Perceived Income Risks

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Outline

1. Motivation
2. Theoretical framework
3. Empirical evidence
   - Cross-sectional patterns
   - Permanent versus transitory risks
   - Perceived risks and macroeconomic history
   - Couter-cyclical perceived risks
   - Perceived risks and decisions
4. Summary

Motivation

- Risks matter for individual decisions
  - precautionary saving
  - stock market participation
  - portfolio choice
- Risks matter for macroeconomic outcomes
  - since idiosyncratic risks are not perfectly insured
    - $\rightarrow$ income/wealth inequality
    - $\rightarrow$ heterogeneous MPCs
    - $\rightarrow$ distributional channel of macroeconomic policies
    - $\rightarrow$ business cycle flucuations
- Income risks are central inputs of any incomplete-market model
- My question: perceptions $\approx$ estimates $\approx$ "the truth"?

This paper's agenda

1. **Empirics:** subjective risk profiles from a density survey
   - Heterogeneity: sizable difference across/within groups
   - State-dependence: negative correlation with recent/past labor market conditions
   - History-dependence: positive correlation with experienced volatility/unemployment
   - Asymmetry: presence of tail risks
   - Decisions: spending plans react to risk perceptions
2. **Model** (in progress):
   - a survey-informed subjective life-cycle consumption/saving model

Literature

- income risks and partial insurance : Gottschalk et al. (1994), Carroll and Samwick (1997), Meghir and Pistaferri (2004), Storesletten et al. (2004), Blundell et al. (2008), Moffitt and Gottschalk (2002), Guvenen et al. (2014), Arellano et al. (2017), Bloom et al. (2018)
- subjective/probabilistic survey of belief: Manski (2004), Delavande et al. (2011), Manski (2018), Bertrand and Mullainathan (2001), Armantier et al. (2017)
- incomplete market macro: Huggett (1993), Aiyagari (1994), Krusell and Smith (1998), Heathcote et al. (2009), Carroll et al. (2017), Krueger et al. (2016), Bayer et al. (2019)
- consumption/saving under incomplete information/imperfect perception: Pischke (1995), Wang (2004), Rozsypal and Schlafmann (2017), Carroll et al. (2018), Lian (2019)

Income process

$$\underbrace{y_{i,c,t}}_{\text{idiosyncratic log earning}} = \underbrace{z_{i,c,t}}_{\text{Predictable component}} + \underbrace{e_{i,c,t}}_{\text{Stochastic component}}$$

- individual i at time t
- group c: share income process/risks $\sigma^2_{c,t}$
  - i.e. education/year of birth/gender/age
- $e_{i,c,t}$: to be specified later

Perceived risks (PR)

- Income growth

$$\Delta y_{i,c,t+1} = \Delta z_{i,c,t+1} + \Delta e_{i,c,t+1}$$

- To the agent: **expected volatility** under FIRE

$$Var^*_{i,c,t}(\Delta y_{i,c,t+1}) = \sigma^2_{c,t+1|t}$$

- To econometricians: **volatility**

$$Var^c(\Delta \hat{e}_{i,c,t+1}) = \hat{\sigma}^2_{c,t} + \hat{\sigma}^2_{c,t+1} - 2Cov^c(\hat{e}_{i,c,t}, \hat{e}_{i,c,t+1})$$

- To econometricians: **inequality**

$$Var^c(\hat{e}_{i,c,t+1}) = \sigma^2_{c,t+1}$$

Predictions from FIRE

- PR equal within groups with identical risks
  - Question: do similar people perceive similar degree of risks?
- PR ↑ with income volatility and inequality
  - Question: do groups with higher volatility/inequality perceive higher risks?
- PR independent from the income realization under state-independent risks
  - Question correlated with past/recent outcomes?

Robustness to alternative considerations

- superior information/unobserved heterogeneity
  - higher income volatility/inequality due to ommited variable
- measurement error in PR
  - lower correlation but still positive
- time aggregation
  - higher frequency of income than observed series
- time-varying/stochastic risks
  - a concern if realizations and perceptions not overlapping in time
  - time-invariant risks for now: $\sigma^2_{c,t} = \sigma^2_c \quad \forall t$

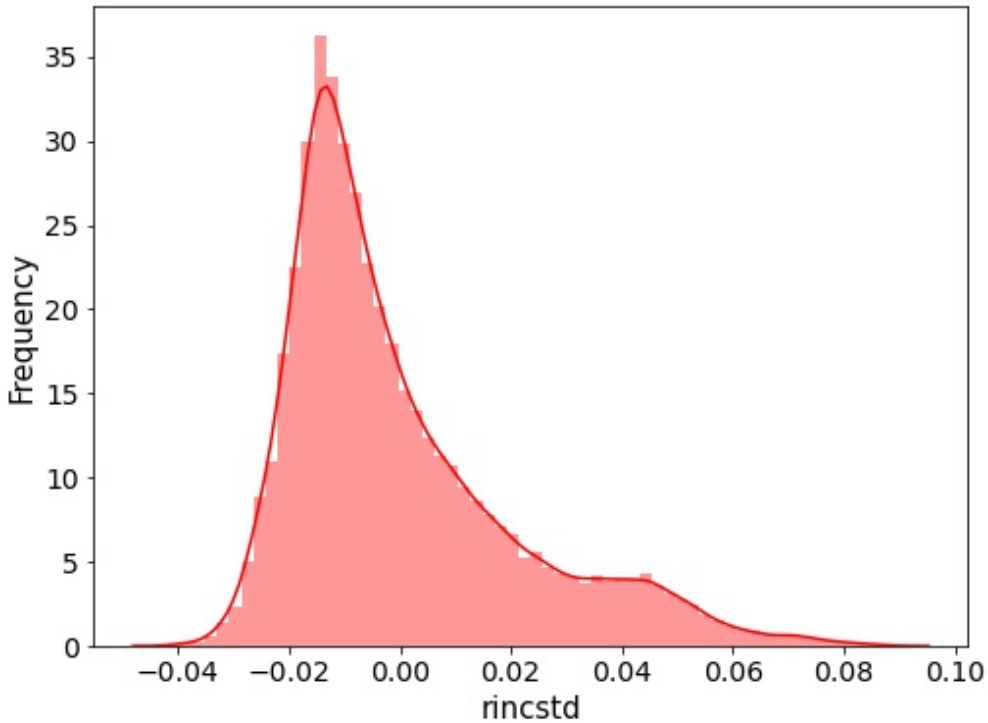
Data

- Density survey: SCE
  - 2013M6-2020M4 (monthly)
  - 1300 households
  - 12-month panel
- Income panel: PSID
  - 1970-1996 (annual), 1997-2017 (biennial)
  - approximately 5000 males/females
  - variable: wage/earning of household heads
  - stay in the sample for 11+ years
  - CPI adjusted
  - age 20-59

Survey question

- Individual-specific bin-based forecast on $\Delta y_{i,t+1}$
  - earning growth of the same job/position/hours
  - exl. endogeous labor supply changes/promotion/demotion/separation
- Meausurement of PR:
  - variance: $\overline{Var}_{i,t}(\Delta y_{i,t+1})$
  - skewness: $\overline{Skew}_{i,t}(\Delta y_{i,t+1})$
- density estimation following Engelberg et al. (2009)
- restricted to attentive/high numeracy score sample
- adjusted into real terms using inflation uncertainty

Within-group dispersion in perceived income risks

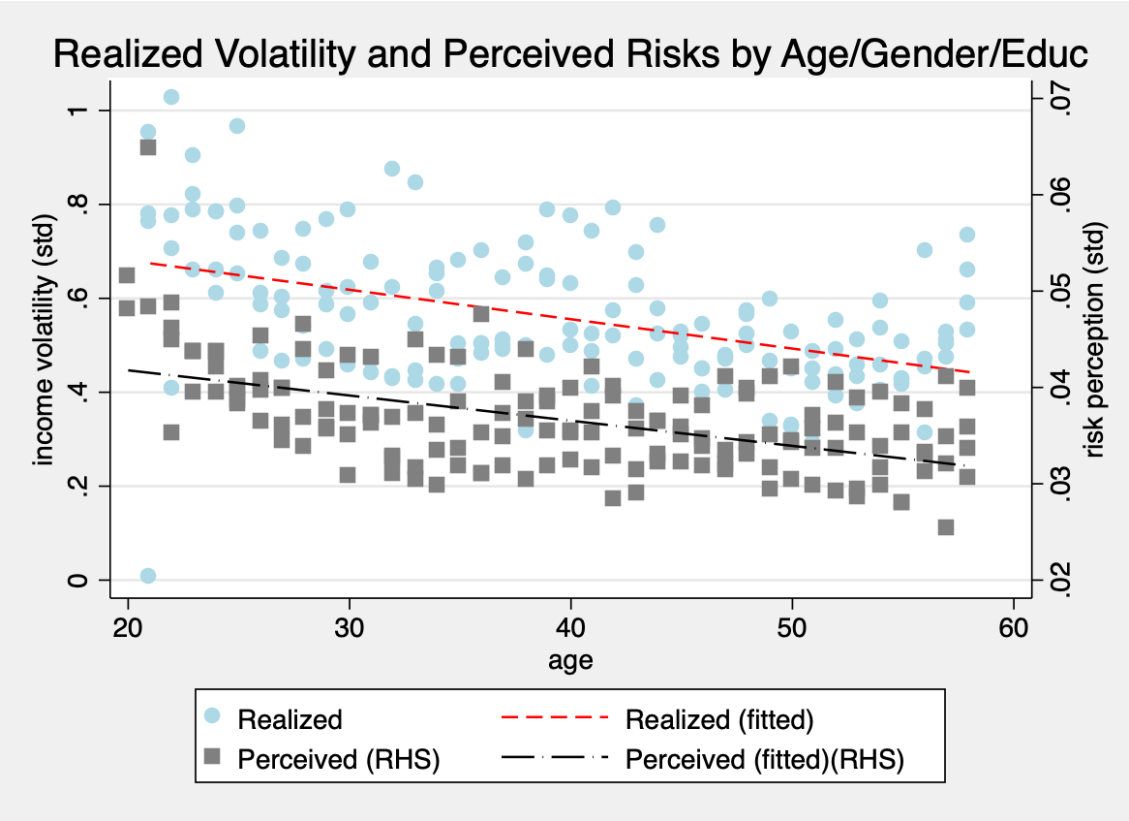


- residuals controlling for observables/time fixed effects ($R^2 = 0.07$)
- average PR: 3.5% in std; 10/90 IQR: 5.2% in std

nominal

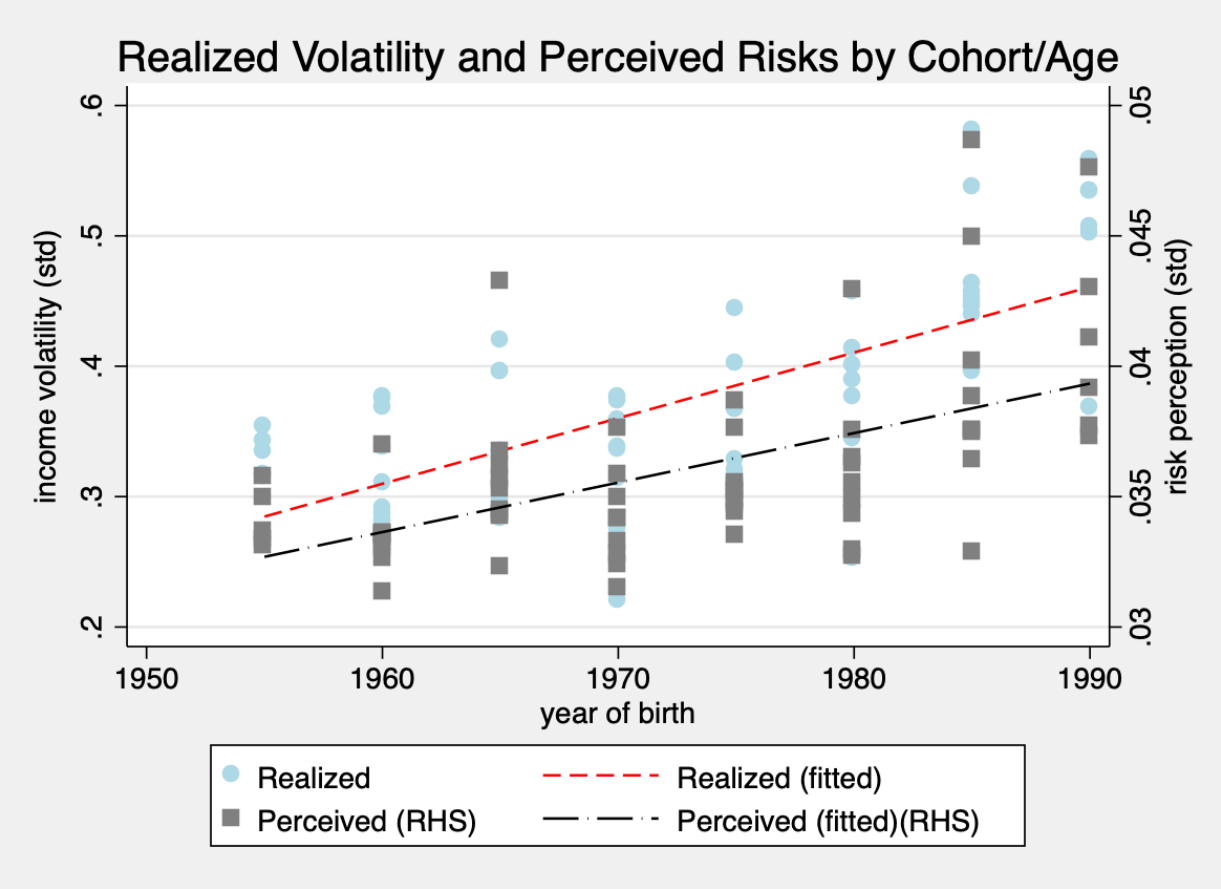
skewness

By **age**/gender/education



- e.g. a male high school graduate aged 30 inequality by age by age/education by 5-yr of birth/education/gender
- consistent with Moffitt and Gottschalk (2002), Sabelhaus and Song (2010)

By 5-yr of birth/age



- e.g. born between 1985-1990 at age 25
- only possible for post-2013 sample

inequality

Time series structure of income shock

$$e_{i,c,t} = \underbrace{p_{i,c,t}}_{\text{Ind Permanent}} + \underbrace{\eta_{i,c,t}}_{\text{Ind Transitory}}$$

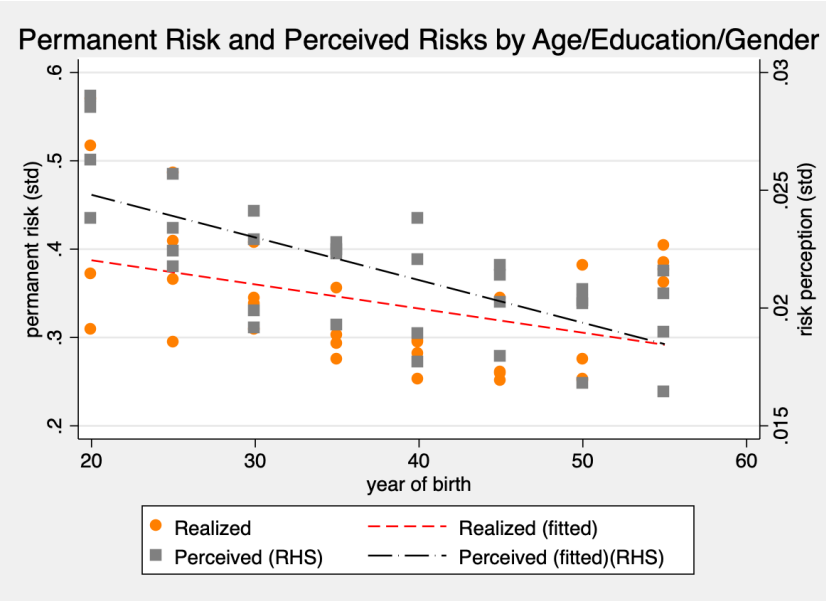
$$p_{i,c,t+1} = p_{i,c,t} + \psi_{i,c,t+1}$$

$$\underbrace{\eta_{i,c,t+1}}_{\text{MA(1)}} = \phi\epsilon_{i,c,t} + \epsilon_{i,c,t+1}$$

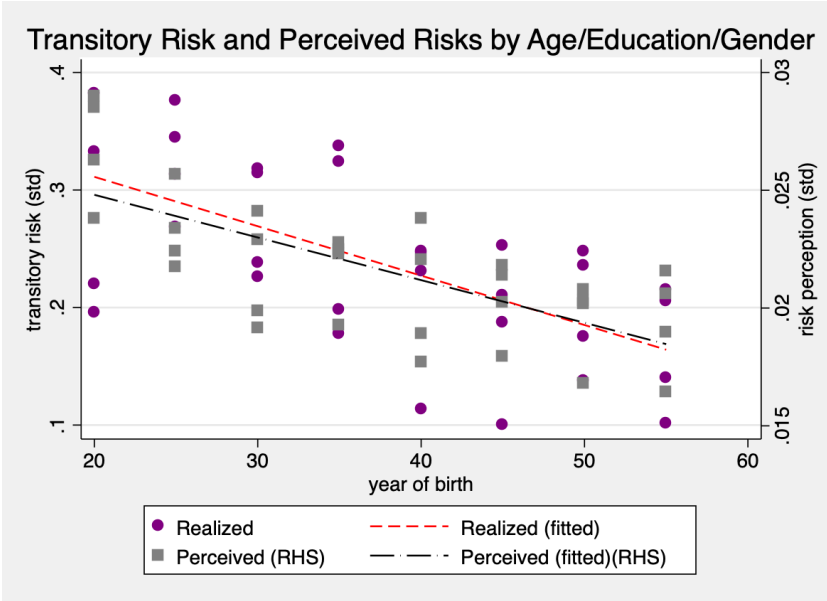
- Different approaches of estimation:
  - approximation: Moffitt and Gottschalk (2002)
  - variance/covariance matching: Carroll and Samwick (1997), Meghir and Pistaferri (2004), Blundell et al. (2008)
  - continuous time: immune to time aggregation: Crawley (2019)

Permanent versus transitory risks

(a) permanent



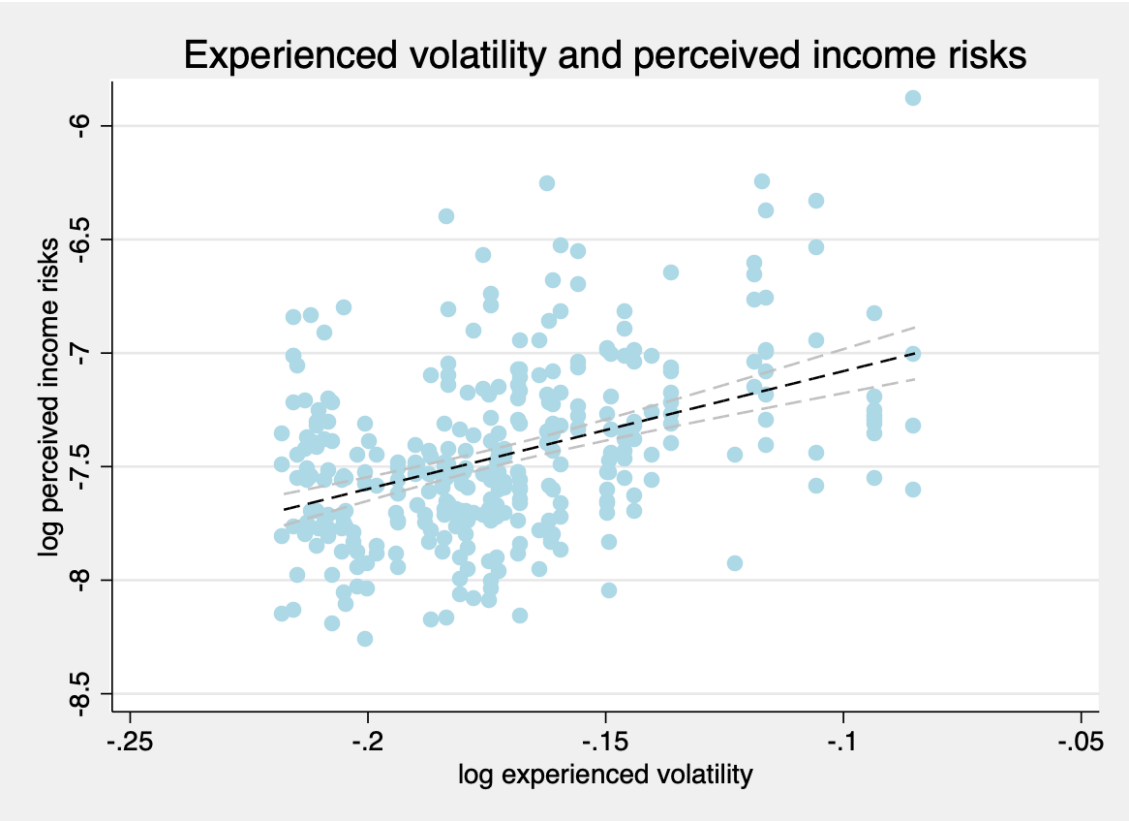
(b) transitory



- e.g. a female high school graduate aged 30-35

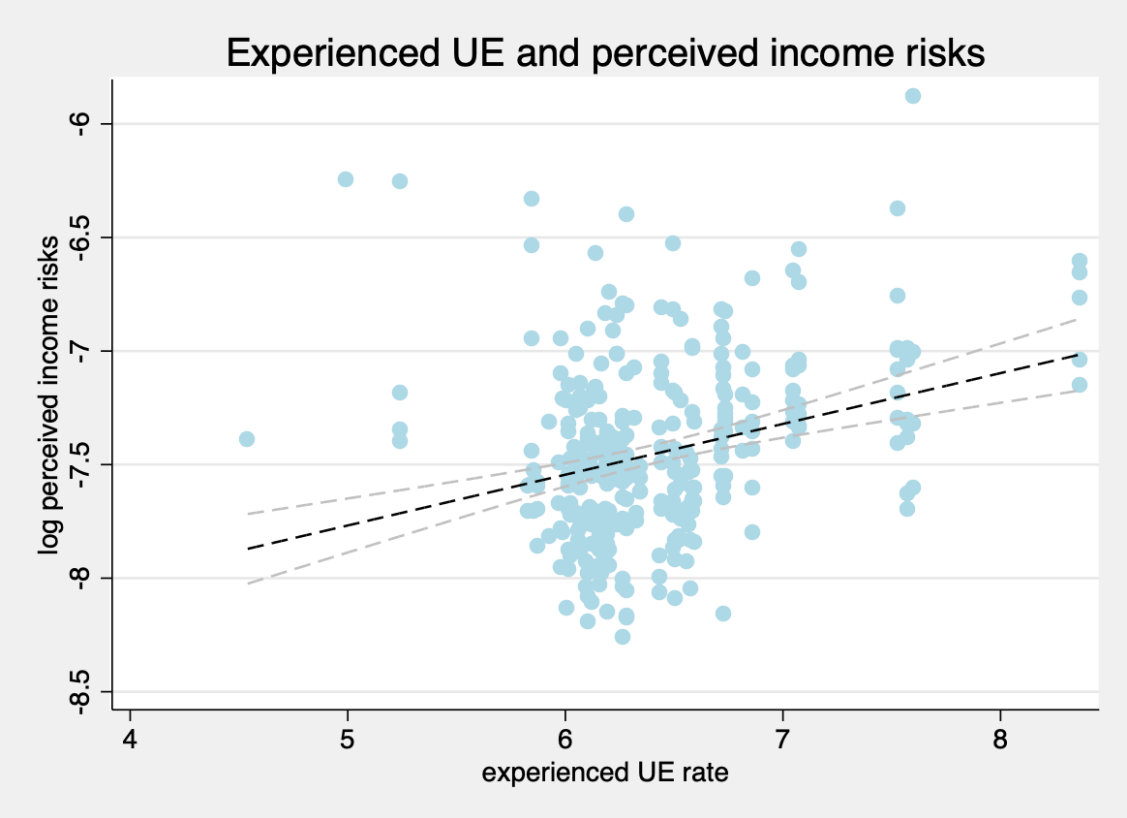
  5-yr cohort/education/gender

Experienced income volatility and perceived risks



- income volatility conditional on macroeconomic history Storesletten et al. (2004)
- e.g. the experience by a 25-year old till 2015 is between 1990-2015

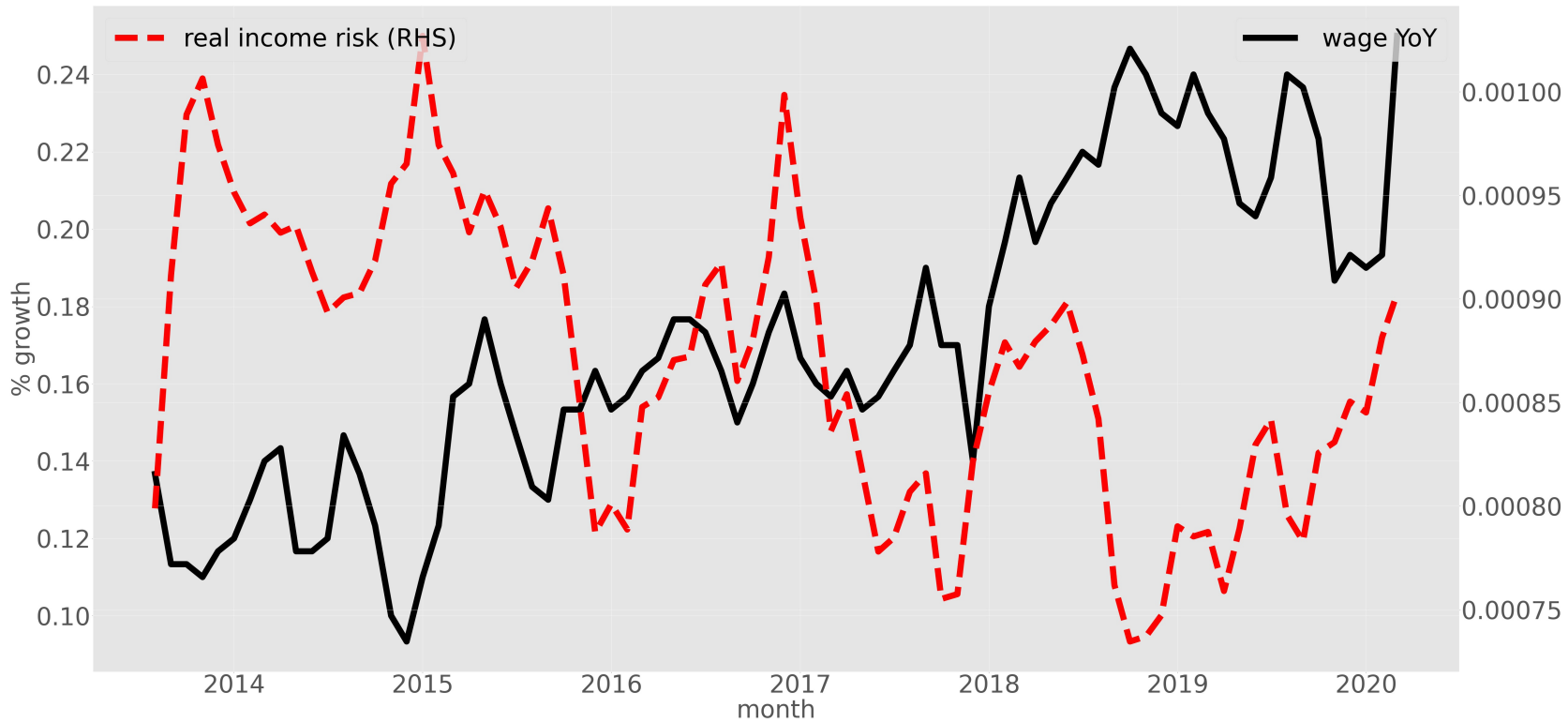
Experienced labor market and perceived risks



- e.g. experienced UE by a 25-year old in 2015 is between UE over 1990-2015

Perceived risks and recent (past) wage growth

- $\overline{\text{var}_t}$: average perceived risk across individuals
- $log(\text{wage}_t) - log(\text{wage}_{t-1/4})$: quarterly growth in average hourly wage



Perceived risks and current labor market condition

$$\underbrace{\overline{\text{risk}_t}}_{\text{average perceived risk}} = \alpha + \beta \underbrace{(log(\text{wage}_{t-k/12}) - log(\text{wage}_{t-(k-3)/12}))}_{\text{wage growth}} + \epsilon_{i,t}$$

$$\forall k = 0...4$$

	mean:var	mean:iqr	mean:rvar	mean:skew
0	-0.28**	-0.42***	-0.48***	-0.02
1	-0.42***	-0.53***	-0.51***	0.12
2	-0.43***	-0.48***	-0.44***	-0.01
3	-0.43***	-0.48***	-0.42***	-0.1
4	-0.31***	-0.41***	-0.32***	-0.21*

- Counter-cyclical income risks: Storesletten et al. (2004), Guvenen et al. (2014), Bayer et al. (2019)

Perceived risks and current labor market condition

$$\underbrace{\overline{\text{risk}_{s,t}}}_{\text{median perceived risk in state } s} = r + \psi \underbrace{LM_{s,t}}_{\text{state labor market condition}} + \eta_{s,t}$$

	(1)	(2)	(3)	(4)
	log(var)	log(risk)	log(iqr)	log(iqr)
wage growth	-0.05***		-0.03***	
	(0.01)		(0.01)	
unemp rate		0.04*		0.04***
		(0.02)		(0.01)
Observations	3529	3529	3546	3546
R-squared	0.023	0.020	0.025	0.028

Perceived risks and household spending

$$E_{i,t}(\Delta c_{i,t+1}) = u_0 + u_1 \overline{\text{risks}}_{i,t}(\Delta y_{i,t+1}) + \xi_{i,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)
log perceived risk (real)	1.060***	1.065***	0.502***	0.432***		
	(0.129)	(0.129)	(0.0667)	(0.0675)		
log perceived risk					0.306***	
					(0.0628)	
UE expecation						0.0356**
						(0.0126)
Observations	61541	61541	61541	61541	65655	98191
R-squared	0.001	0.003	0.921	0.921	0.911	0.001
Time FE	No	Yes	No	Yes	Yes	Yes
Ind FE	No	No	Yes	Yes	Yes	No

- Higher perceived risks → higher expected spending growth.

Taking stock

- People do have some clues
  - consistent with inter-group differences in income volatility
  - other covariates
    - $\downarrow$ with education, household income, being a male
    - $\uparrow$ with numeracy score, self-employed job, perceived individual UE risks, and aggregate UE expectations
- But huge amount of heterogeneity remains
  - including all above: $R^2 = 0.10$
  - individual fixed effects only: $R^2 = 0.71$
- Possible explantions
  - state dependence: aggregate economy conditions matter
  - past dependence: experiences matters Kuchler and Zafar (2019)
  - imperfect understanding of the nature of the risks
  - intrinsic heterogeneity: some are more uncertain than the other Ben-David et al. (2018)

A simple model of risk perception

- Under FIRE

$$Var^*_{i,c,t}(\Delta y_{i,c,t}) = \sigma^2_{\psi,c} + \sigma^2_{\epsilon,c}$$

- Under imperfect understanding
  - ϕ and $\sigma^2_{\epsilon,c}$ are not perfectly known
  - all realized shocks are perfectly observed

$$\widetilde{Var}_{i,c,t}(\Delta y_{i,c,t+1}) = \sigma^2_{\psi,c} + \tilde{\sigma}^2_{\epsilon,c,t}$$

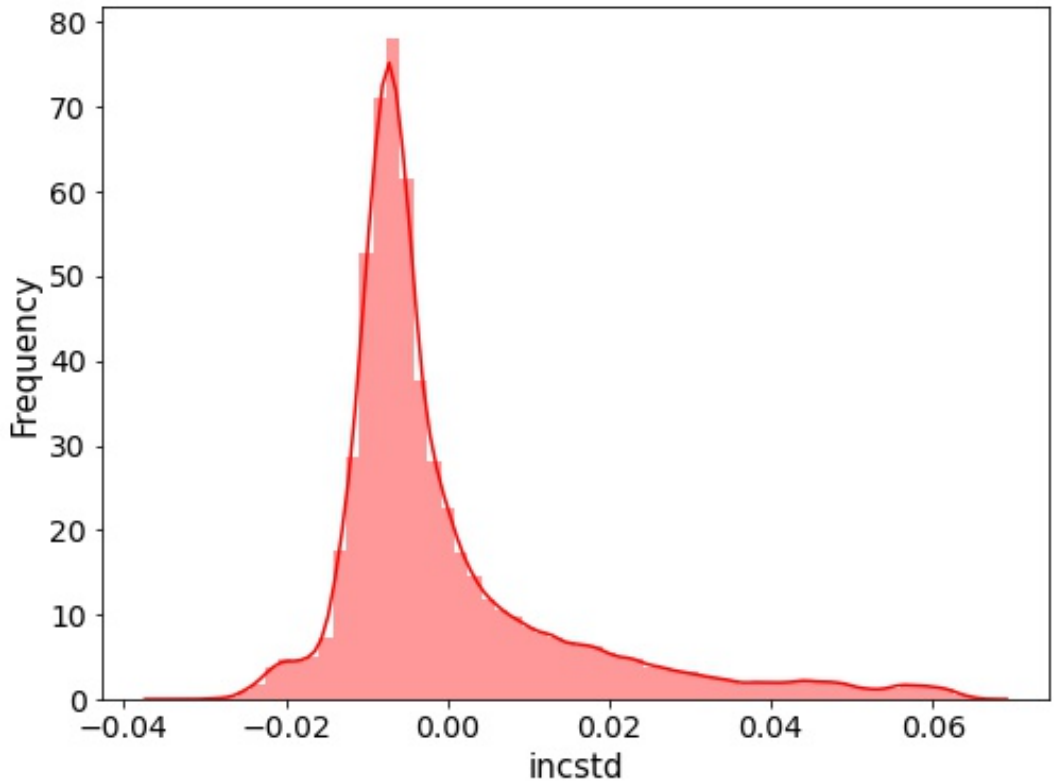
Experience-dependence: $\tilde{\sigma}^2_{\epsilon,c,t} = \dfrac{\overbrace{Var_{i,c,t}(\eta_{i,c,t})}^{\text{experienced volatility}}}{1 + \tilde{\phi}^2_{i,c,t}}$

State-dependence: $\tilde{\phi}_{i,c,t} = \delta(\epsilon_{i,c,t})$

Implications for consumption/saving

- heterogenous risk perceptions within groups:
  - heterogeneity in PR $\rightarrow$ hetergeneity in saving/wealth
- countercylical risks: idiosyncratic risks are negatively correlated with aggregate state of the economy
  - stochastic risks induce more precautionary savings in aggregate Caballero (1990), Meghir and Pistaferri (2004)
  - aggregate impacts of shocks to income risks Bayer et al. (2019)

Within-group dispersion in perceived income skewness



- residuals controling for observables/time fixed effects
- average PR: 2.1% in std; 10/90 IQR: 3.2% in std

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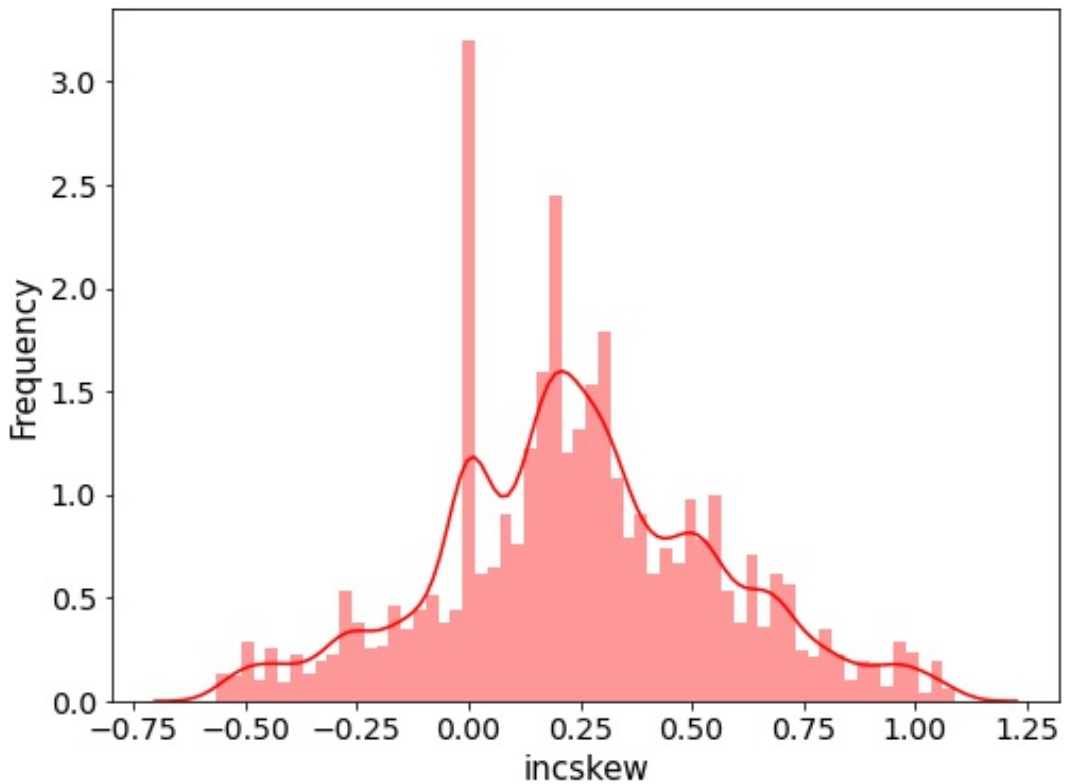
Within-group dispersion in PR skewness



- residuals controling for observables/time fixed effects

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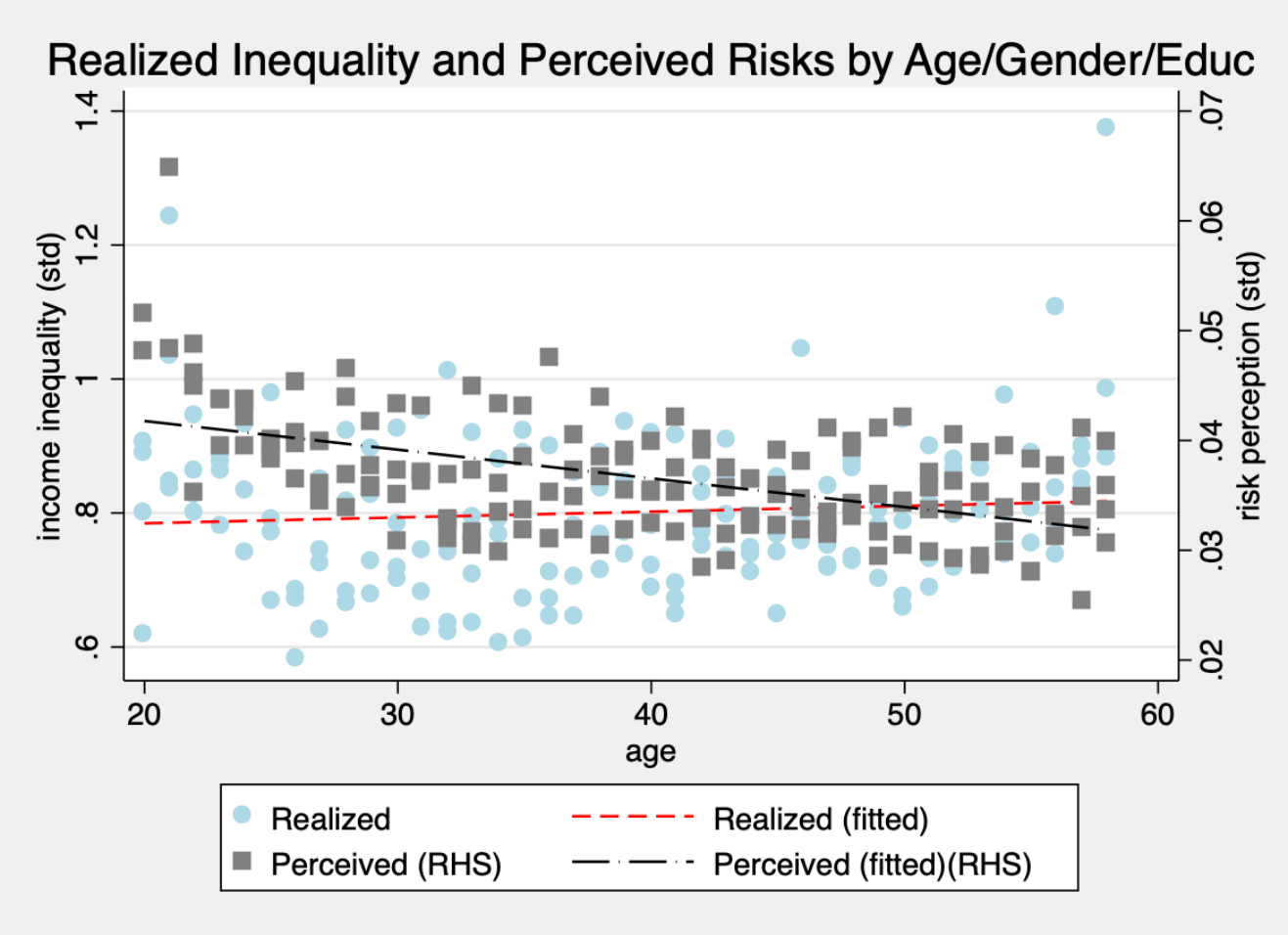
Appendix: PR by age/gender/education



- age /gender/education

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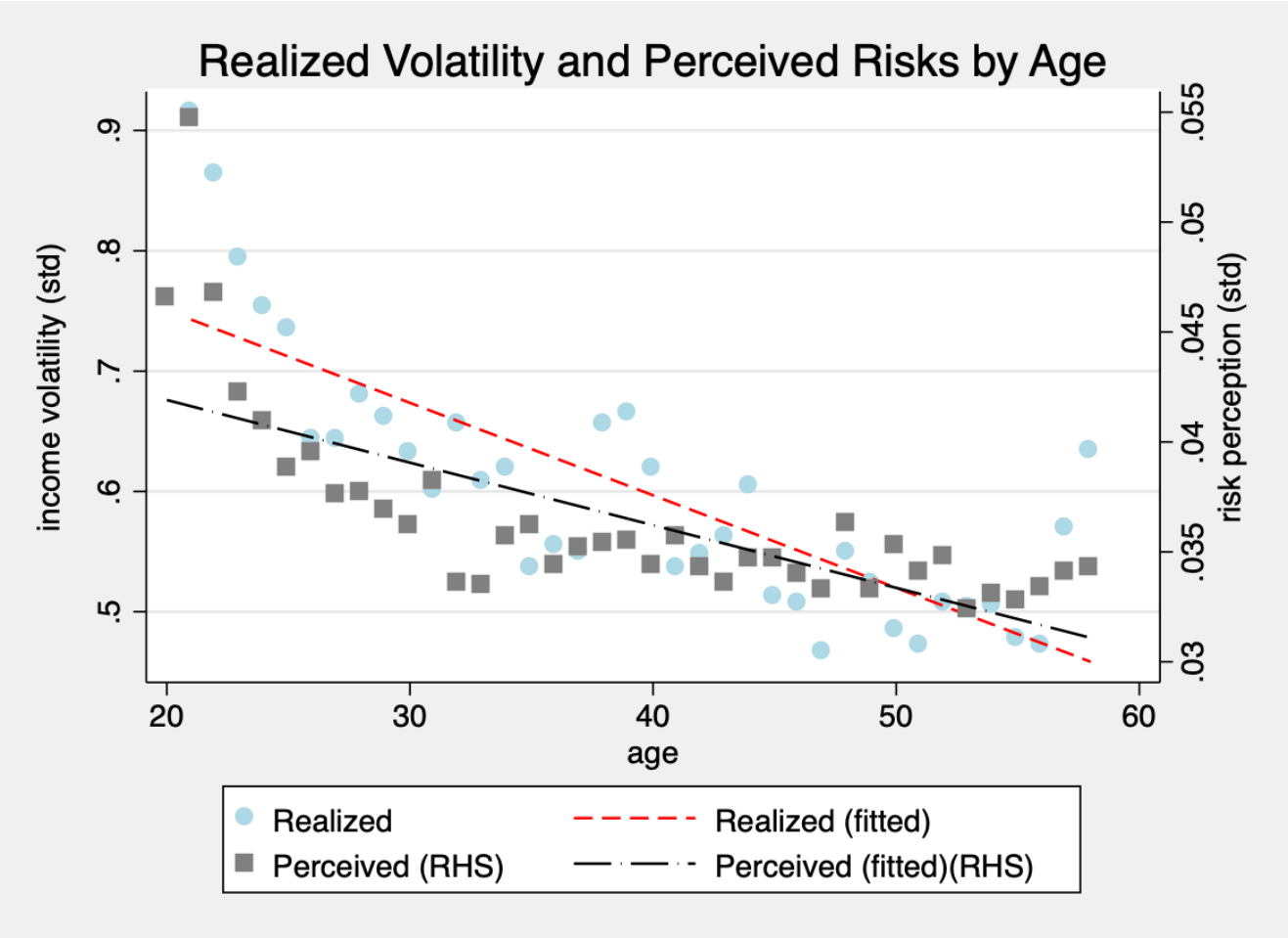
Appendix: PR by age



- e.g. a 35-year old

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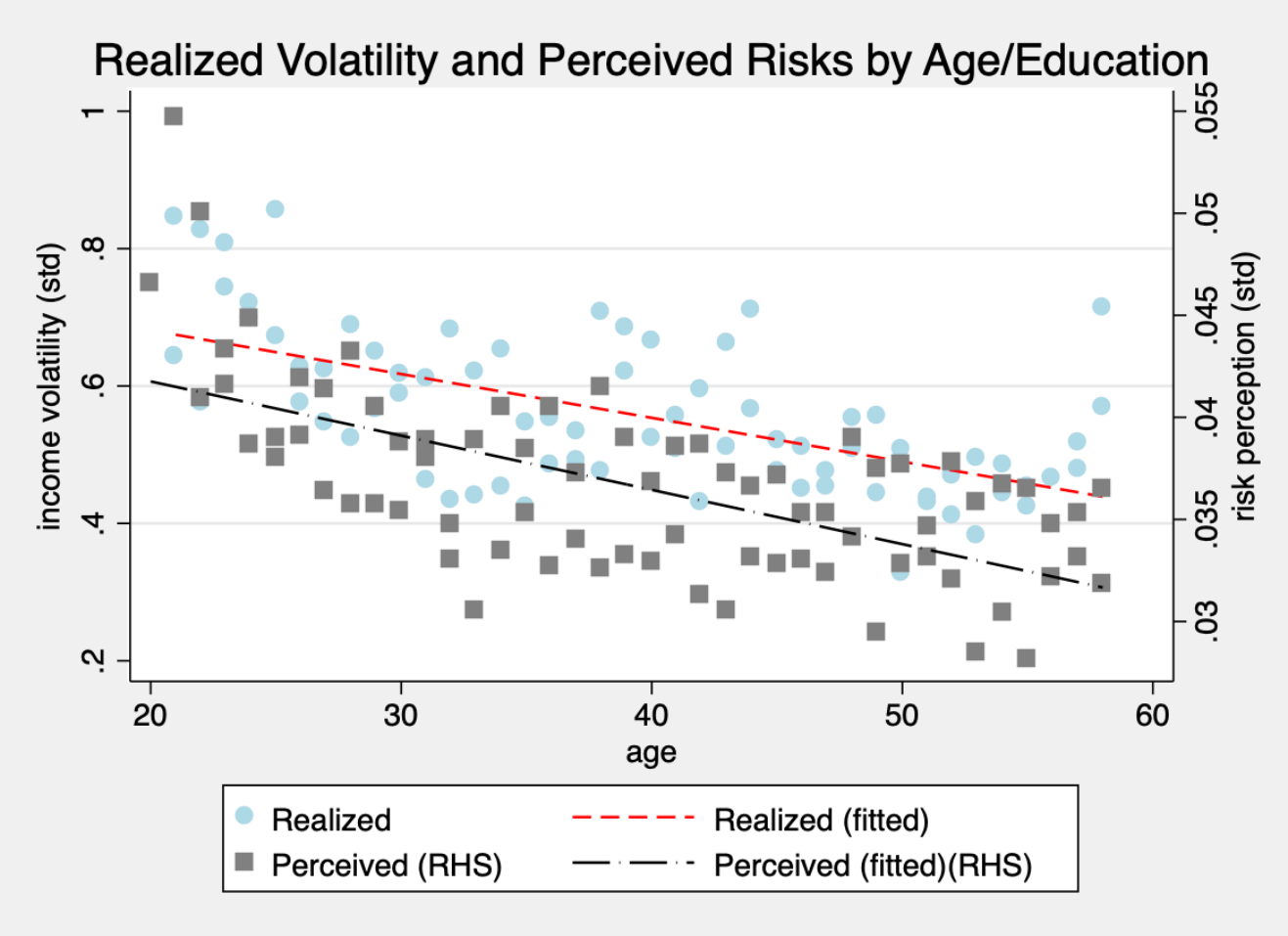
Appendix: PR by age/education



- e.g. a 35-year old high school graduate

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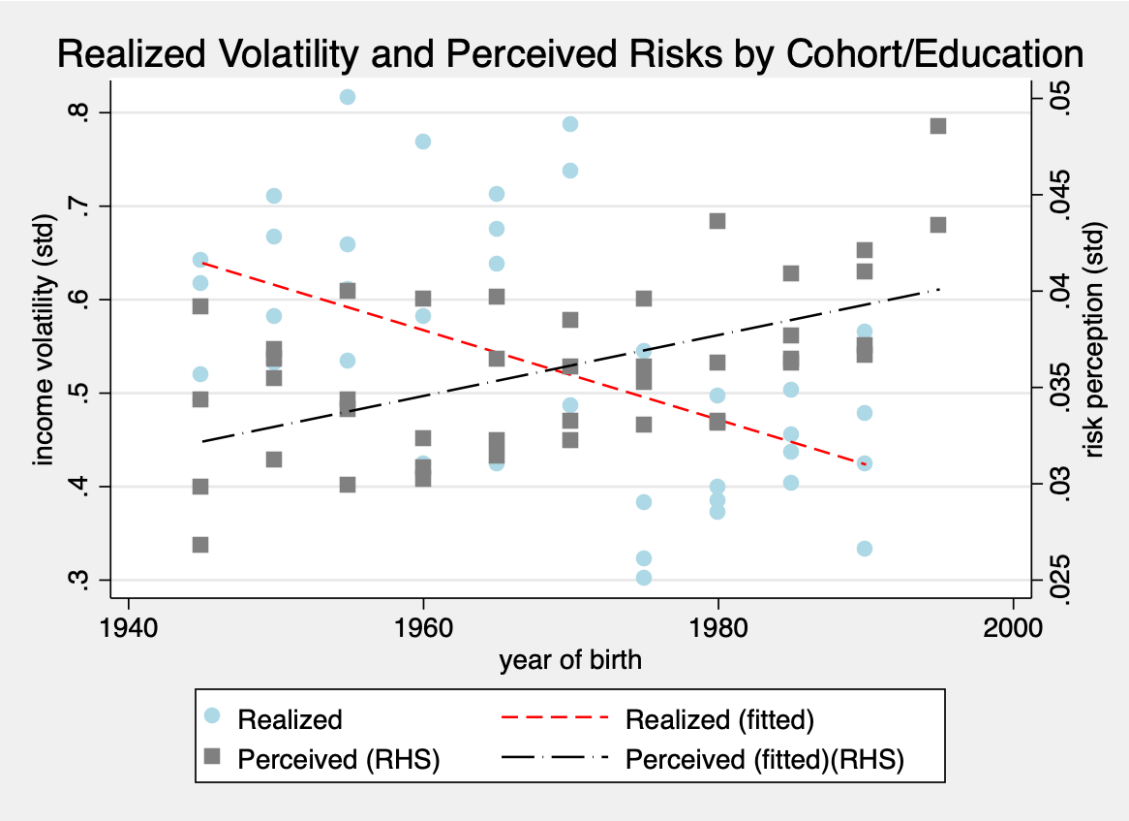
Appendix: PR by cohort/education/gender

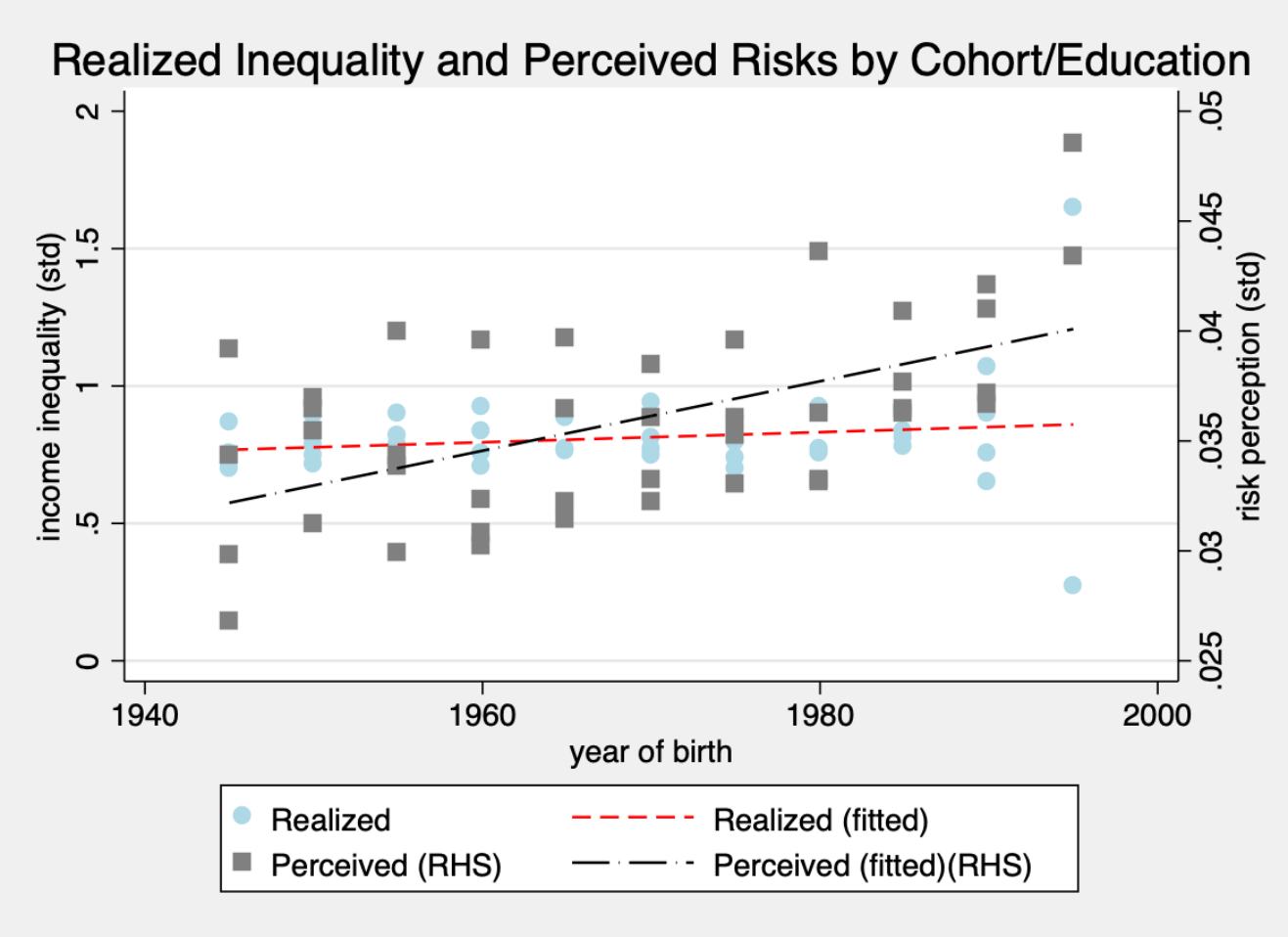


- e.g. a male higher school graduate born between 1990-1995

inequality | inequality by 5-year/education | 5-year/education | Back

- declining income volatlity between 1978-2013 Sabelhaus and Song (2010), Bloom et al. (2018)

Appendix: PR by cohort



- e.g. a female college graduate born between 1970-1975

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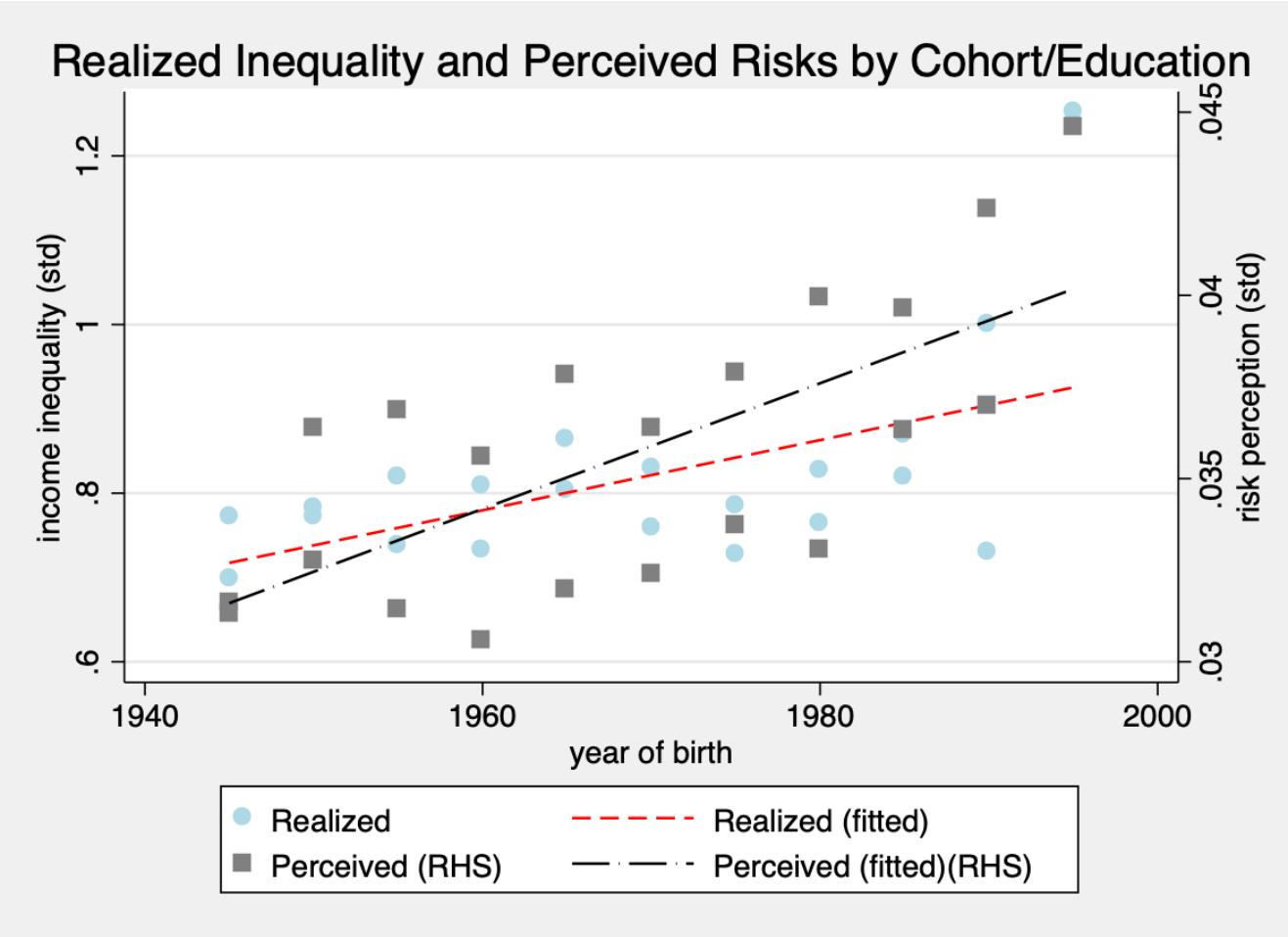
Appendix: PR by cohort/education



- e.g. a high school graduate born between 1985-1990

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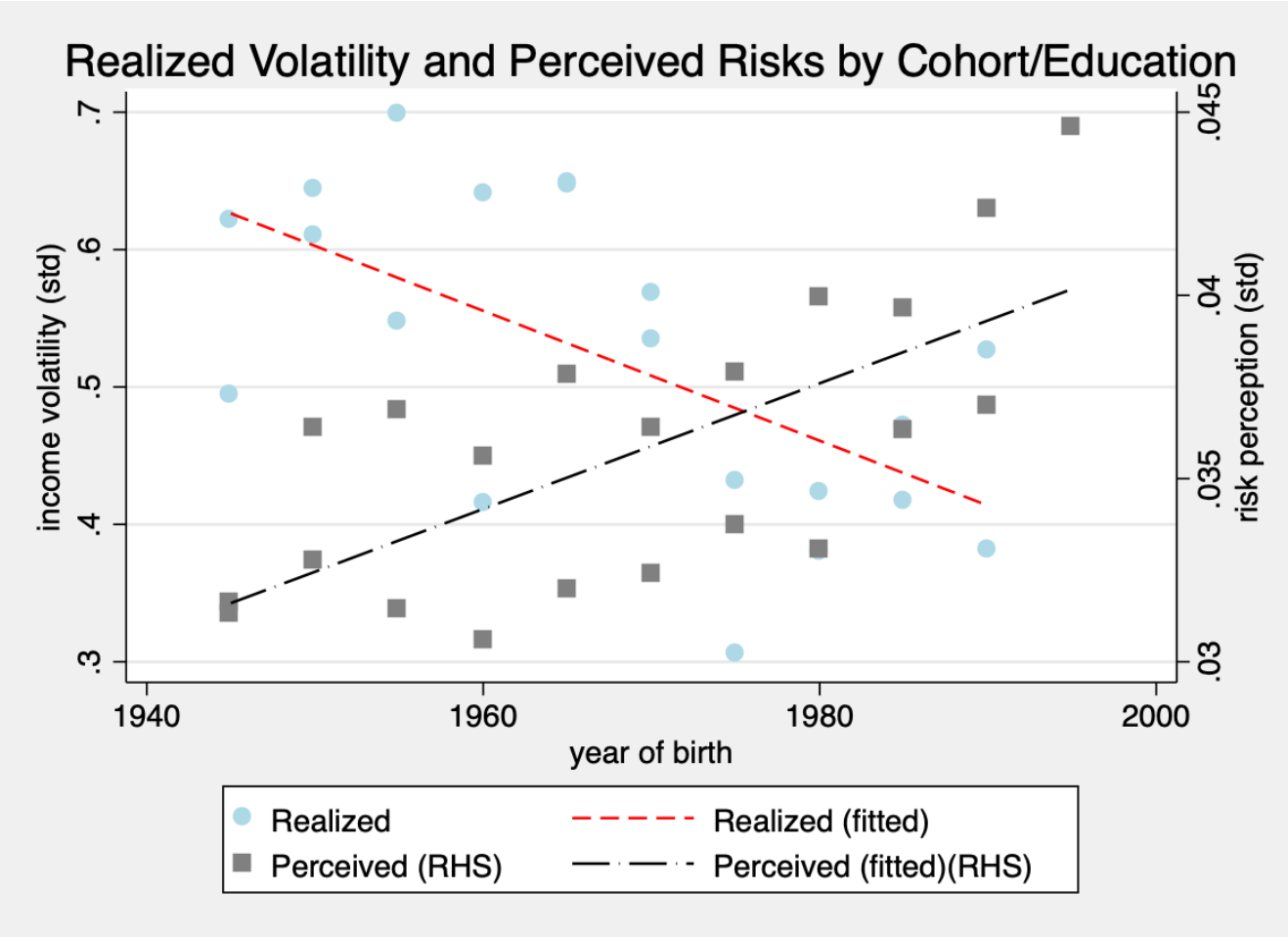
Appendix: PR by cohort/education



- a college graduate born between 1985-1990

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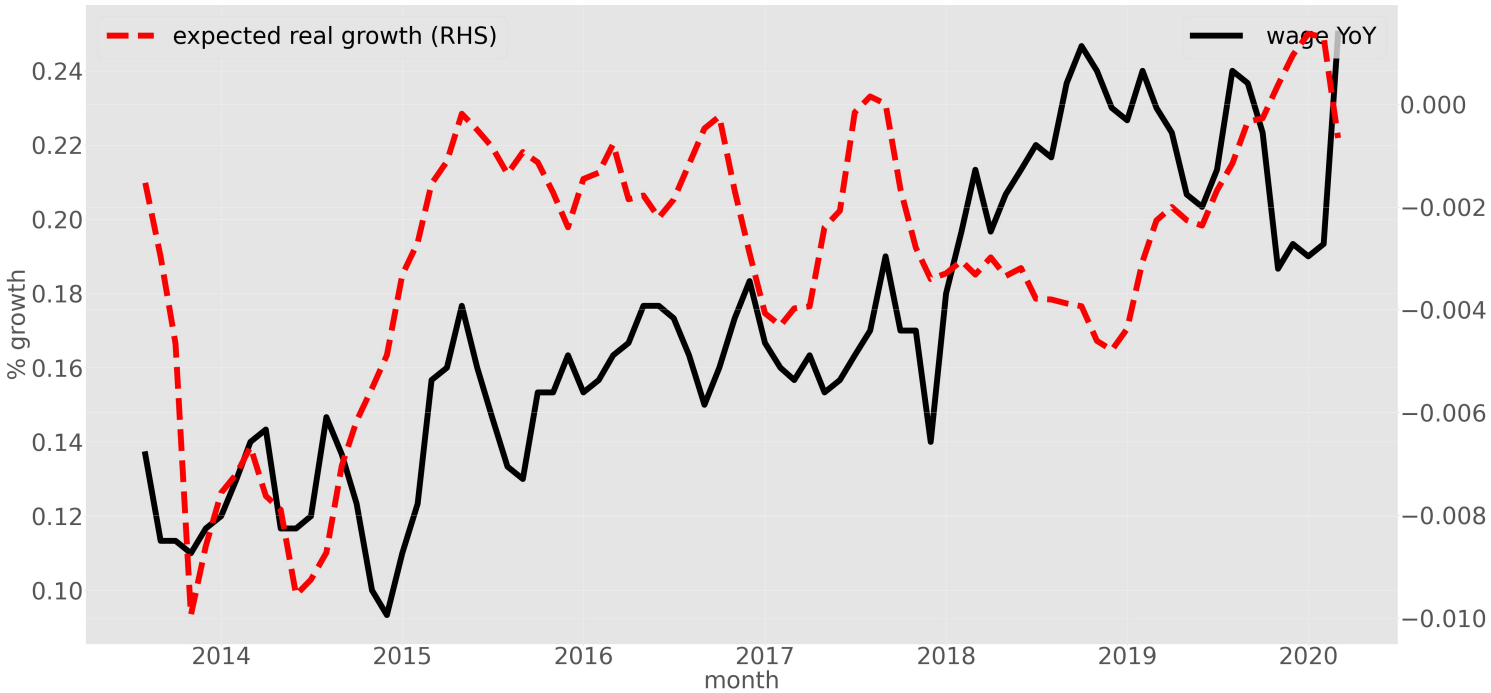
Appendix: expected income growth and recent (past) wage growth

- $\overline{\exp_t}$: average expected growth across individuals
- quarterly growth in average hourly wage



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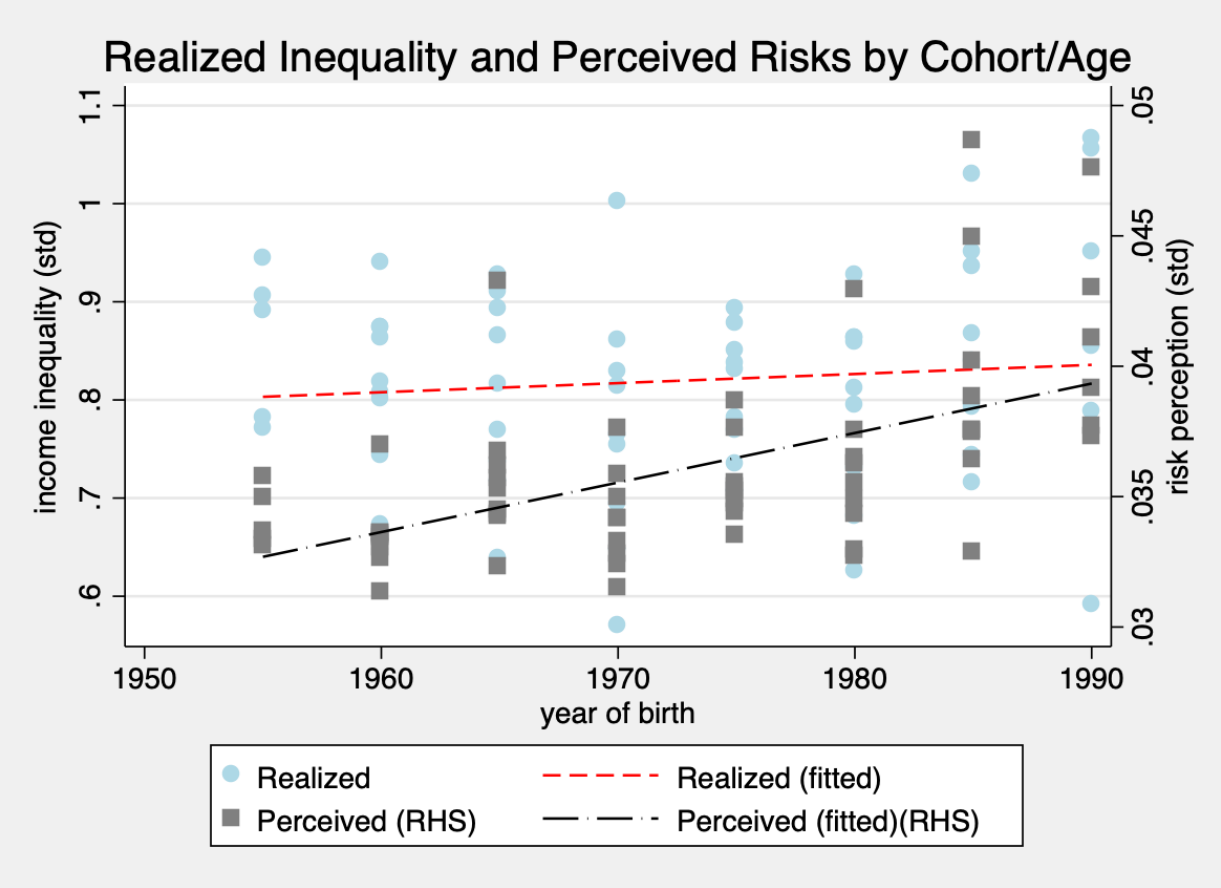
Appendix: by **5-yr of birth/age**



- e.g. a 25-year old born between 1985-1990
- only possible for post-2013 sample

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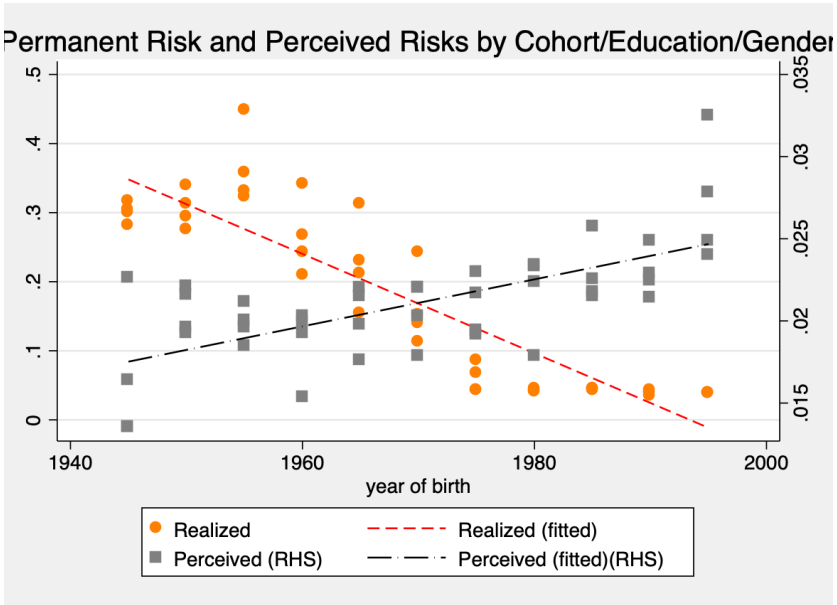
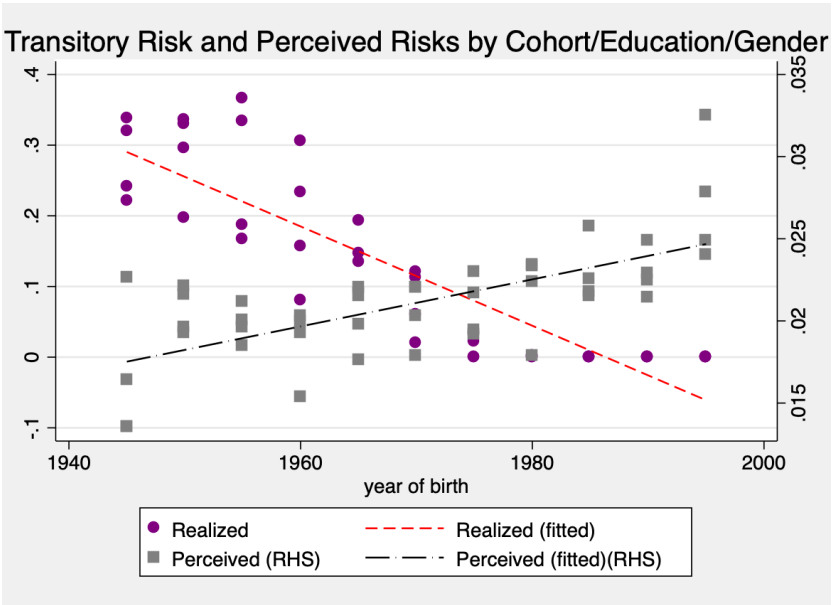
Appendix: permanent versus transitory risks

(a) permanent



(b) transitory



- e.g. a female high school graduate born between 1985-1990

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