Leverage and Rate of Return Heterogeneity among U.S. Households

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Introduction

Question:

How and why do returns on wealth permanently differ between U.S. households and vary over the wealth distribution?

Method:

- Propose panel-data measures for returns on U.S. household assets and wealth using the PSID.
- Estimate type-dependence using fixed effects with empirical Bayes shrinkage.
- Document how and why returns vary over the wealth distribution – like Fagereng et. al. (2020) for Norway.
- Examine correlation of household-specific wages and returns.

Findings:

- Leverage exhibits permanent heterogeneity - explains most of the permanent heterogeneity in the U.S. returns on wealth
  - ➢ 9.2 p.p. s.d. in household-specific returns to wealth.
  - ➢ returns on assets heterogeneity, 3.8 p.p. s.d., understate return heterogeneity.
  - ➢ 16.3 p.p. s.d. in household-specific leverage.
- Returns to wealth *decline* on average with scale / returns to non-financial assets decline with specialization.
- Household-specific returns and wages are correlated.

U.S. Data

Panel Study of Income Dynamics (PSID) from 1999—2019

Returns to household wealth, $r^{w}_{j,it}$ and assets, $r_{j,it}$, are observed:

- Assets *(j):* total *(j=a)*, primary housing, secondary housing, private businesses, public equities, and risk-free assets

$$r^{w}_{a,it} = \frac{\sum_{j\in J}\{y_{j,it} + \triangle a_{j,it} - n_{j,it} - c_{j,it}\}}{\sum_{j\in J}\{a_{j,it-1} - d_{j,it}\}}$$

for household i at time t, $y_{j,it}$ is flow net dividends, $a_{j,it}$ is asset value, $n_{j,it}$ is net investment, $d_{j,it}$ debt, and debt service costs $c_{j,it}$

Data advantages:

- Net investment included in the measures of capital gains
- Encompassing: total assets - not just taxable (retirement)
- U.S. estimates (no wealth tax, representative, no top-coding)
- Does not require hedonic pricing estimates for housing

Summary Statistics for Returns to Asset and Wealth

	Obs	House-holds	Mean	Standard Deviation		
				Total	Within	Between
Total Assets	15223	3271	3.5	10.6	9.4	5.7
Primary Hous.	16111	3144	5.2	10.4	9.5	5.3
Secondary Hous.	1766	420	9.7	33.1	30.1	16.0
Private Business	859	235	38.0	99.3	85.7	53.5
Risk-Free	23923	4594	-1.7	1.0	0.8	0.6
Public Equity	8901	1918	8.6	36.8	32.4	19.4
Total Wealth	15223	3271	8.2	28.2	24.4	16.8
Primary Hous.	16111	3144	14.5	39.1	33.8	23.9
Secondary Hous.	1766	420	13.6	53.7	47.9	28.5
Private Business	859	235	53.1	152.1	128.0	81.4

Note: Annualized rates of return for households, in percentage points, 1999-2019.

Household-Specific Returns

- First stage removes age and year fixed effects, z_{it}.

$$r_{j,it} = z_{it}\beta^{z} + \tilde{r}_{j,it}$$

- Second stage controls for observable household and portfolio characteristics, x_{it}.

$$\tilde{r}_{j,it} = x_{it}\beta^{x} + e_{j,it}$$

- Unexplained component is the sum of a household-specific return, $\varepsilon_{j,it}$, and idiosyncratic error, $u_{j,it}$

$$e_{j,it} = \varepsilon_{j,i} + u_{j,it}$$

- Standard deviation of household-specific returns, $\hat{\sigma}(\varepsilon_j; a)$, estimated with FE with empirical Bayes shrinkage- unbiased
- Idiosyncratic returns on wealth, $\hat{\sigma}(\varepsilon_j; w)$, are calculated $r^{w}_{j,it}$ in the same way and for every asset class j
- The contribution of borrowing to the standard deviation in the household-specific returns to wealth, γ_j:

$$\gamma_j = \frac{\hat{\sigma}(\varepsilon_j; w) - \hat{\sigma}(\varepsilon_j; a)}{\hat{\sigma}(\varepsilon_j; w)}$$

Results- Type Dependence

Leverage Explains 58 Percent of Household-Specific Returns to Wealth

	$\hat{\sigma}_{\epsilon}$	$\hat{\sigma}^2_{\epsilon} / \hat{\sigma}^2_{e}$	γ
Total Assets	3.83 (0.369)	0.13	
Primary Hous.	3.14 (0.402)	0.09	
Secondary Hous.	3.36 (1.328)	0.01	
Private Business	41.44 (9.351)	0.16	
Risk Free	0.35 (0.017)	0.19	
Public Equity	4.21 (1.313)	0.01	
Total Wealth	9.18 (0.728)	0.11	58%
Primary Hous.	13.20 (1.531)	0.12	76%
Seconday Hous.	5.739 (2.912)	0.01	41%
Private Business	58.91 (17.61)	0.16	30%

Note: Estimates are of the household-specific returns, in percentage points, using fixed effects with empirical Baynes shrinkage. They include the standard deviation with standard errors in brackets and variance decomposition.

Permanent heterogeneity in returns to assets (Fagereng et. al., 2020) understates the permanent heterogeneity in returns to wealth – 3.8 versus 9.2 p.p, respectively.

Portfolio Allocation and Risk Account for Little of Permanent Heterogeneity

	Year	Year, Age	+Portfolio	+Port. & Risk
Total Assets	4.15	3.83	3.34	3.22
	(0.379)	(0.369)	(0.362)	(0.350)
Total Wealth	9.73	9.18	9.30	8.85
	(0.913)	(0.728)	(0.721)	(0.712)

Note: Standard deviation of household-specific returns, in percentage points.

Household-Specific Leverage is Substantial

	$\hat{\sigma}_{\epsilon^l}$	$\hat{\sigma}^2_{\epsilon^l} / \hat{\sigma}^2_{e^l}$
Total	16.33 (0.785)	0.25
Private Business	19.10 (4.426)	0.68
Primary Housing	24.22 (0.357)	0.71
Secondary Housing	26.24 (0.914)	0.81

Note: Estimates of household-specific leverage, with standard errors in parentheses and variance decomposition. Leverage is measured as the debt-to-assets ratio in percent.

Leverage permanently differs across households and is correlated with wage income

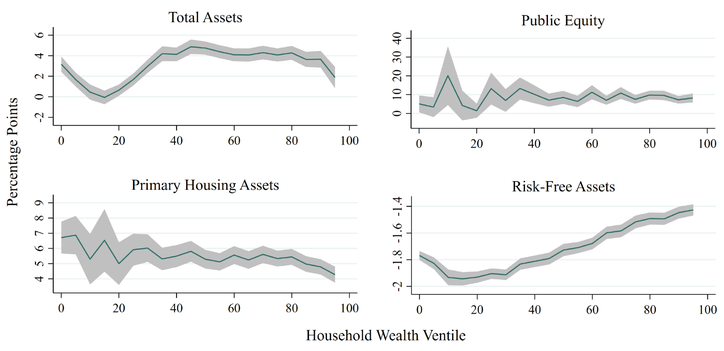
Correlation of Permanent Returns and Leverage with Explained Wages

	Return to Assets	Return to Wealth	Leverage
Total	0.45 (0.000)	0.51 (0.000)	0.30 (0.000)
Primary Housing	0.21 (0.000)	0.36 (0.000)	0.18 (0.000)
Secondary Housing	0.03 (0.174)	-0.03 (0.224)	0.01 (0.810)
Private Business	0.49 (0.000)	0.49 (0.000)	0.24 (0.000)
Risk-Free	0.31 (0.000)	-	-
Public Equity	0.40 (0.000)	-	-

Note: Pairwise correlation of household-specific returns to assets, returns to wealth and the debt-to-assets ratio with the explained component of wages. P-values are in parentheses.

Results- Scale Dependence

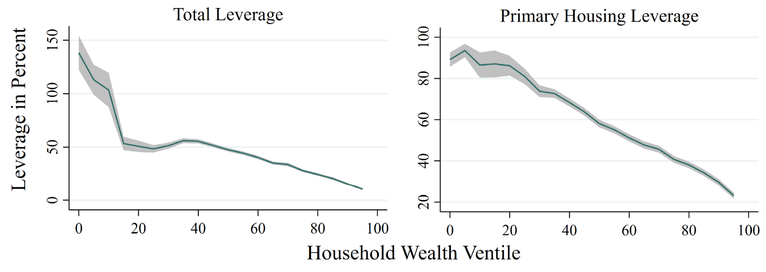
Only Average Returns to Financial Assets Increase with Wealth



Note: Predictive margins for returns to assets by household wealth ventile. Controls for lagged wealth ventile as well as household and time fixed effects. 95 % confidence intervals.

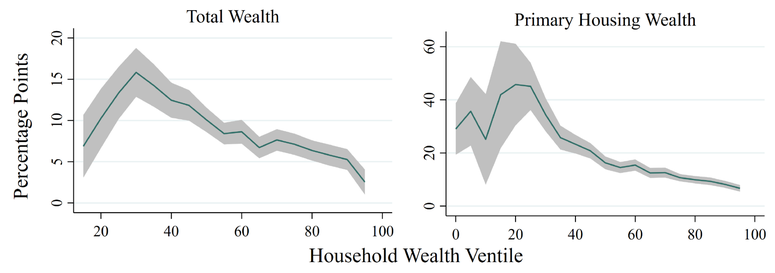
Returns to wealth decline on average with scale. Returns to non-financial assets decrease with specialization.

Wealthy Aggressively Reduce Leverage (Increases only for Private Business Equity)



Note: Predictive margins for leverage by household wealth ventile. 95% confidence intervals. Leverage is measured as the debt-to-assets ratio.

Average Returns to Wealth Decline Due to Reduced Leverage



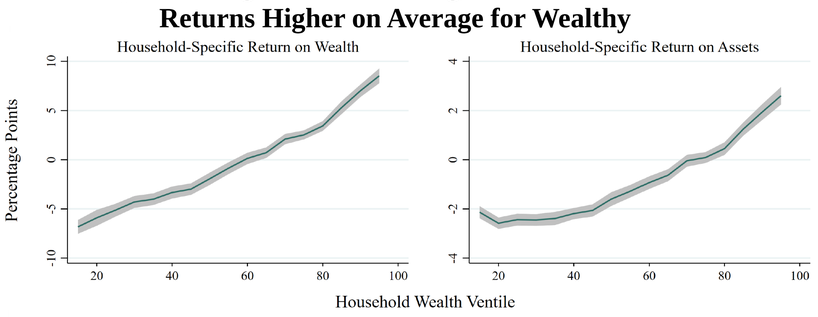
Note: Predictive margins for the returns to wealth by household wealth ventile. Controls for the lagged wealth ventile as well as the household and time fixed effects. 95% confidence intervals.

Household-specific leverage matters more than asset allocation and asset risk for permanent return heterogeneity

Regressive Taxation and Lower Borrowing Costs Contribute to Returns of Wealthy

Note: Predictive margins for the primary-housing real mortgage rate by household wealth ventile. Controls for the lagged wealth ventile as well as the household and time fixed effects.

Despite Average Returns Falling, Households-Specific Returns Higher on Average for Wealthy



Note: Predictive margins for household-specific returns to assets and wealth by household wealth ventile. 95% confidence intervals.

Robustness

- Empirical Baynes ensures results robust to assumptions that effect transitory idiosyncratic returns and error.
- Non-homeowners do not display permanent heterogeneity.
- Non-business owners display permanent heterogeneity.

Household-Specific Returns Robust to Various Assumptions

	$\hat{\sigma}_{\epsilon}$	$\hat{\gamma}$	$\hat{\sigma}^2_{\epsilon} / \hat{\sigma}^2_{e}$	N
Baseline	3.83 (0.369)	0.58	0.13	15223
Individuals	4.06 (0.223)	0.58	0.14	26807
$r^{w}_{a,it}$ not required	3.59 (0.292)	-	0.11	17831
Fagereng et al. measure	4.20 (0.212)	-	0.15	30975
No min. asset value	4.20 (0.391)	0.55	0.13	15436
Ex. Public Equity Owners	3.18 (0.271)	0.62	0.11	11632
Exclude Homeowners	1.24 (1.247)	0.31	0.03	2236
Exclude Bus. Owners	3.39 (0.373)	0.60	0.11	13833

Note: Standard deviation of household-specific returns, in percentage points with standard errors in brackets, using fixed effects with empirical Baynes shrinkage under various sample restriction assumptions. The Fagereng et al. measure assumes that observations of individuals' returns and returns to wealth are not required.

Implications

- Returns on assets understates permanent heterogeneity.
- Return on wealth heterogeneity primarily due to leverage.
- Helps generalize and reconcile evidence from Scandinavia:
  - ➢ returns to wealth decrease on average (Bach et al 2020)
  - ➢ returns to assets increase on average (Fagereng et al. 2020)
- Debt should not be ignored as part of portfolio choice; it is needed for type and scale dependance in returns – understanding wealth inequality more generally.

References

Bach, L., L. E. Calvet, and P. Sodini (2020). Rich pickings? Risk, return, and skill in household wealth. *American Economic Review* 110(9): 2703-47.

Fagereng, A., Guiso, L., Malacrino, D., and Pistaferri, L. (2020). Heterogeneity and persistence in returns to wealth. *Econometrica*, 88(1):115-170.

Acknowledgements

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