

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

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November 26, 2024

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My research focuses on the behavior of individuals and households in various economic roles:

1. Worker: **Asymmetric Labor Income Uncertainty: Implications for Risk-Taking in Financial Markets** (JMP)
2. Investor: **Navigating Through Fear and Greed: The Experience-Driven Disposition Effect** (preparing for submission)
3. Consumer: **Savings, Inequality, and Austerity: Unpacking the Consumption Divide in Japan** (PDRC Project ID: 6721) (WP)

Using empirical data, I identify behaviors that existing economic models fail to explain and endeavor to extend these models to encompass my observations.

	% Share of Assets Directly Invested in Stocks
Labor Income Volatility	0.076

- Why do households with higher labor income uncertainty hold more risky assets in the financial market?
- This is unrelated to hedging motives, as the labor income variance does not show a significant correlation with market returns.
- Rashin (2013) attributes this effect to selection bias.

In this paper, I am going to show:

- People's earnings are more volatile than we typically believe.
- The individual level of income volatility is not the only factor influencing how people perceive the risk they face.
- Uncertainty can be decomposed into downside risks (disaster risks) and upward surprises (opportunity risks).
- People respond not only to downside risks but also to upward surprises, an area less explored in the literature. I named it **opportunity risks** in this paper.

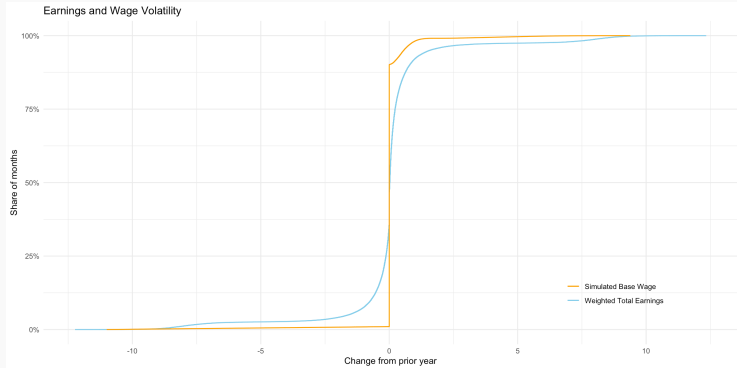
Motivation

- **Standard portfolio choice models with Gaussian income risk fail to explain:**
 - Why households experiencing higher labor income volatility tend to hold more risky assets
[Merton \(1969\)](#), [Cocco, Gomes and Maenhout \(2005\)](#), [Fagereng, Guiso and Pistaferri \(2018\)](#)
- **Scarce reduced-form evidence on how higher-order moments of income risk influence portfolio decisions:**
 - Most papers focus on income risk variance
[Betermier et al. \(2012\)](#), [Fagereng et al. \(2018\)](#)
 - Findings regarding covariance are mixed
[Vissing-Jorgensen \(2002\)](#), [Massa and Simonov \(2006\)](#), [Calvet and Sodini \(2014\)](#), [Bonaparte et al. \(2014\)](#)
 - Higher-order moments conditional on stock market returns
[Catherine, Sodini, and Zhang \(2024\)](#)

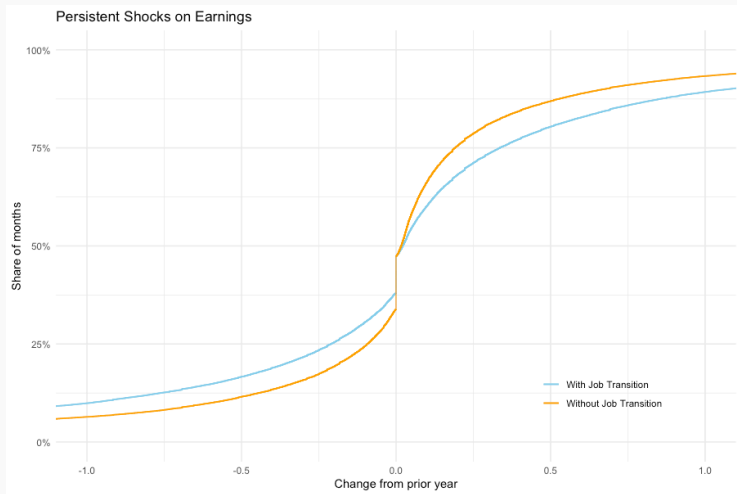
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Merton (1969), Cocco, Gomes and Maenhout (2005), Fagereng, Guiso and Pistaferri (2018)
- My paper bridges the gap between these two strands of the literature
- Scarce reduced-form evidence on how higher-order moments of income risk influence portfolio decisions:
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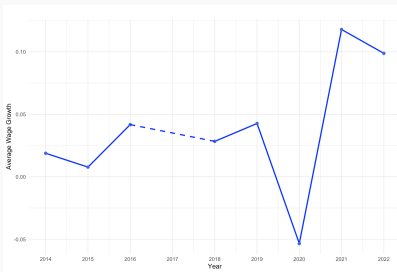
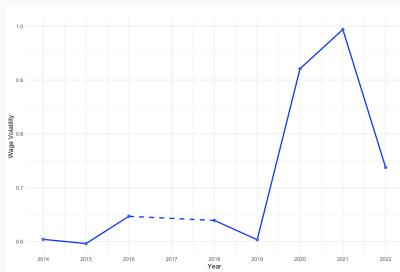
Earnings instability



Earnings instability



Rise in labor income uncertainty



- People's labor income volatility increases both during economic booms and recessions.




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

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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* (**disaster risks**) as well as the potential for *upward surprises* (**opportunity risks**).

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. 
- Main insight: **The asymmetric effect of volatility**
 - When the first moment (Mean) and second moment (Variance) are equal, the third moment (Skewness) can vary. 
- 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 
 - economies can fall into a trap - wealthier accumulate wealth even faster

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** solely 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.

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 2023.
- 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.

Estimation of labor income risk in data

1. Volatility, a.k.a. labor income growth variance, is captured at annual frequency and at individual level. 
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. 
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.

From Campbell and Viceira (2001), an agent with constant relative risk aversion (CRRA) will choose his optimal risky allocation following:

$$RS = \pi = \frac{\mu - r}{\gamma \sigma_S^2} + \left(\frac{\mu - r}{\gamma \sigma_S^2} - \beta_H \right) \frac{H}{W} \quad (1)$$

In this paper, I focus on the effect of H , which can be interpreted as the certainty equivalent of future earnings, such that:

$$H_{t-1,it} \approx \bar{H}_{it} - \frac{\gamma}{2} \frac{\text{Var}_{t-1}(H_{it})}{W_{it}} + \frac{\gamma^2 + \gamma}{6} \frac{\text{Skew}_{t-1}(H_{it})}{W_{it}^2} \quad (2)$$

This implies that $\text{Var}_{t-1}(H_{it})$ should have a negative effect on π , while $\text{Skew}_{t-1}(H_{it})$ should exert a positive influence on π .

However, most empirical studies have failed to identify a negative correlation between labor income variance and the allocation to risky assets, regardless of whether the covariance between the stock market and the labor market is considered. They attribute this puzzling result to various channels.

Rashin (2013)

Betermier et al. (2014)

Catherine et al. (2024)

In this study, I propose a new potential explanation that aligns with the theoretical model and remains consistent with all previous findings.

Conceptual Framework of labor income risk

Labor income variance can be categorized into two types based on its distribution: opportunity risk and disaster risk.

To measure the distribution of workers' labor income risk, 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:

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

This can be interpreted as the conditional variance of labor income.

Empirical approach

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

Where i stands for individual ID, M means at the monthly level, Y means at the annual level, and $g(i, M)$ means at the group level.

I include controls for demographics such as age, gender, education level, and dummy variables for housing status and unemployment status.

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

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

$$sk_{g(i,M)} = \underbrace{(P90 - P50)}_{L9050} \quad \text{or} \quad \underbrace{(P50 - P10)}_{L5010}$$

To comprehensively understand asset pricing implications, I focus on the **marginal investor** rather than the average household.

- My analysis includes only households that directly hold stocks or mutual funds during any period they are present in the panel.
- This approach eliminates the need for a Tobit model, as there is no significant lower bound in the data.

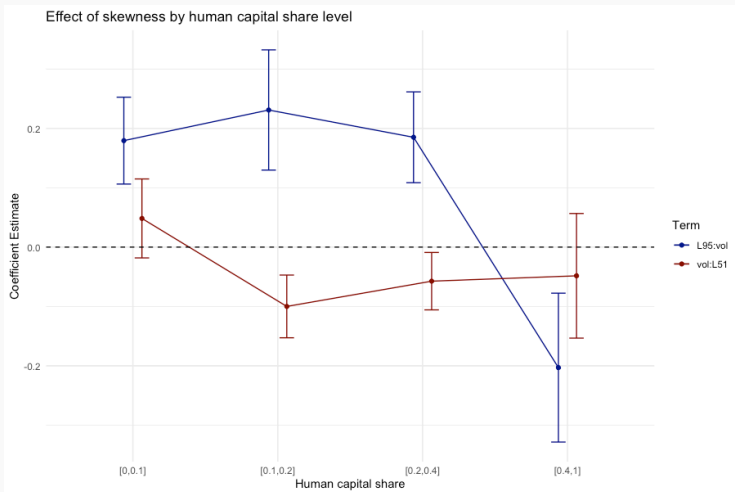
Findings

Skewness and asset allocation

	% Share of Assets Directly Invested in Stocks % \in [0,100]					
	(1)	(2)	(3)	(4)	(5)	(6)
Opportunity (L9050)	0.323 (3.668)	-	0.316 (3.593)	0.120 (1.346)	-	0.152 (1.678)
Disaster (L5010)	-0.246 (-3.332)	-	-0.251 (-3.403)	-	-0.211 (-2.822)	-0.219 (-2.885)
Individual Risk (Variance)	-	0.076 (4.628)	0.076 (4.621)	-0.057 (-2.249)	0.074 (3.257)	-0.033 (-1.243)
Opportunity Risk (L9050 \times Var)	-	-	-	0.137 (6.843)	-	0.162 (7.482)
Disaster Risk (L5010 \times Var)	-	-	-	-	0.003 (0.190)	-0.044 (-2.779)

All columns control for household characteristics and include industry fixed effects as well as year-month fixed effects. The total number of observations is 259,485.

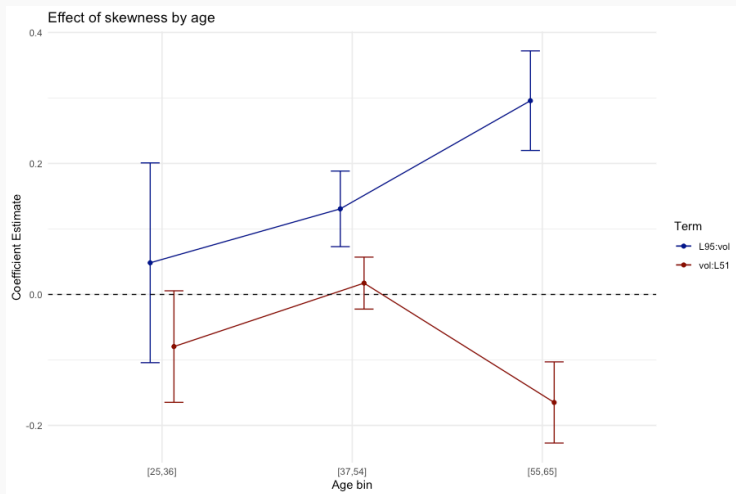
Empirical evidence for downside risk aversion



Theory

Effect

Labor income risks by age group



Characteristics of human capital and financial asset accumulation across age groups.

Vol

Trend

Conclusion

Main Findings

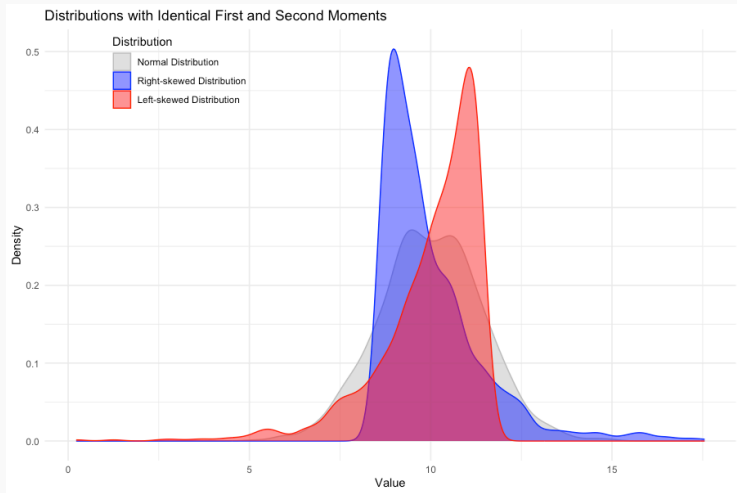
- The capacity of households to engage in financial risks is intimately connected to the **Individual Volatility** and **Aggregate Skewness** of labor market returns.
- Households with a greater dependence on **human capital** are at an increased risk of experiencing financial distress from stock market downturns due to their exposure to human capital risk.
- This further links to another research topic, the heterogeneous return between rich and poor in financial market.

- Nonparametric approach to portfolio decision problem with both macro (aggregate level skewness) and micro (individual level labor income variance) elements.
- Ongoing: Estimating an empirical portfolio choice model with labor income uncertainty that can replicate my reduced-form findings.

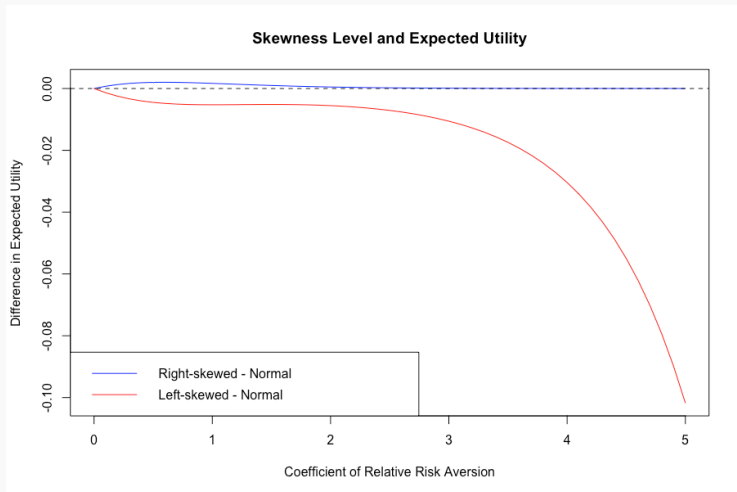
Thank You!

Appendix

Distributions with identical first and second moments

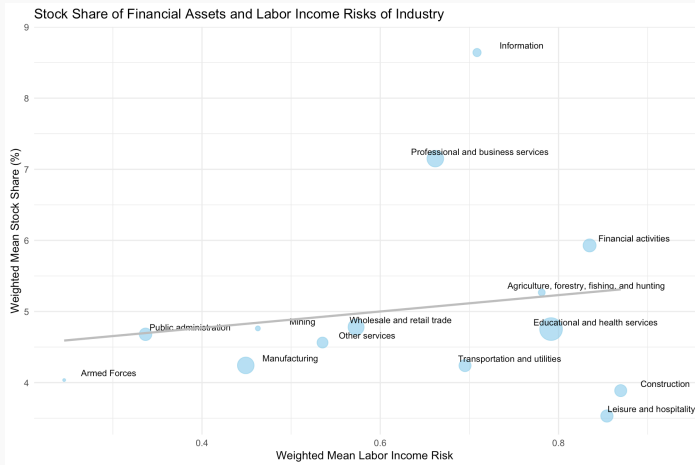


Distributions with identical first and second moments



Return1

Return2



Return

Panel A: Estimates using correlation between income growth and market returns

Independent variable	PropSTK (1-3)		
	(1)	(2)	(3)
<i>Corr(Rm, dy)</i>	-0.124 (-6.52)	-0.129 (-6.53)	-0.110 (-5.55)
<i>Ln(y)</i>		0.191 (13.56)	0.011 (0.82)
<i>St. Dev(dy)</i>		0.359 (8.01)	0.153 (3.42)
<i>Ln(Net Worth)</i>			0.088 (14.93)
<i>HH size</i>			0.005 (0.70)
<i>Age</i>			0.004 (4.30)
<i>Age² × 100</i>			0.009 (2.43)
<i>Education</i>			0.004 (0.29)
<i>Male</i>			0.008 (0.39)
<i>Unemployed</i>			0.012 (0.49)
<i>Retired</i>			0.058 (2.26)
<i>Good health</i>			-0.006 (-0.53)
<i>Risk aversion</i>			-0.130 (-27.32)
<i>N</i>	13,999	11,961	9,133
<i>Pseudo R²</i>	0.011	0.047	0.326
<i>Lamda</i>			

Return

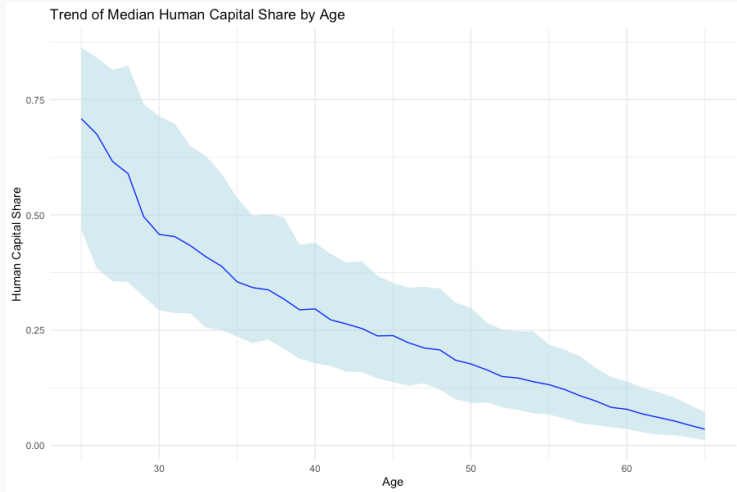
Table III
Equity Share and Countercyclical Income Risk

This table reports results of Tobit regressions of the equity share on measures of countercyclical income risk, controlling for worker and households characteristics. Absolute *t*-statistics reported in parentheses are clustered by industry \times education group.

	(1)	(2)	(3)	(4)	(5)
Cyclical skewness	-1.113 (2.92)			-0.878 (5.17)	-0.298 (3.22)
Count. variance		-0.647 (0.84)		-0.216 (0.69)	0.532 (2.64)
Covariance			-0.517 (0.70)	-0.445 (1.45)	0.168 (0.94)
Skewness				-1.969 (3.18)	-1.765 (5.49)
Variance				0.675 (4.34)	-0.039 (0.42)
Age				-0.002 (7.64)	-0.001 (2.76)
Sex				-0.003 (0.44)	-0.008 (2.25)
Immigrant				-0.141 (28.64)	-0.143 (30.54)
Household size				-0.009 (10.83)	-0.009 (14.63)
Entrepreneur				-0.009 (2.07)	-0.004 (1.14)
Log Total assets				0.136 (40.56)	0.124 (48.58)
Financial/Total wealth				1.403 (32.09)	1.440 (33.66)
Real estate/Total wealth				-0.540 (23.24)	-0.459 (24.00)
Pension/Total wealth				0.025 (1.77)	0.013 (0.96)
Debt/Total wealth				-0.487 (10.81)	-0.504 (10.62)
Education FE					Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	32,934,044	32,934,044	32,934,044	32,933,774	32,933,774
Pseudo R^2	0.006	0.004	0.004	0.190	0.198

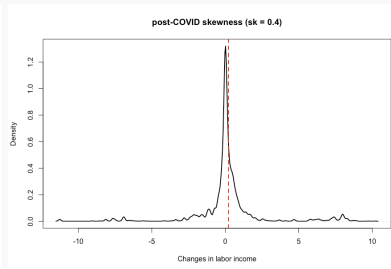
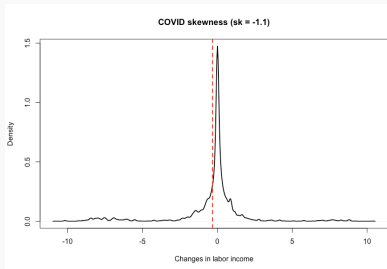
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Life-cycle profile of human capital share



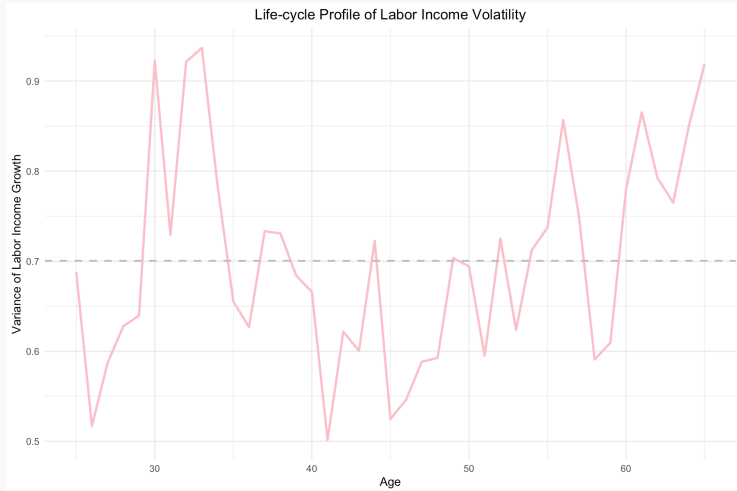
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Skewness in and post disaster



Skewness of labor income growth for leisure and hospitality [Return](#)

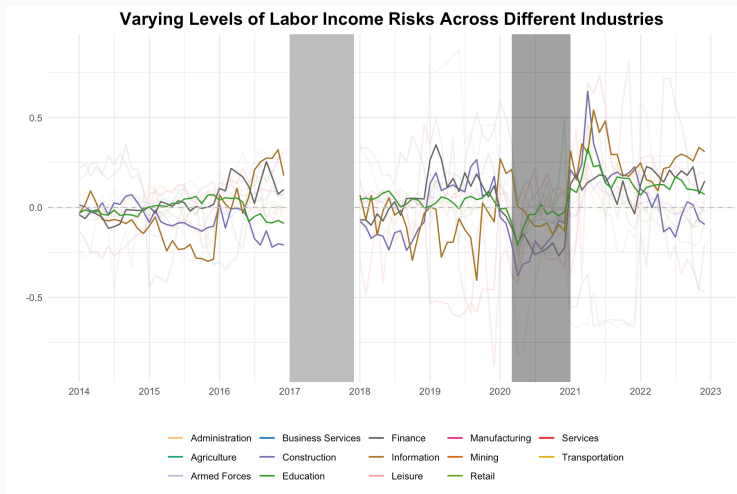
Life-cycle variance of labor income growth



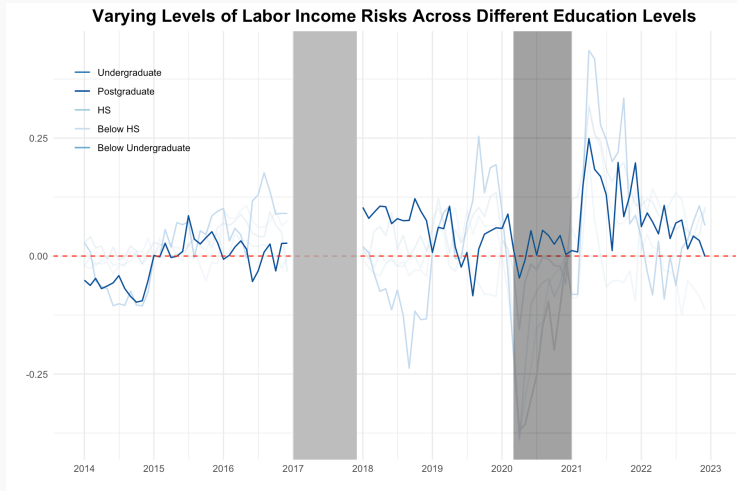
Return 1

Return 2

Skewness: Heterogeneity between industry



Skewness: Heterogeneity between education level



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