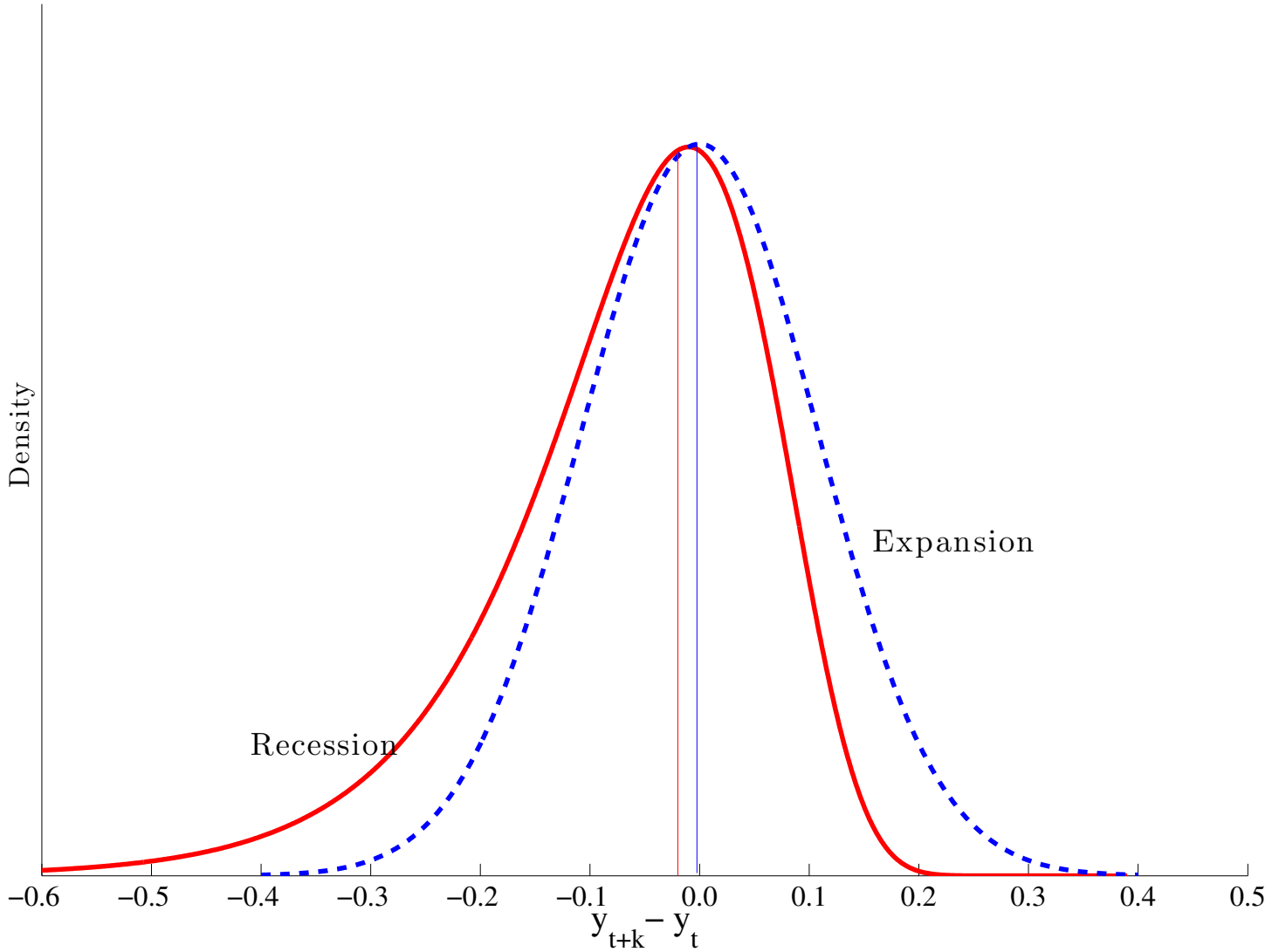
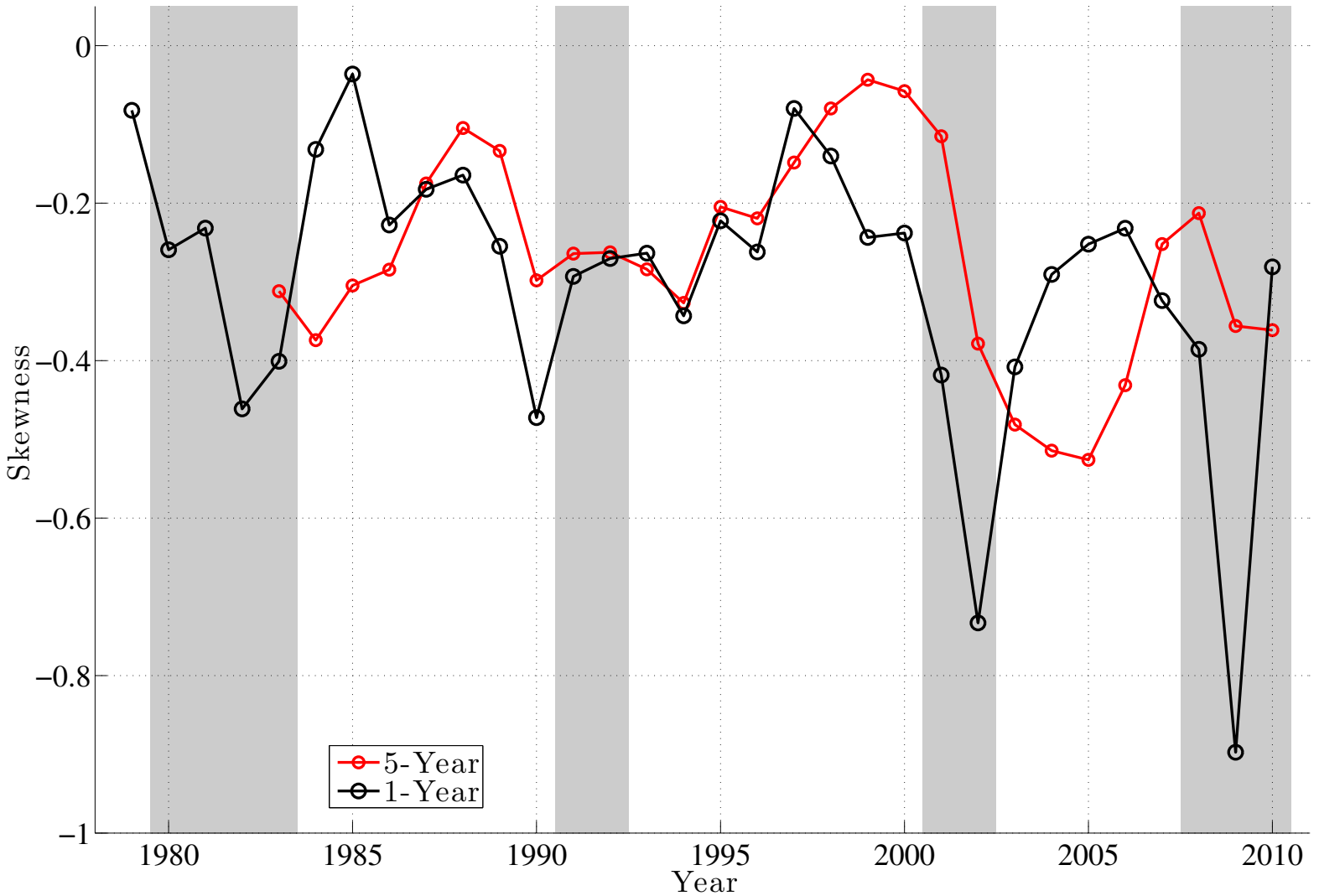
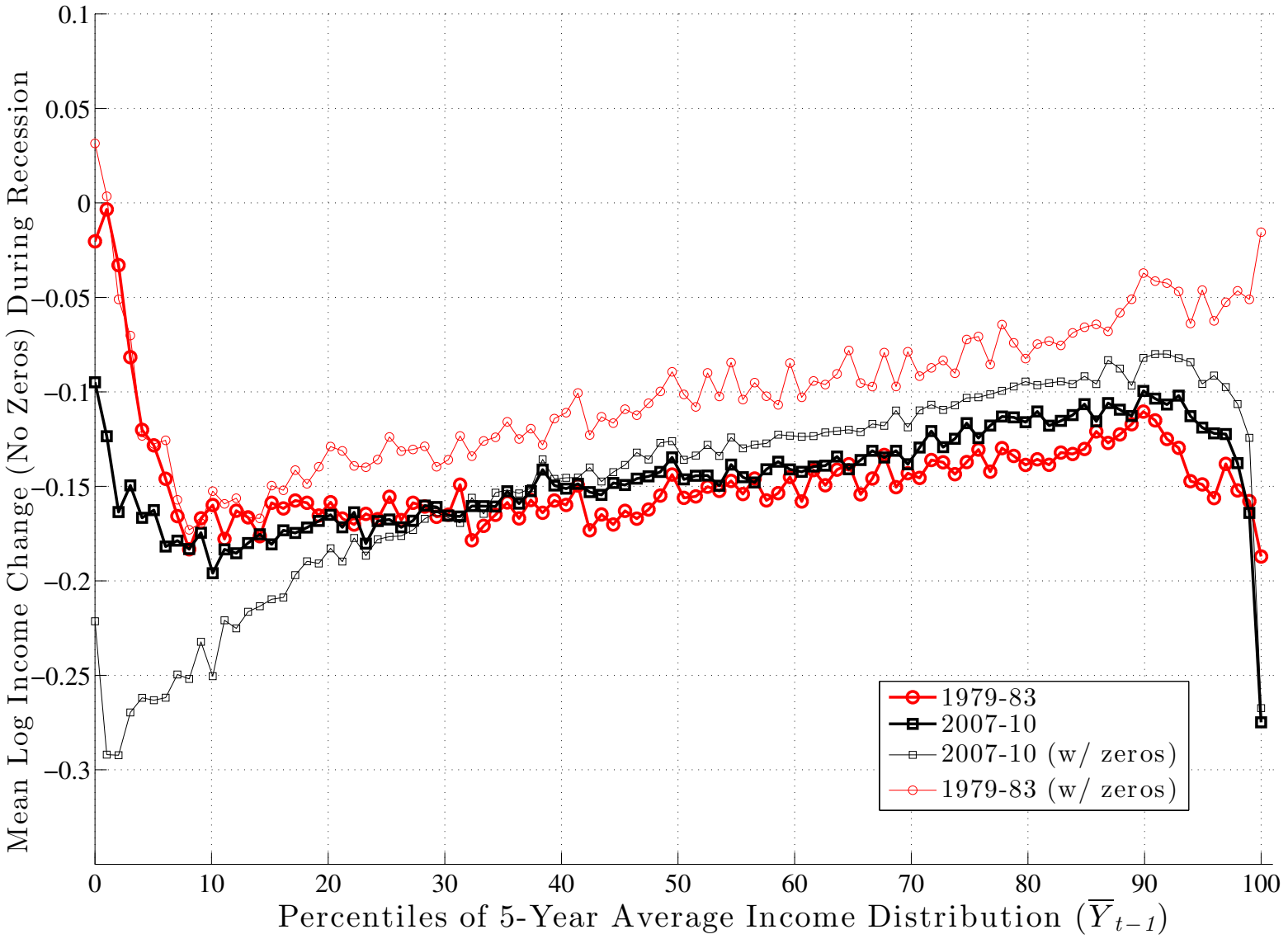
Recessions: Shock to Skewness?



Skewness of $\Delta \log(Y^i)$ and $\Delta_5 \log(Y^i)$



Full vs. Intensive Margin Comparison



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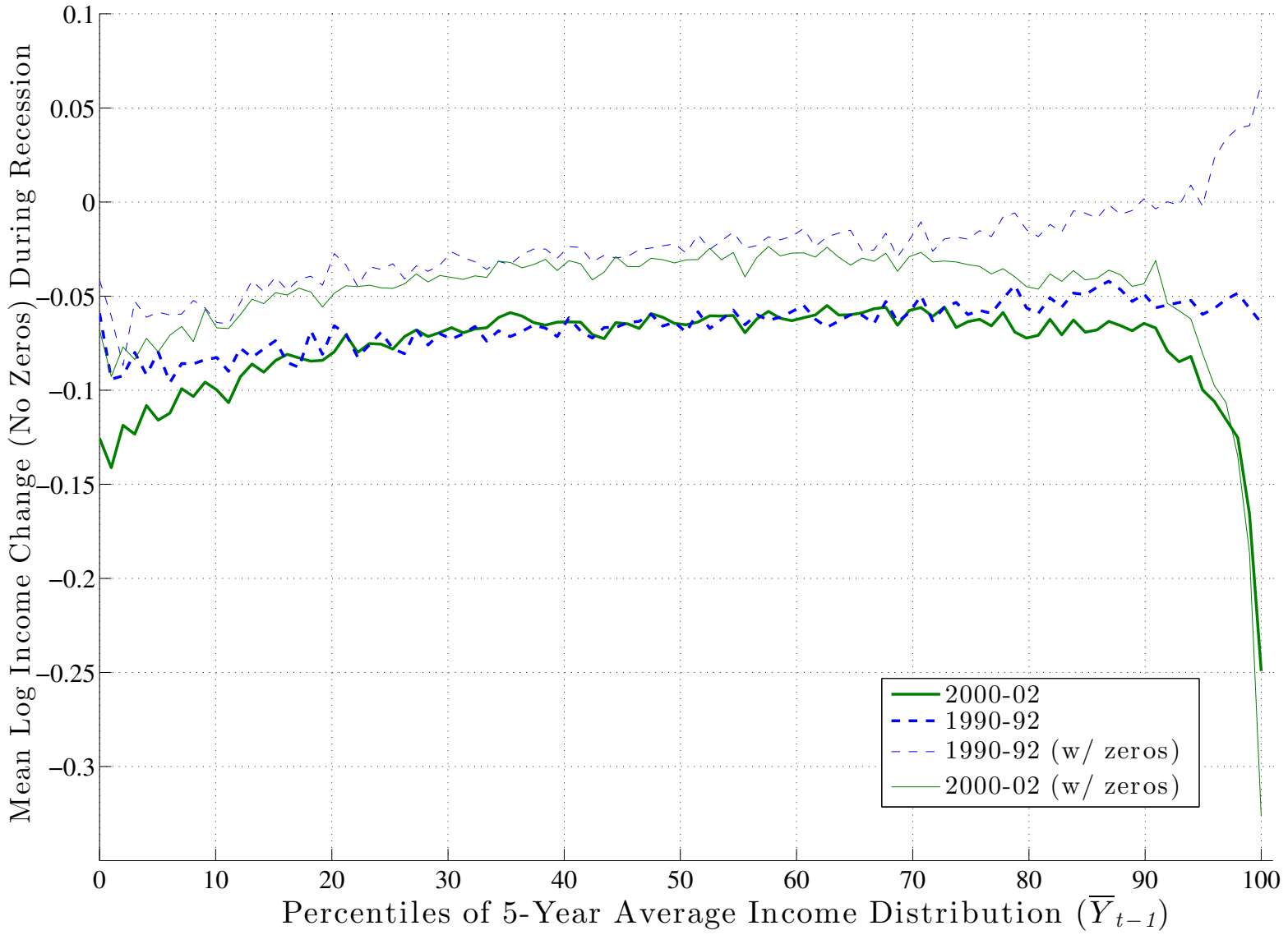
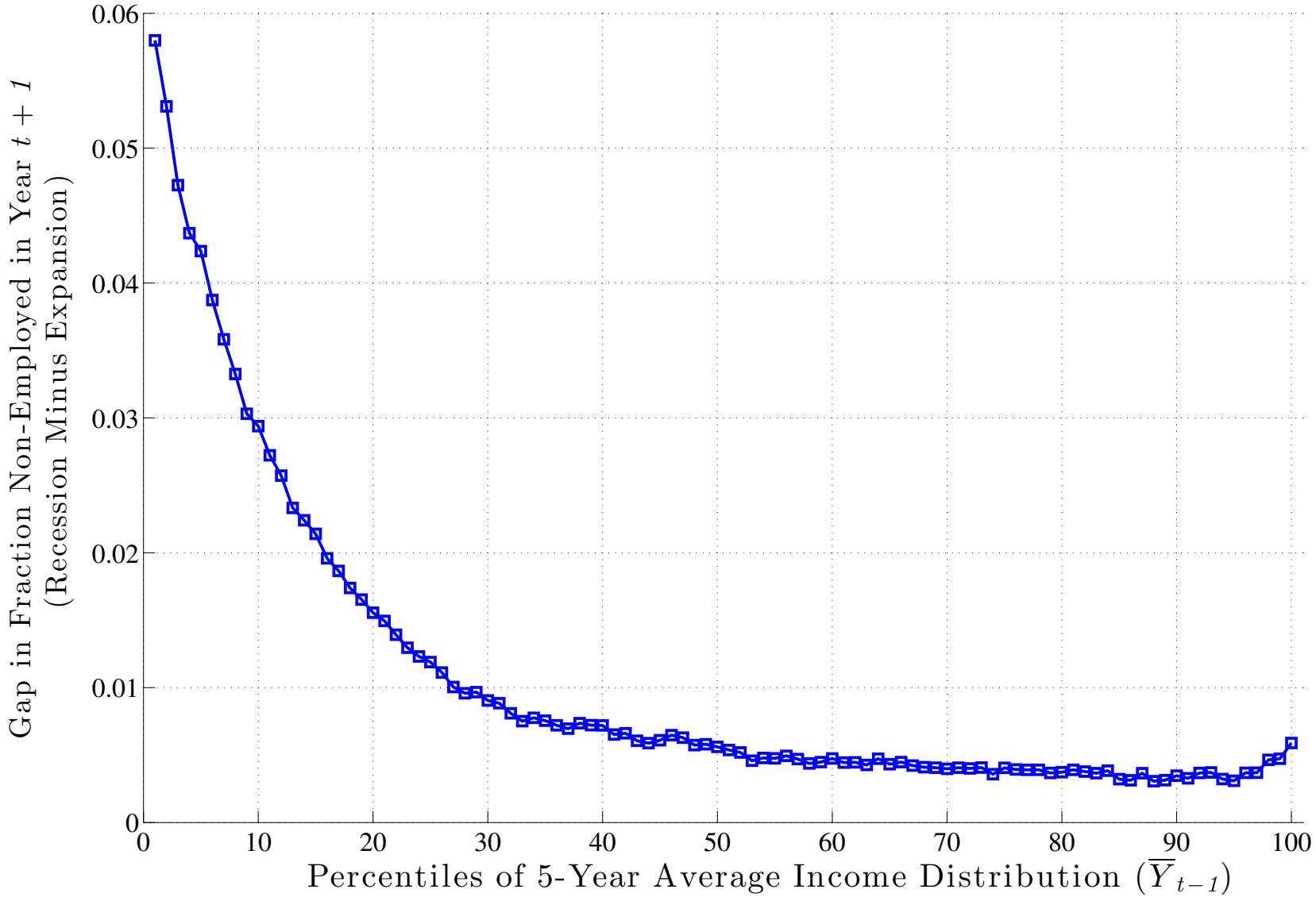


Change in Prob. of Full-Year Nonemployment



Variation by Age: Great Recession (2007–10)