Asymmetric Labor Income Uncertainty: Implications for Risk-Taking in Financial Markets

Tai Lo Yeung, USI

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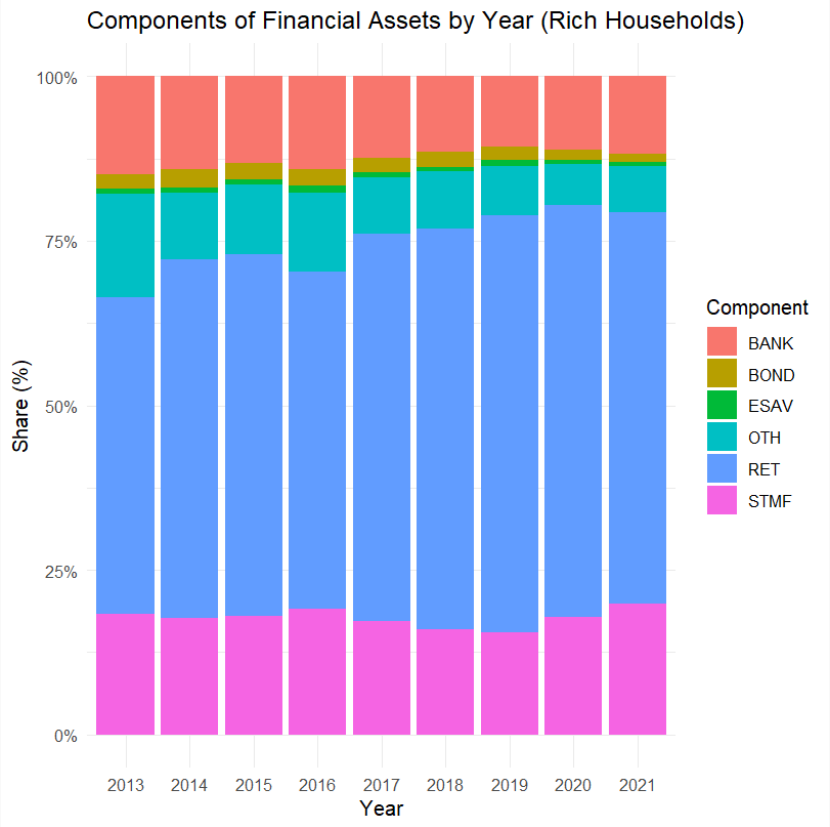
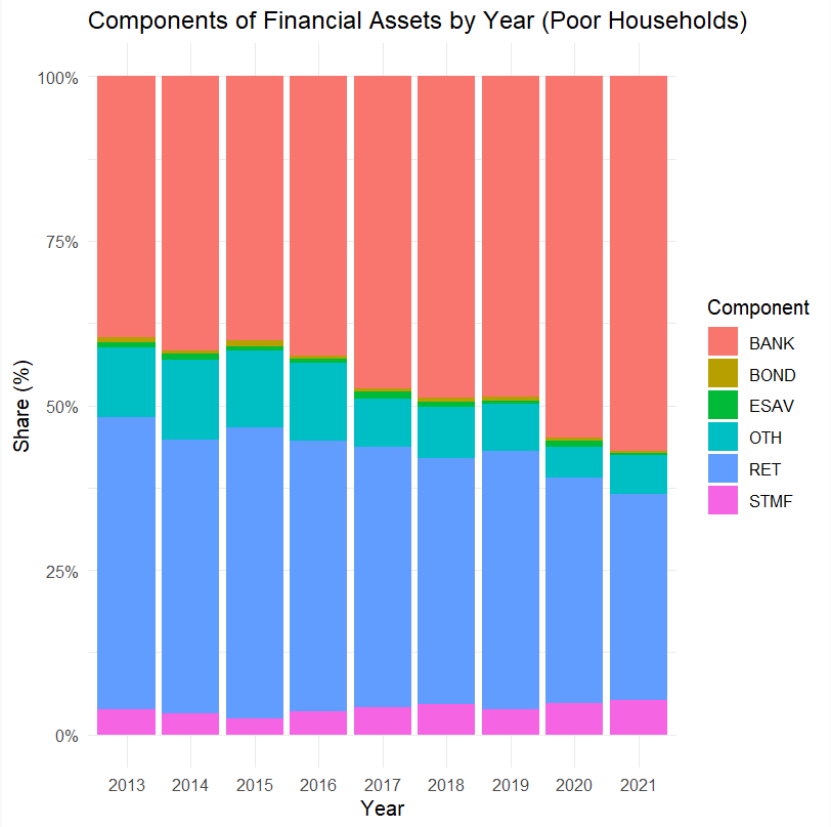
A decade of bull market

- Looks tempting, but who actually benefit from it?

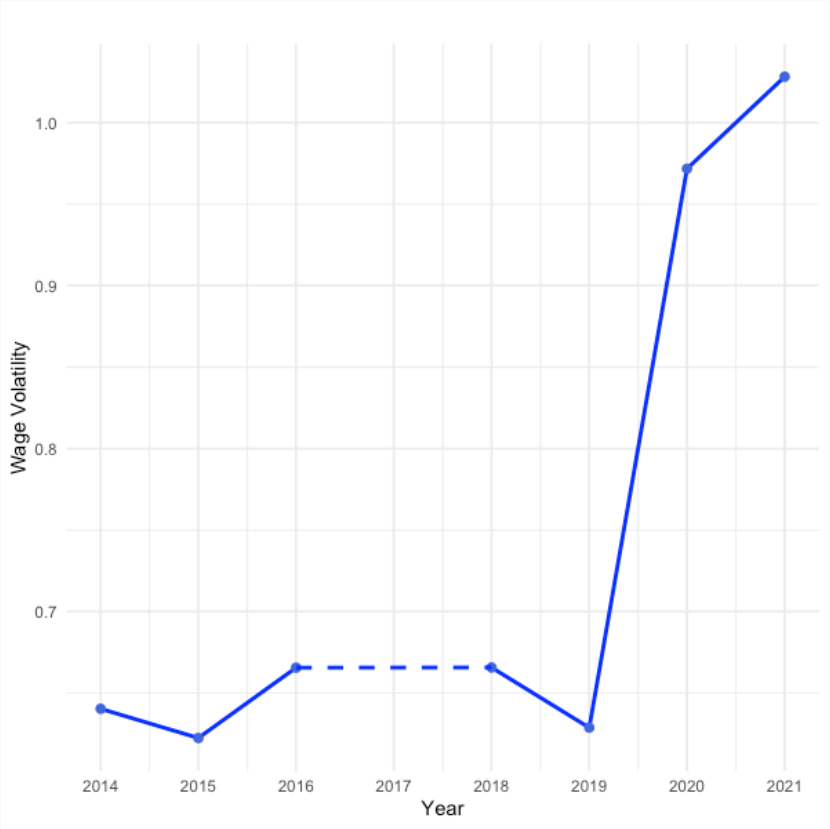
Asset allocation: Whole population

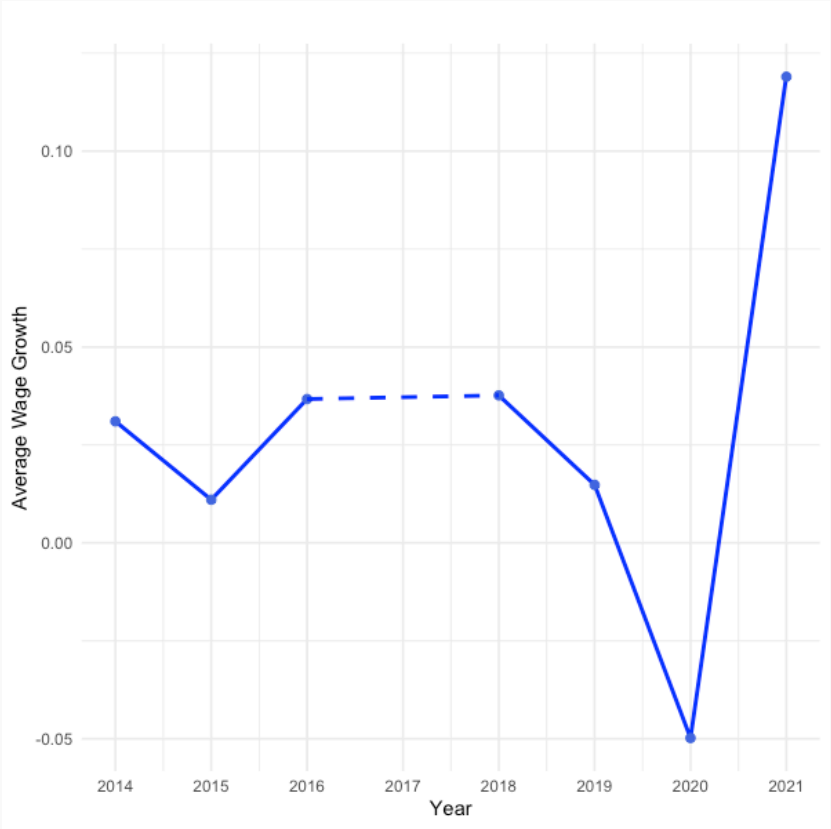




- Rich invests more while poor saves more

Rise in labor income uncertainty





- In 2020 and 2021, there was high volatility, but due to differing causes.

Guiso et al (1996, p. 160)

"The main difficulty in the empirical analysis is to find appropriate measures of income risk..."

Guiso et al (1996, p. 160)

> *"The main difficulty in the empirical analysis is to find appropriate measures of income risk..."*

In addition to a traditional metric of risk assessment, **volatility**, I am incorporating an additional factor, **skewness**.
This new element is designed to identify the direction of volatility, enabling it to consider the likelihood of encountering *downside risks* as well as the potential for *upward surprises*.

Contribution - The labor income risk framework

- Introduce **skewness** to the labor income uncertainty.
  - negative macroeconomic (undiversifiable) shocks result in a left-skewed distribution of labor income changes, et vice versa.
  - Skewness, capturing disaster risks, is thus procyclical. Figures
- Main insight: **The asymmetric effect of volatility**
  - When the first moment (Mean) and second moment (Variance) are equal, the third moment (Skewness) can vary. Figures
- Implications:
  - Enhancing the analytical framework to elucidate the portfolio decisions of households
  - Low skewness levels tend to have a disproportionate effect on reducing household equity holdings while simultaneously magnifying return heterogeneity Figures
  - economies can fall into a trap - wealthier accumulate wealth even faster

At the center of my analysis is a simple equation

The utility premium of the risk $\tilde{y}$ can be written as:

$$\theta(W) = u(W) - Eu(W + \tilde{y})$$

Which under third-order Taylor series approximation:

$$\theta(W) \approx \overbrace{-\frac{\sigma^2 u''(W)}{2}}^{>0} - \frac{E[\tilde{y}^3]u'''(W)}{6}$$

Note that under CRRA (downside RA), $u''(W) < 0$ and $u'''(W) > 0$, thus the sign of $\theta(W)$ depends on the sign and magnitude of $E[\tilde{y}^3]$.

Main takeaways

- Labor market risks can be more accurately understood by removing the **parametric assumption**.
- Households experiencing greater fluctuations in labor income tend to have larger stock holdings, previously attributed to risk-tolerant individuals choosing jobs with higher risk levels.
- Risk averse households, who typically rely more heavily on human capital for their livelihood, reduce their investment holdings under left-skewed risks.

Literature

1. **Limited household stock market participation:** Haliassos Bertaut (1995)
2. **Life cycle portfolio choice model:** log-normal: Fagereng Gottlieb Guiso (2017). not log-normal: Catherine (2022), Shen (2023)
3. **Skewness:** Golec Tamarkin (1998), Garrett Sobel (1999), Busch Domeij Guvenen Madera (2020), Catherine (2022)
4. **Labor and portfolio (empirics):** Massa Simonov (2006), Cardak Wilkins (2009), Betermier Jansson Parlour Walden (2012), Park Suh (2019)
5. **Return heterogeneity:** Campbell Ramadorai Ranish (2019), Fagereng Holm Moll Natvik (2019), Mian Straub Sufi (2020), Catherine Miller Paron Sarin (2023)

Table of contents

1. Data & Methodology

2. Findings

3. Conclusion

Data & Methodology

Survey of Income and Program Participation (SIPP)

- The Survey of Income and Program Participation (SIPP) is a nationally representative longitudinal survey containing comprehensive information on the dynamic of income, employment, household composition, and government program participation, conducted by the Census Bureau.
- In this research, I am constructing my panel using surveys conducted from 2014 to 2022.
- Based on statistics provided by the Bureau of Labor Statistics, typical weekly earnings for full-time workers fluctuated between $795 and $1,009 from 2014 to 2021. When extrapolated to a monthly scale, this translates to roughly $3,180 to $4,036. In my analysis, the figure stands at $3,281.

Conceptual Framework of labor income risk

Labor income can be decomposed as the product of the wage index (aggregate component) and an idiosyncratic component (Catherine 2022, RFS):

$$L_{it} = L_{1,t} \cdot L_{2,it}$$

$$l_{1,t} - l_{1,t-1} = \mu_l + \varepsilon_{l,t}$$

I assume that in any given month of any year, workers within the same education $\times$ industry cluster experience independent shocks, $\varepsilon_{l,t}$, drawn from an identical distribution. Hence, labor income risk can be segregated into aggregate risk and idiosyncratic risk components:

$$Labor\ Income\ Risk_{it} = \underbrace{Skewness_{gt}}_{aggregate} \times \underbrace{Variance_{it}}_{idiosyncratic}$$

Identification of labor income risk in data

1. Volatility, a.k.a. tansitory labor income growth variance, is captured at annual frequency and at individual level. Figures
2. As for the skewness, I exclusively focus on workers who have similar education level and work in the same industry, such that this group of people will face similar macro level risk. This serves as a proxy for the distribution or likelihood of all potential labor market outcomes for each individual. Figures
3. I utilize the proportion of **direct holdings in stocks and mutual funds** relative to the total financial assets as an indicator of an investor's appetite for risk. This choice is grounded in the fact that these assets represent the most liquid form of risky investments in a household's portfolio.

Findings

Empirical approach

$$RS_{i,M} = \alpha + \beta_1 \cdot var_{i,Y} + \beta_2 \cdot sk_{g(i,M)} + \beta_3 \cdot \underbrace{sk_{g(i,M)} \times var_{i,Y}}_{\text{Labor income risk}} + Control_{i,M} + \varepsilon_{i,M}$$

$$RS_{i,M} = Risky\ Share_{i,M} = \frac{Sum\ of\ value\ of\ stocks\ and\ mutual\ funds}{Sum\ of\ value\ of\ financial\ assets}$$

$$var_{i,Y} = Variance(\varepsilon)_{i,Y} = \sigma_{i,Y} = E[(\varepsilon_{i,M|Y} - \mu_{i,Y})^2]$$

$$sk_{g(i,M)} = \frac{\overbrace{(P90 - P50)}^{L9050} - \overbrace{(P50 - P10)}^{L5010}}{(P90 - P10)}$$

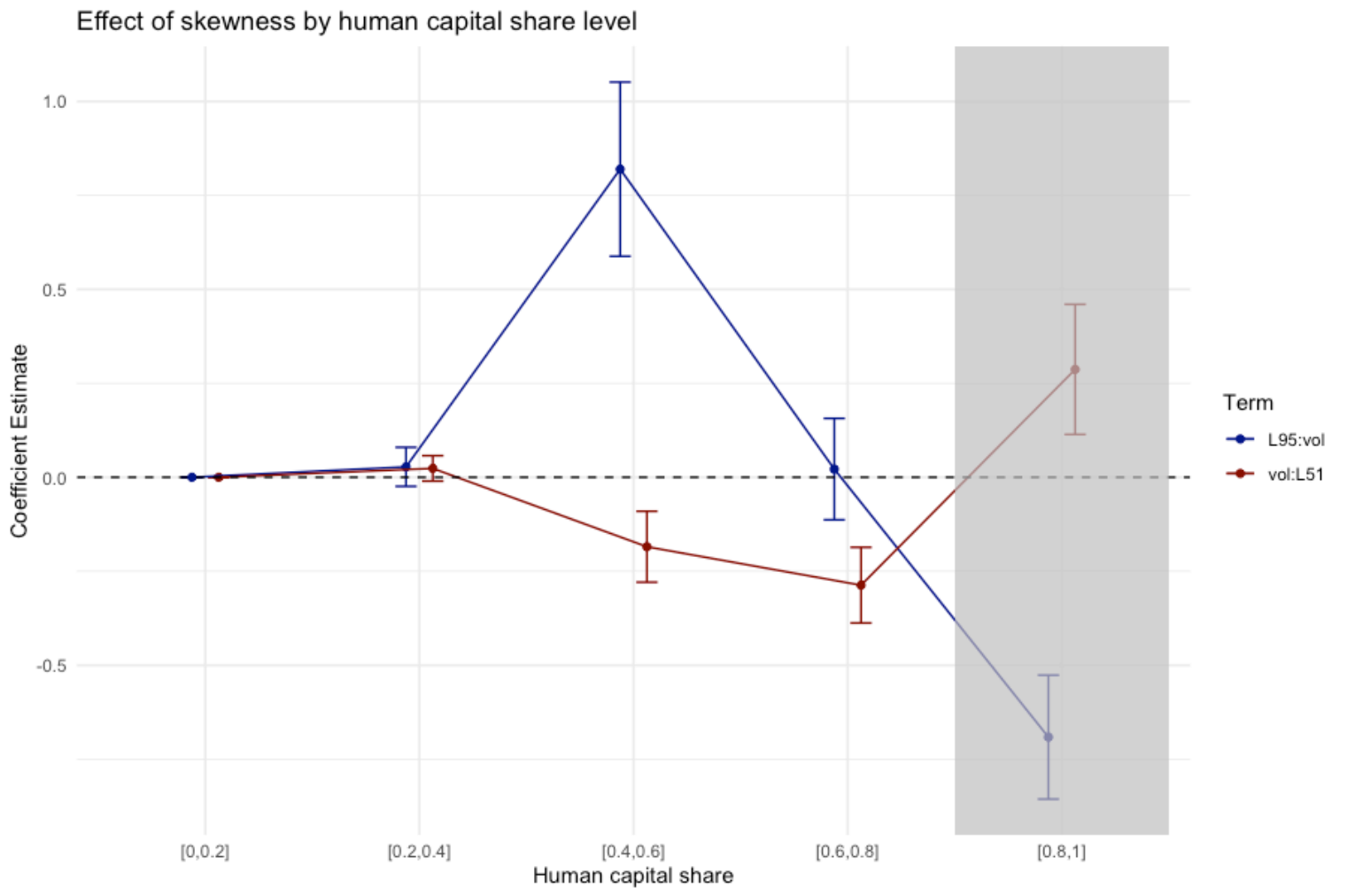
Skewness and asset allocation

	% Share of Assets Directly Invested in Stocks $\% \in [0,100]$								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Kelly Skewness	1.393	-	-	1.389	-	1.184	-	-	-
	(20.449)	-	-	(5.578)	-	(4.642)	-	-	-
L9050	-	0.323	-	-	0.316	-	0.120	-	0.152
	-	(3.668)	-	-	(3.593)	-	(1.346)	-	(1.678)
L5010	-	−0.246	-	-	−0.251	-	-	−0.211	−0.219
	-	(−3.332)	-	-	(−3.403)	-	-	(−2.822)	(−2.885)
Variance	-	-	0.076	0.076	0.076	0.079	−0.057	0.074	−0.033
	-	-	(4.628)	(4.606)	(4.621)	(4.783)	(−2.249)	(3.257)	(−1.243)
Kelly × Var	-	-	-	-	-	0.250	-	-	-
	-	-	-	-	-	(3.668)	-	-	-
L9050 × Var	-	-	-	-	-	-	0.137	-	0.162
	-	-	-	-	-	-	(6.843)	-	(7.482)
L5010 × Var	-	-	-	-	-	-	-	0.003	−0.044
	-	-	-	-	-	-	-	(0.190)	(−2.779)
Household characteristics	T								
Industry FEs	T								
Year-month FEs	T								
Observations	259,485								

Table 1: Main Weighted OLS Regressions

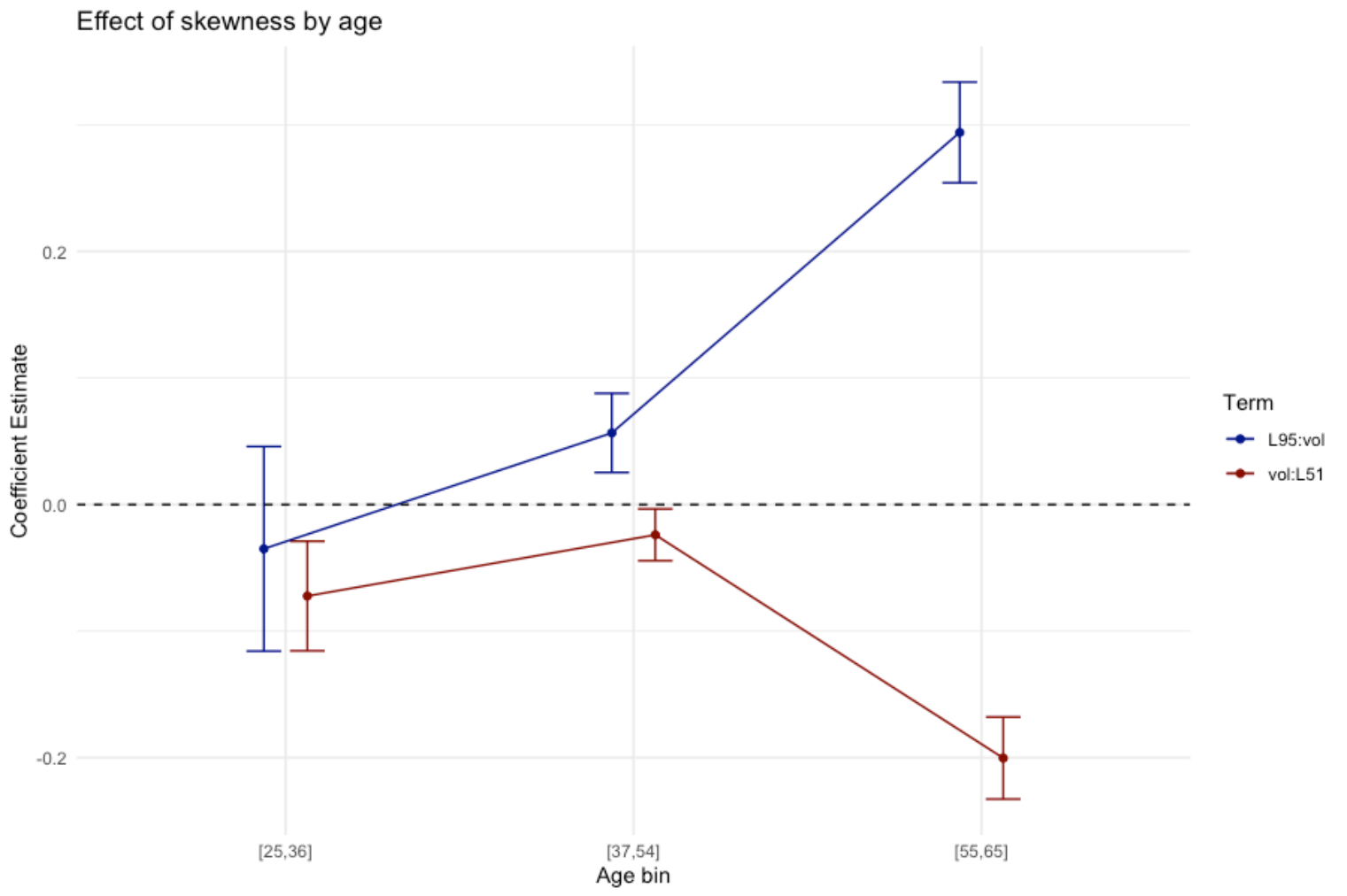
- The salient influence of *Variance* can be attributed primarily to contributions from the upper quantile. Selection

Empirical evidence for downside risk aversion



Theory Trend Effect

Labor income risks by age group



Vol

Conclusion

Main Findings

- The capacity of households to engage in financial risks is intimately connected to the volatility and skewness of their labor market returns.

- This is in line with the concept of **downside risk aversion**, indicating that households with greater risk aversion are more adversely affected by negative skewness levels, which increases their risk of incurring investment losses due to labor market risks.

Results and Interpretation

- Households with a greater dependence on human capital are at an increased risk of experiencing financial distress from stock market downturns due to their exposure to human capital risk.

- Such behaviors may give rise to a trend where affluent households attain more substantial gains from the stock market, whereas less wealthy households find it more challenging to reap the rewards of equity investment. (Campbell et al. (2019); Bach et al. (2020))

Summary

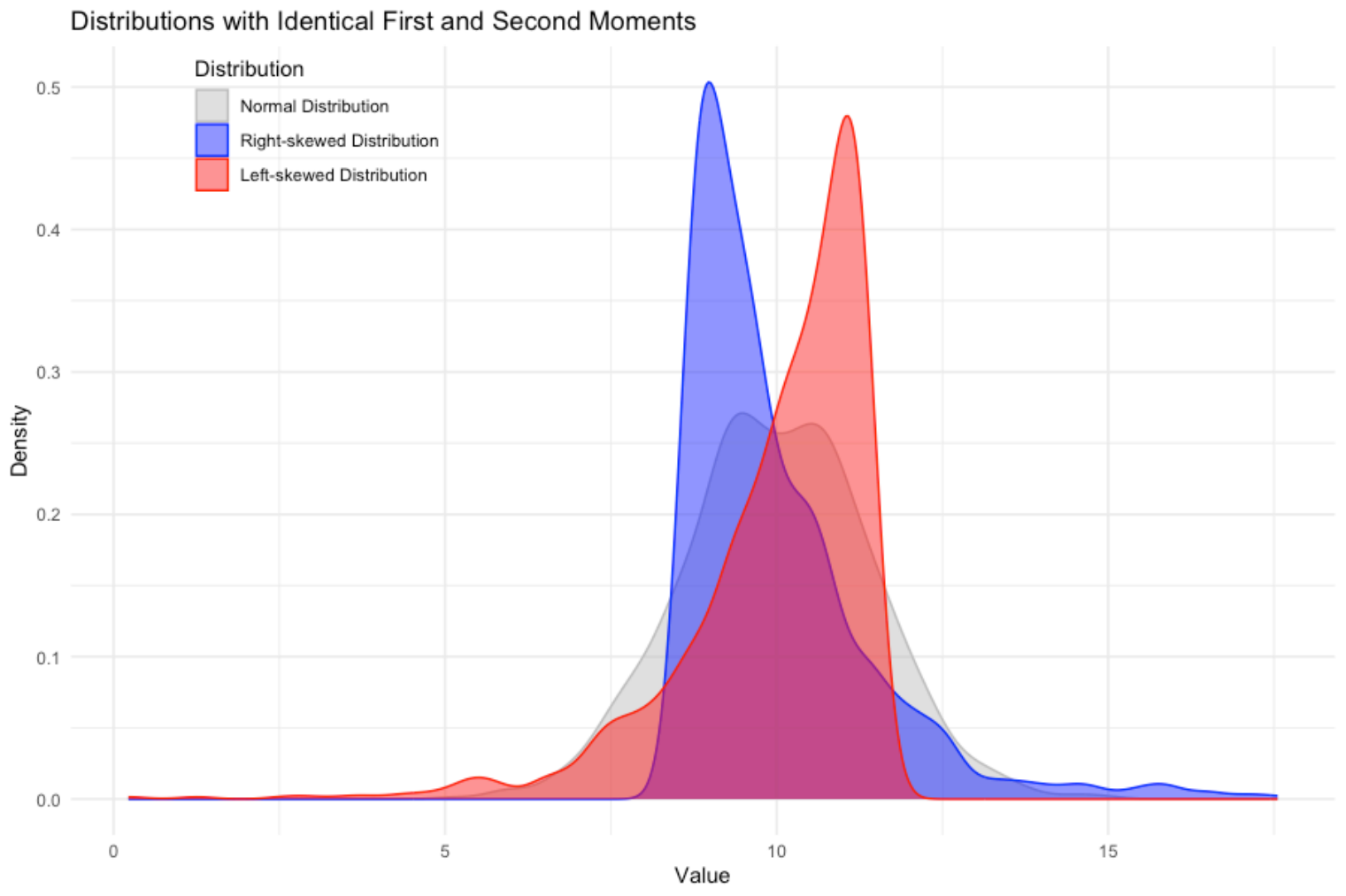
- Nonparamatric approach to portfolio decision problem with both macro (procyclicality of skewness) and micro (individual level labor income variance) elements.

- Trend: In recent years, there has been a growing focus on exploring economic puzzles through the lens of higher-order moments of income shocks, including their implications for monetary and fiscal policy. For instance, Kaplan, Moll, and Violante (2018) investigated the impact of leptokurtic shocks on the monetary transmission mechanism.

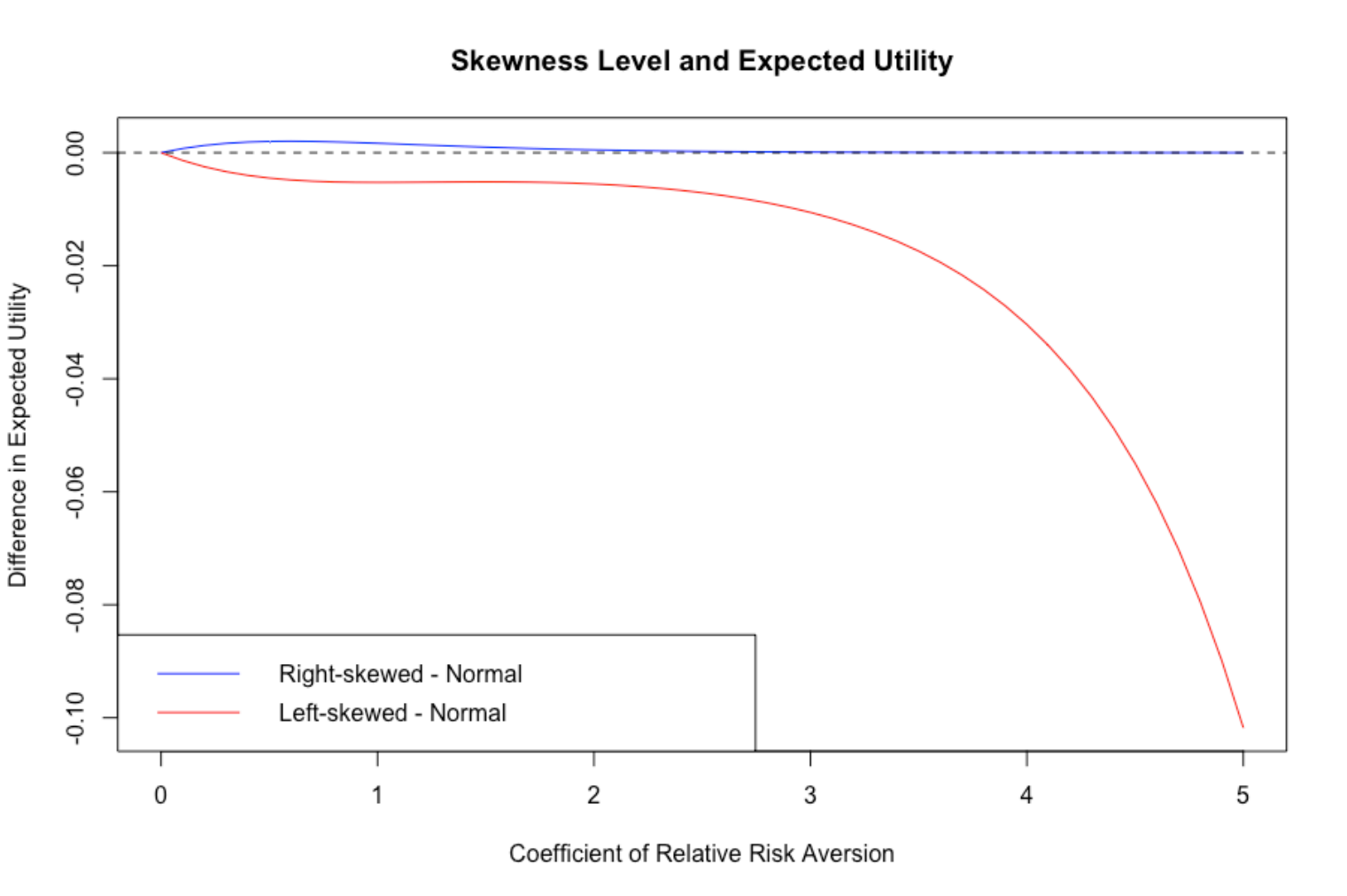
Thank You!

Appendix

Distributions with identical first and second moments

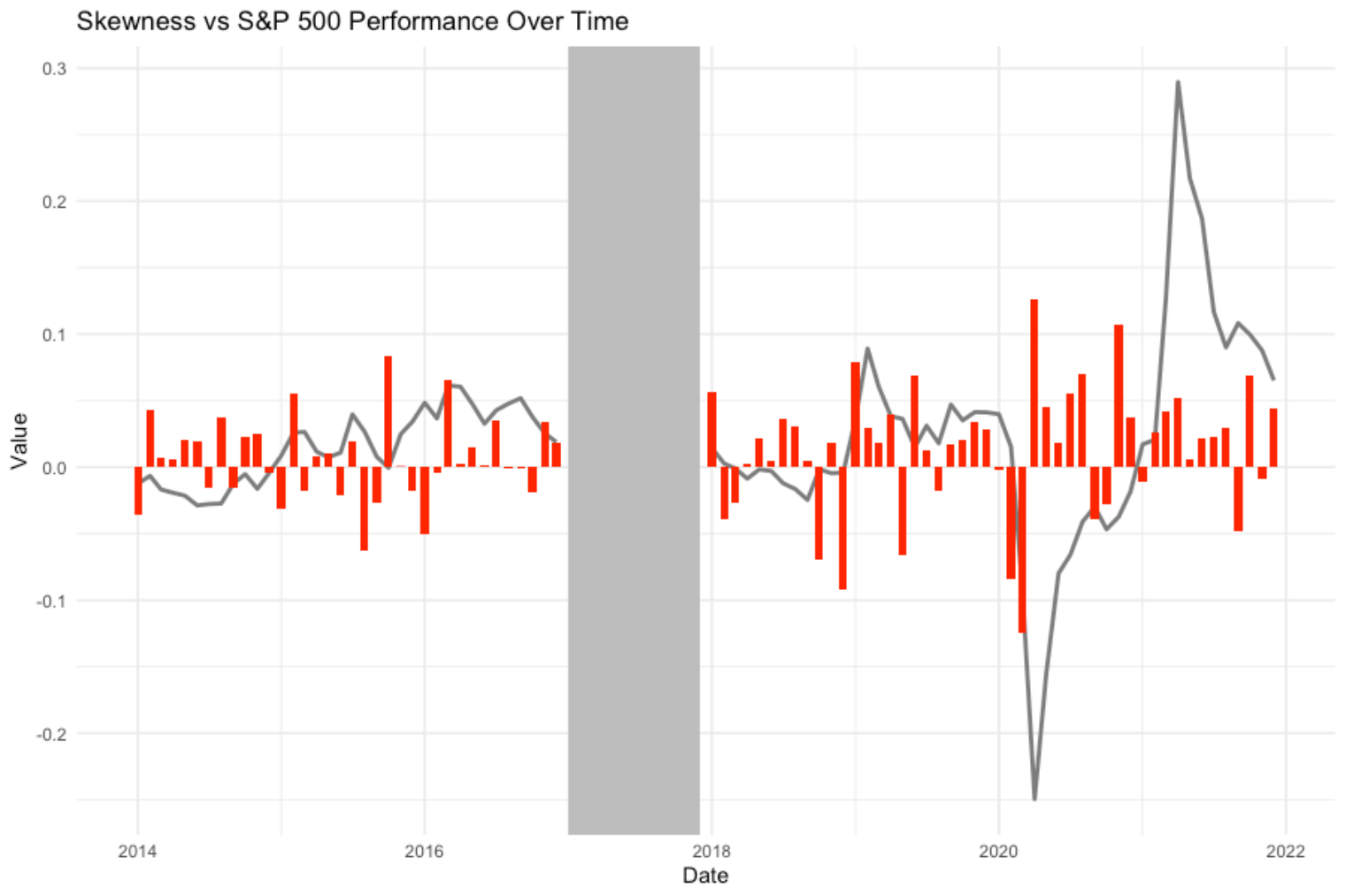


Distributions with identical first and second moments



Return1 Return2

Macro-level: SP500

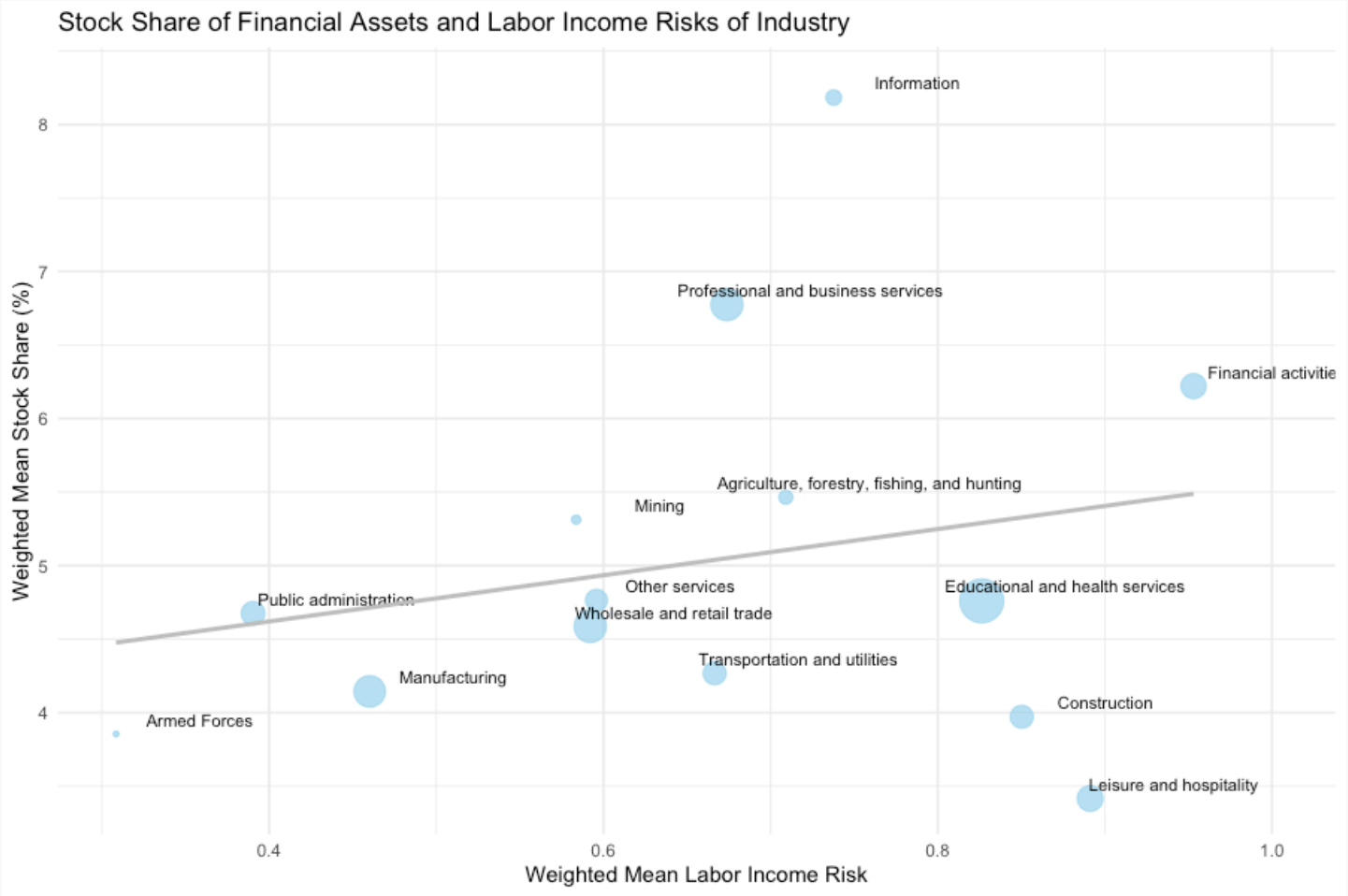


Macro-level: SP500

	SP500		
Skewness	4,531.983***		
	(1,201.405)		
Skewness_L1		4,219.379***	
		(1,213.829)	
Skewness_L2			3,877.396***
			(1,233.136)
Constant	2,665.403***	2,685.503***	2,706.260***
	(84.011)	(84.946)	(85.996)
Observations	84	83	82
Adjusted R^2	0.137	0.119	0.099

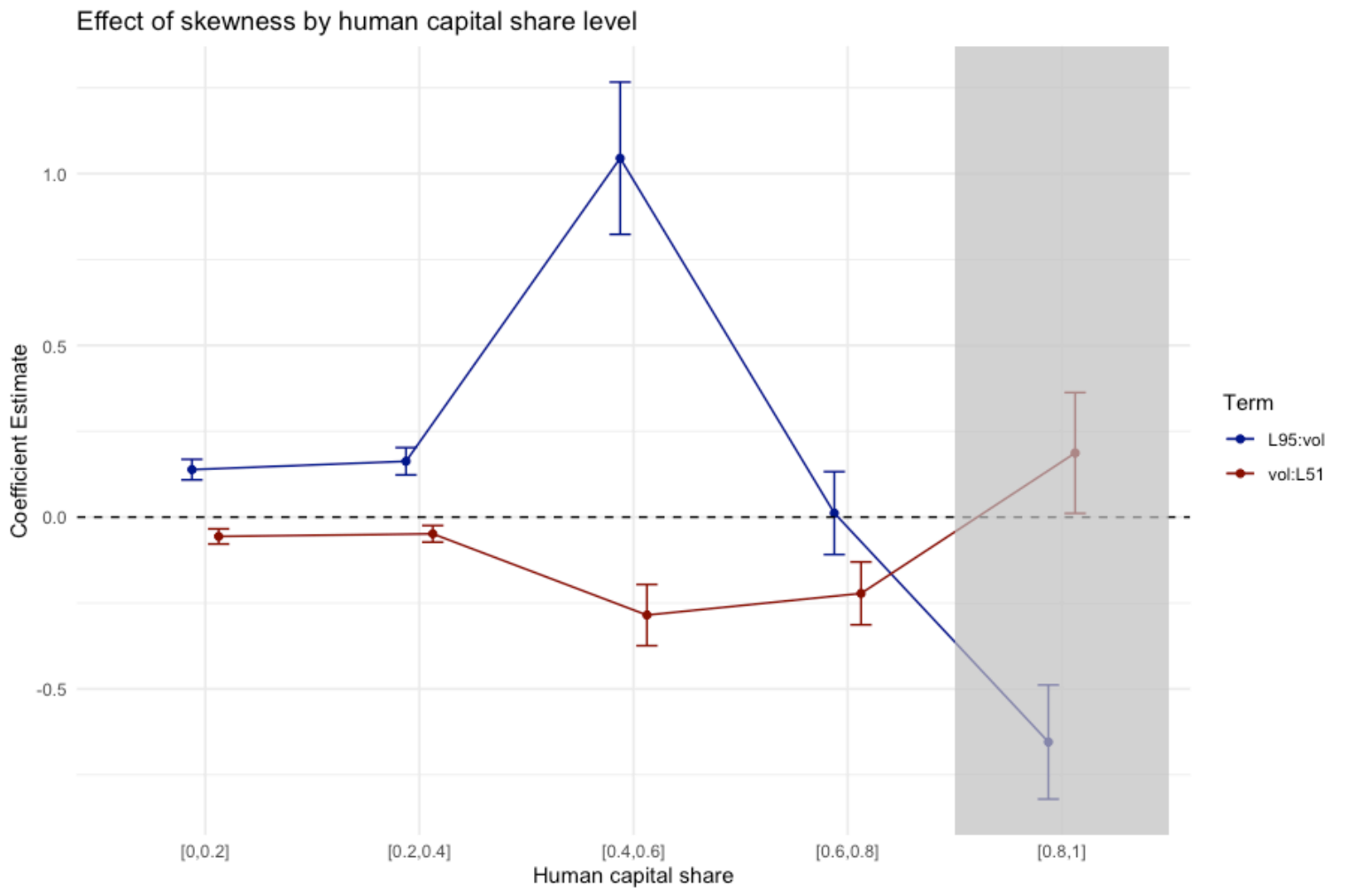
Return

Selection



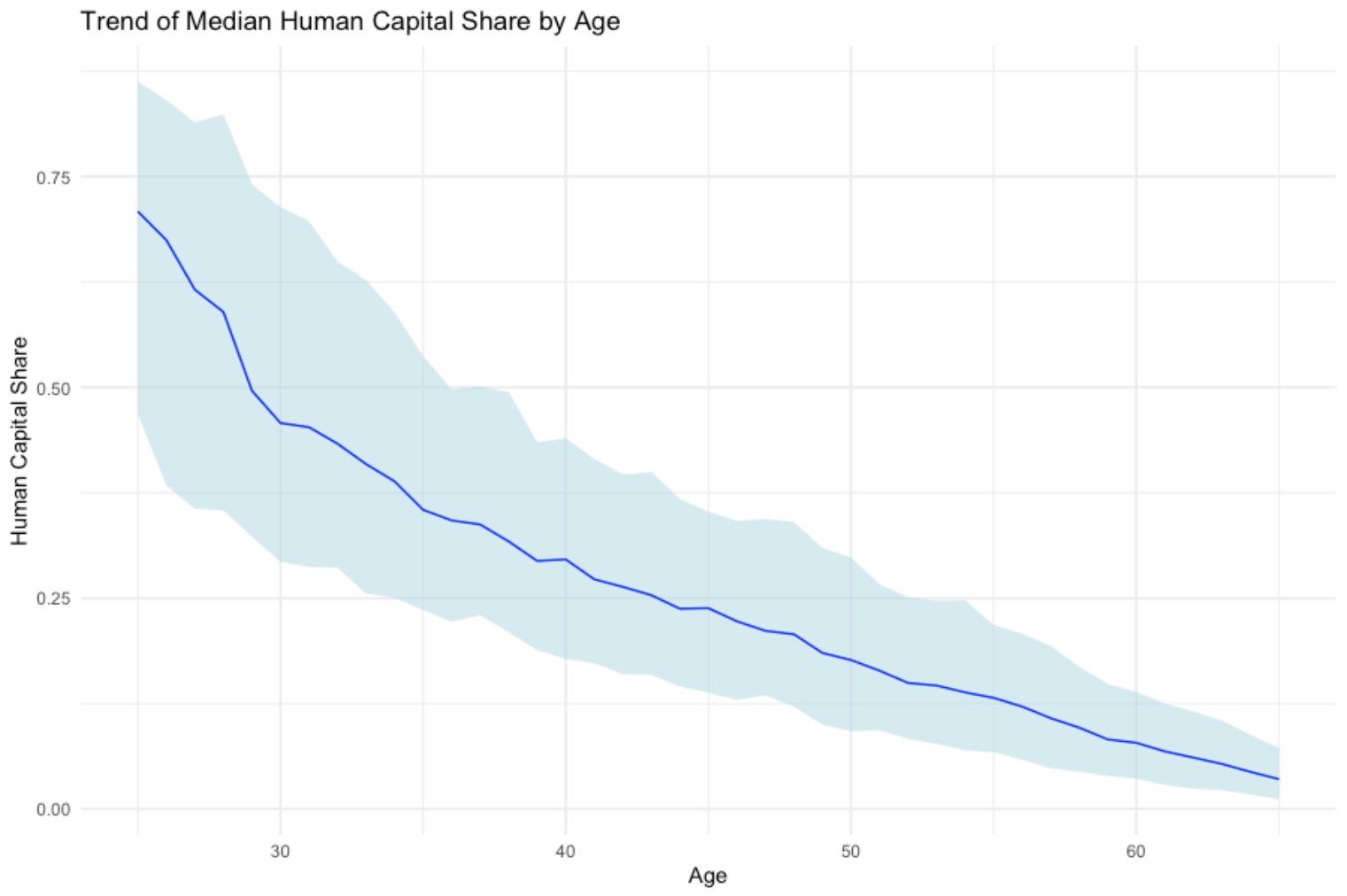
Return

Empirical evidence for downside risk aversion



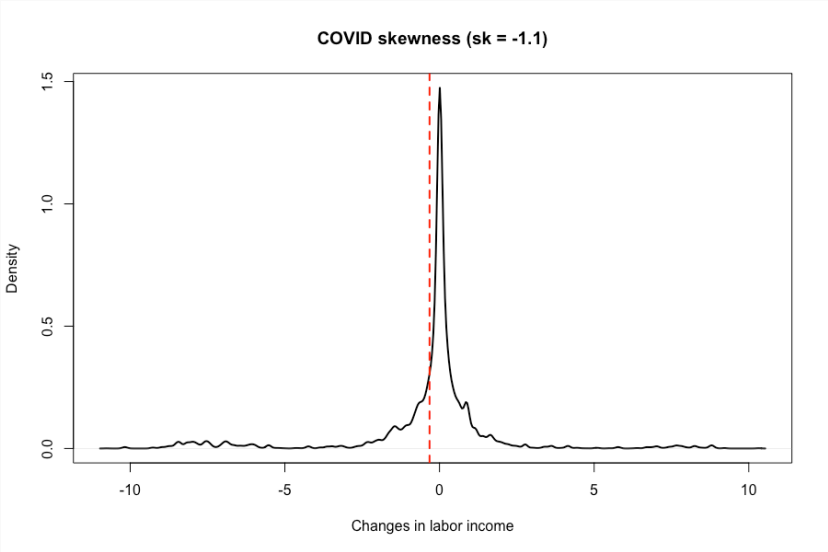
Return

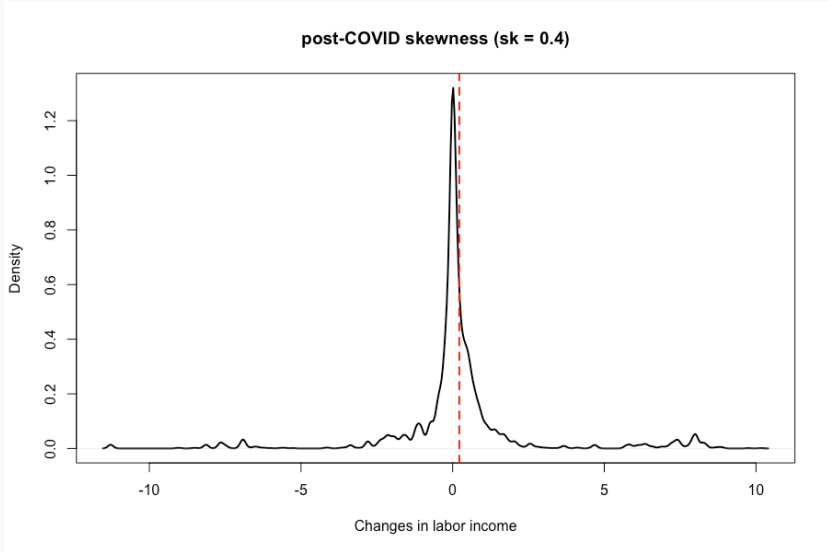
Life-cycle profile of human capital share



Return

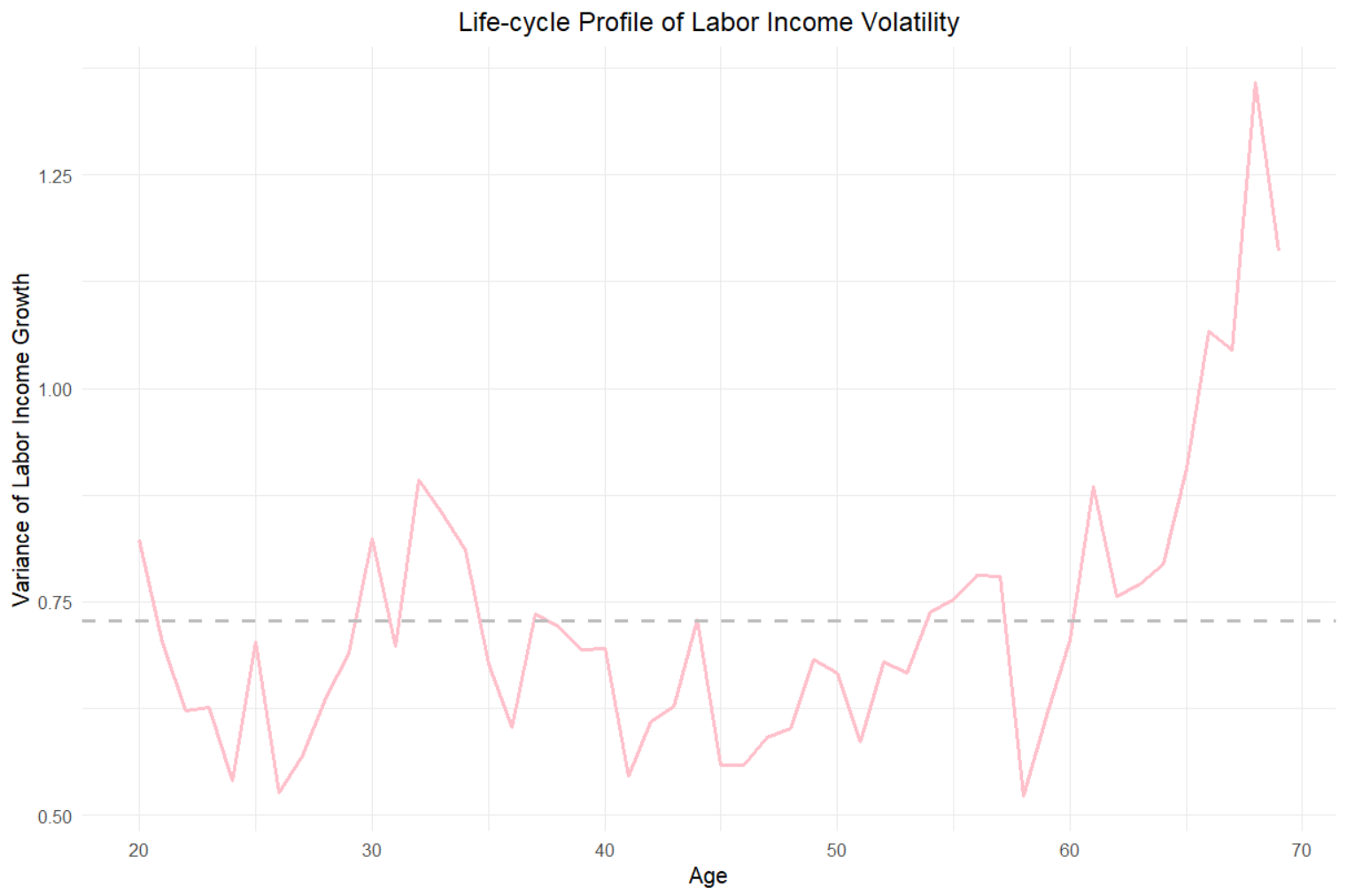
Skewness in and post disaster





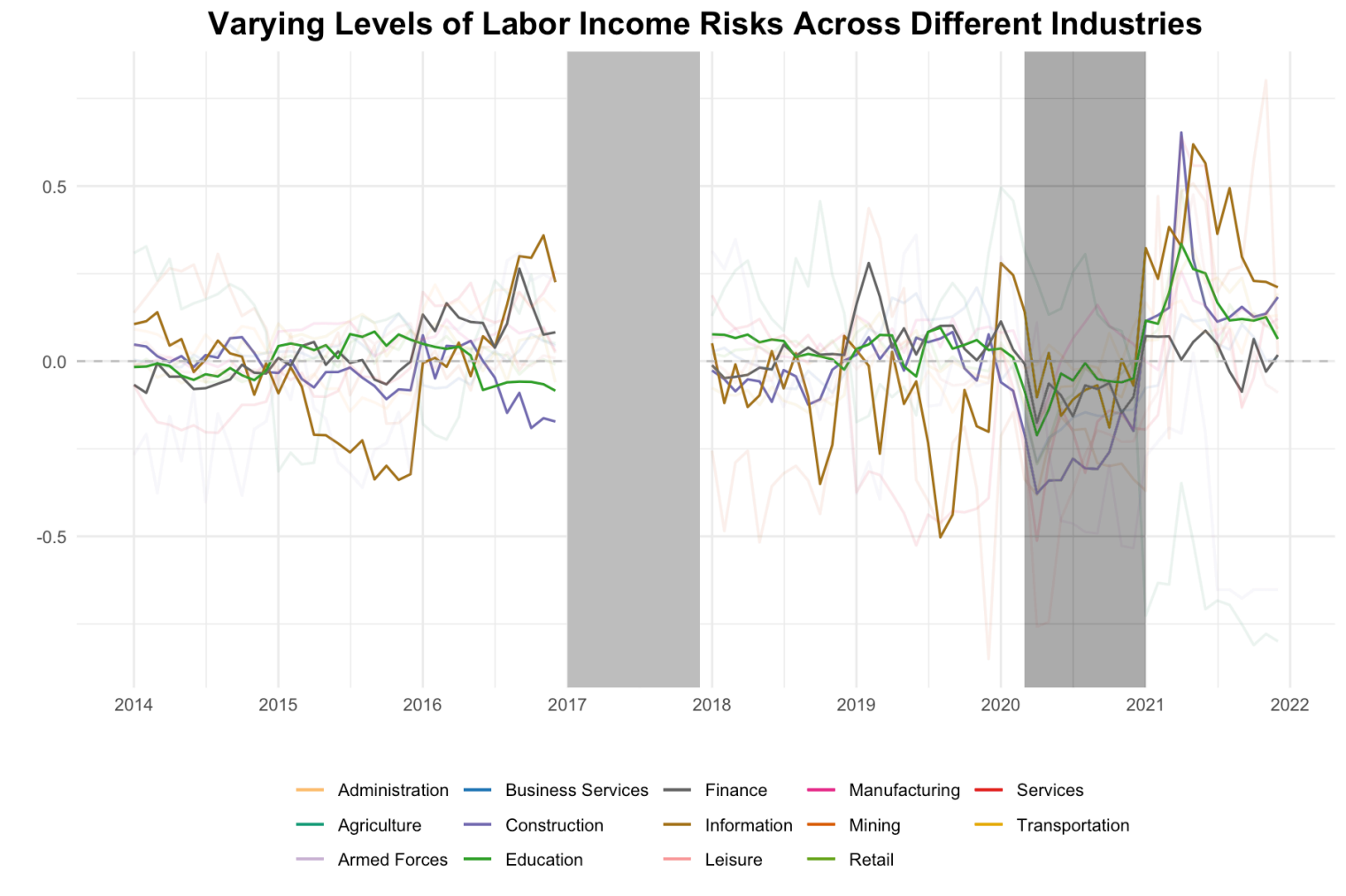
Skewness of labor income growth for leisure and hospitality Return

Life-cycle variance of labor income growth

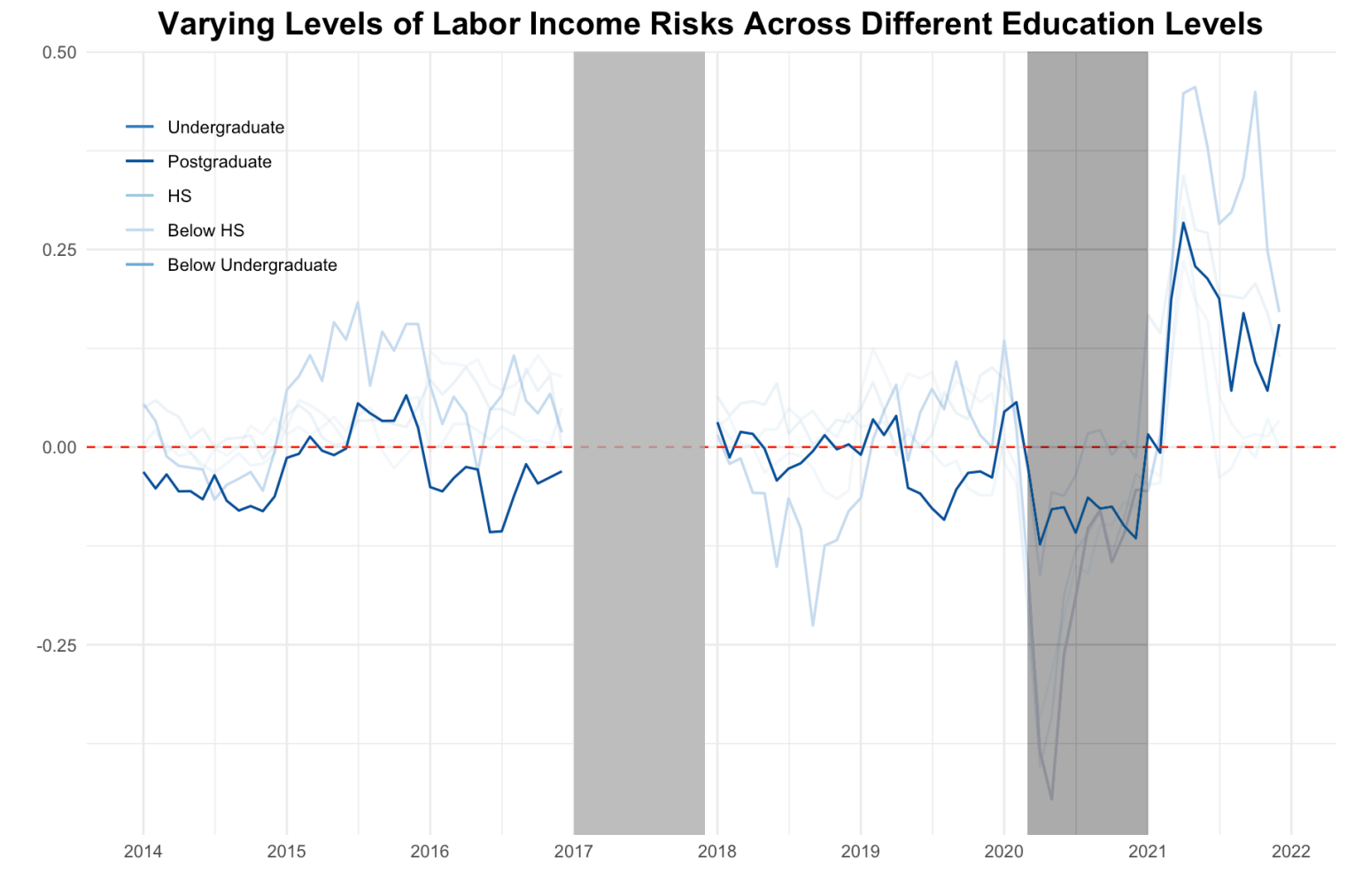


Return 1 Return 2

Skewness: Heterogeneity between industry



Skewness: Heterogeneity between education level



Return