Heterogeneous Returns and the Distribution of Wealth

Decory Edwards

Johns Hopkins University

August 28, 2025

Brief history on wealth inequality

Benhabib and Bisin 2018 offer a useful survey of lit

1. Observable skewness in wealth holdings $\rightarrow$ assume distributional properties
2. Use distribution of income to explain distribution of wealth
3. Describe the dynamics of optimal consumption-saving behavior

an interest in wealth inequality $\rightarrow$ heterogeneous agent macro modeling.

Measured heterogeneity in returns

TABLE 3

RETURNS TO WEALTH: SUMMARY STATISTICS[a]

Wealth Component	Mean	St. Dev.	Skewness	Kurtosis	P10	Median	P90
Net worth (before tax)	0.0379	0.0859	−0.79	47.75	−0.0308	0.0321	0.1109
Net worth (after tax)	0.0365	0.0781	−0.71	36.88	−0.0283	0.0316	0.1067
Net worth (before tax, unweighted)	0.0004	0.2205	−6.73	68.46	−0.0600	0.0230	0.1037
Net worth (after tax, unweighted)	0.0155	0.1546	−5.28	56.42	−0.0449	0.0247	0.1040
Financial wealth	0.0105	0.0596	−1.78	22.17	−0.0171	0.0084	0.0530
Safe fin. assets	0.0078	0.0188	4.38	53.52	−0.0106	0.0059	0.0268
Risky fin. assets	0.0425	0.2473	−0.08	6.22	−0.2443	0.0418	0.3037
Non-financial wealth	0.0511	0.0786	1.80	15.47	−0.0215	0.0429	0.1275
Housing	0.0485	0.0653	0.73	9.95	−0.0209	0.0441	0.1165
Private equity	0.1040	0.5169	18.01	836.79	−0.0531	0.0052	0.3616
Debt	0.0236	0.0216	2.51	29.50	0.0030	0.0215	0.0461
Long-term debt	0.0230	0.0209	3.54	56.92	0.0038	0.0209	0.0446
Consumer debt	0.0961	0.1086	4.60	82.60	−0.0124	0.0741	0.2119
Student debt	0.0078	0.0260	0.68	4.14	−0.0213	0.0074	0.0399

Figure: Distribution of returns in narrowly defined asset classes from Fagereng et al. 2020.

Outline

1. Empirical evidence of heterogeneous returns
2. Model
3. Structural estimation to match wealth data

Life-cycle model with het. returns generates a reasonably skewned distribution.

My contribution

- Why returns? $\rightarrow$ an observable feature of household's problem
- Labor income process: Random walk v.s. AR(1)
- Age-education dependent labor income process and mortality rates

What are het. returns?

From optimal portfolio choice theory...

- Optimal share in the risky asset is

$$\alpha_{it}^m = \frac{\mathbb{E}(r_t^m - r_t^s)}{\gamma_i \sigma_t^2}.$$

- Individual *realized* return is

$$r_{it}^f = r_t^s + \alpha_{it}^m (r_t^m - r_t^s).$$

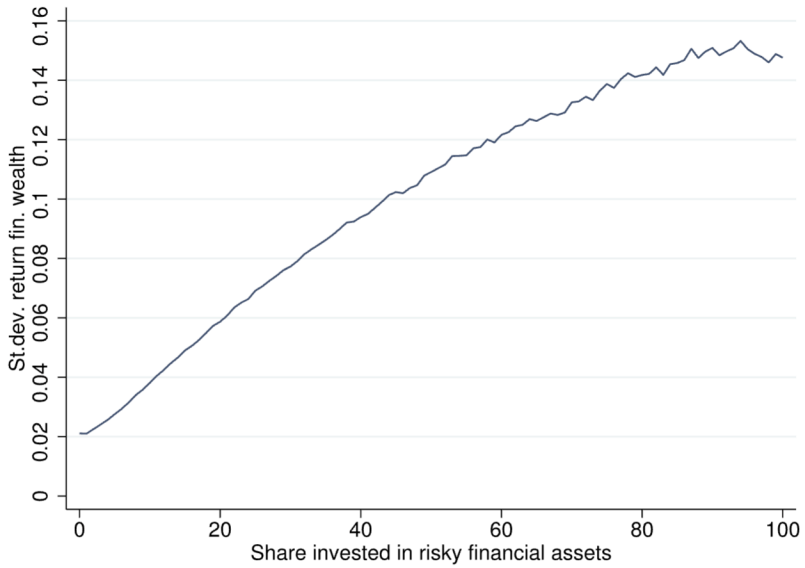


Figure: Heterogeneity in returns to financial wealth by share of risky assets from Fagereng et al. 2020.

Empirical estimate of heterogeneity

- Step 1: panel regression on returns

$$r_{it}^{n} = X_{it}^{'}\beta + u_{it}.$$

- Step 2: Add fixed effects

$$u_{it} = f_i + e_{it}.$$

$\Longrightarrow$ R^2 goes from .33 to .5.

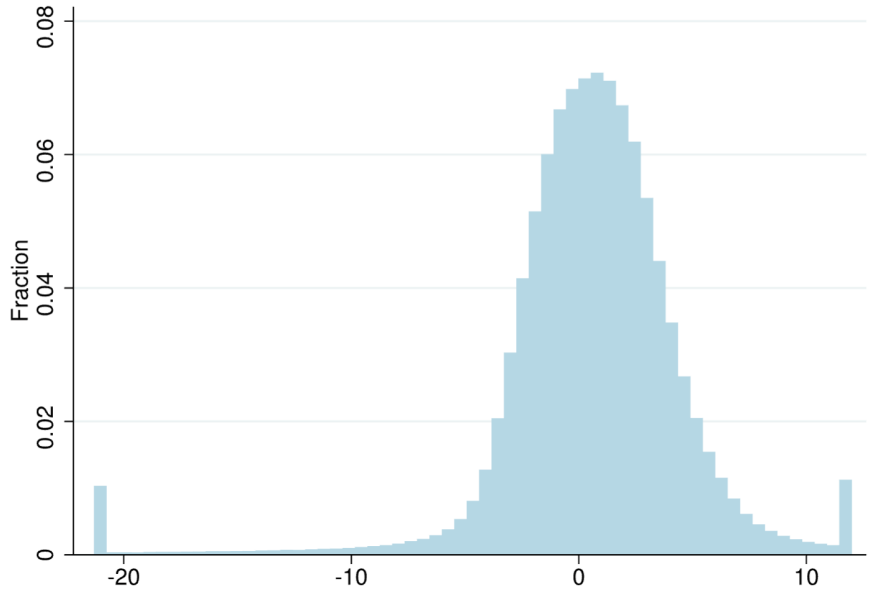


Figure: Distribution of fixed effects in the return to net worth from Fagereng et al. 2020.

Labor income process

- Household income:

$$y_t = p_t \xi_t W_t$$

- Permanent component:

$$p_t = p_{t-1} \psi_t$$

- Transitory component:

$$\xi_t = \begin{cases} \mu & \text{with probability } \mho \\ (1 - \tau_t) \ell \theta_t & \text{with probability } 1 - \mho \end{cases}$$

(Normalized) Optimization problem

Choose consumption profile $\{c_{t_n}\}_{n=0}^{\infty}$ that maximizes

$$
\begin{aligned}
v(m_t) &= \max_{c_t} u(c_t(m_t)) + \beta \cancel{D} \mathbb{E}_t[\psi_{t+1}^{1-\rho} v(m_{t+1})] \\
&\text{s.t.} \\
\underbrace{a_t}_{\text{assets today}} &= m_t - c_t(m_t), \\
\underbrace{k_{t+1}}_{\text{capital tomorrow}} &= \frac{a_t}{\cancel{D}\psi_{t+1}}, \\
\underbrace{m_{t+1}}_{\text{market resources tomorrow}} &= \underbrace{(1-\delta+r_t)k_{t+1}}_{\text{bank balances}} + \underbrace{\xi_{t+1}}_{\text{perm. inc. unit scaled by trans. shock}}.
\end{aligned}
$$

Calibration

Description	Parameter	Value
Time discount factor	β	0.99^4
CRRA	ρ	1
Capital share	α	0.36
Depreciation rate	δ	0.025
Time worked per employee	ℓ	$1/.09$
Wage rate	W	2.37
Unempl. insurance payment	μ	0.15
Probability of survival	$\not{D}$	$(1 - 0.00625)^4$
Std. dev of $\log \theta_{t,i}$	σ_θ^2	$0.010 \times 4 \times \sqrt{4}$
Std. dev of $\log \psi_{t,i}$	σ_ψ^2	$0.010 \times 4/11 \times \sqrt{4}$
Unemployment rate	$\mho$	0.07

Table: Parameter values (annual frequency) for the perpetual youth model.

Estimation procedure

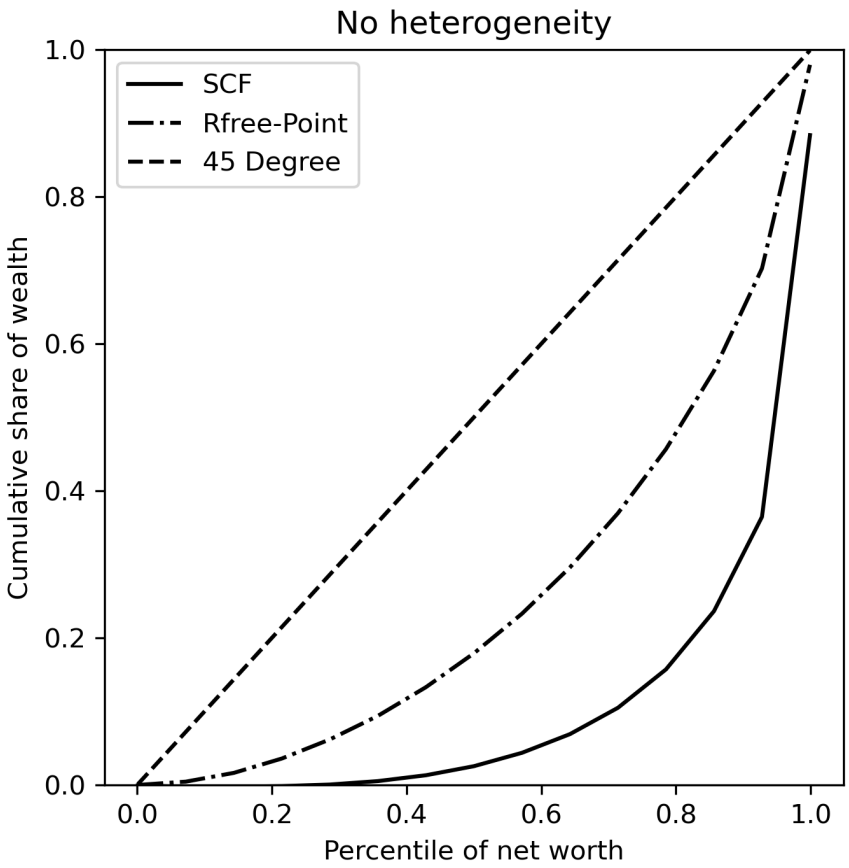
Simulated method of moments (SMM) estimation for R using 2004 SCF wealth data.

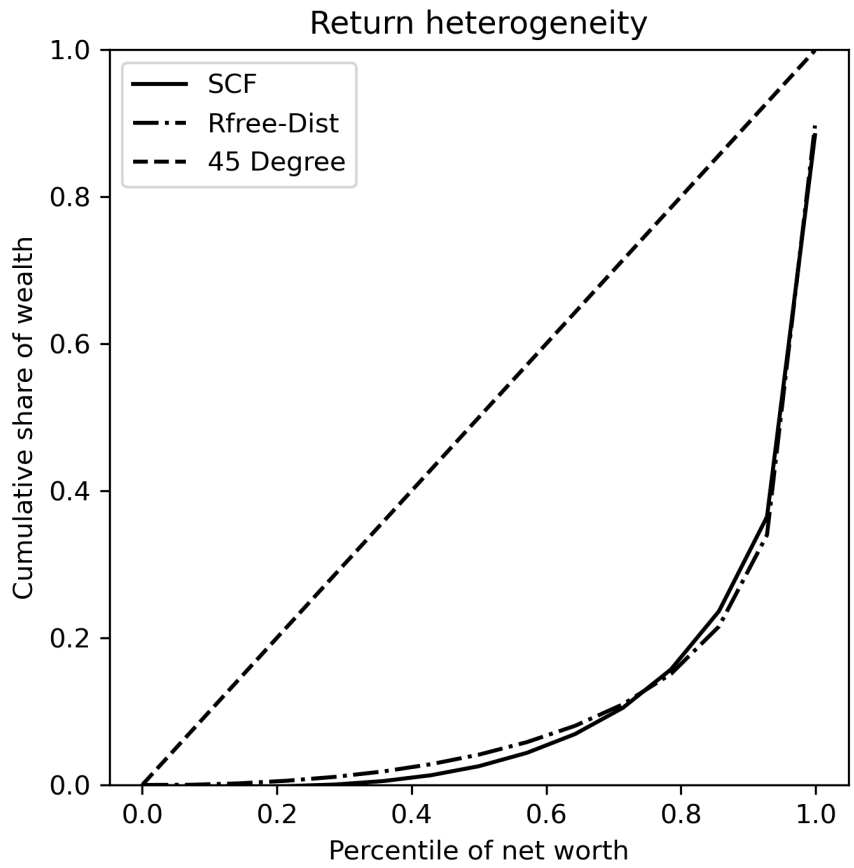
1. No ex-ante heterogeneity: *R-point* model
   Estimate a common rate of return:
   "Center" so the model matches the capital-to-output ratio ($\frac{K}{Y} = 3$).

2. Ex-ante heterogeneity: *R-dist* model
   Estimate a **Uniform distribution** of returns:
   "Center" and "spread" so the model matches SCF Lorenz targets, given $\frac{K}{Y}$.

Net worth percentile	Cumulative net worth
20th	-.18%
40th	.95%
60th	5.3%
80th	17.09%

How good is the fit?





Lifecycle version of the model

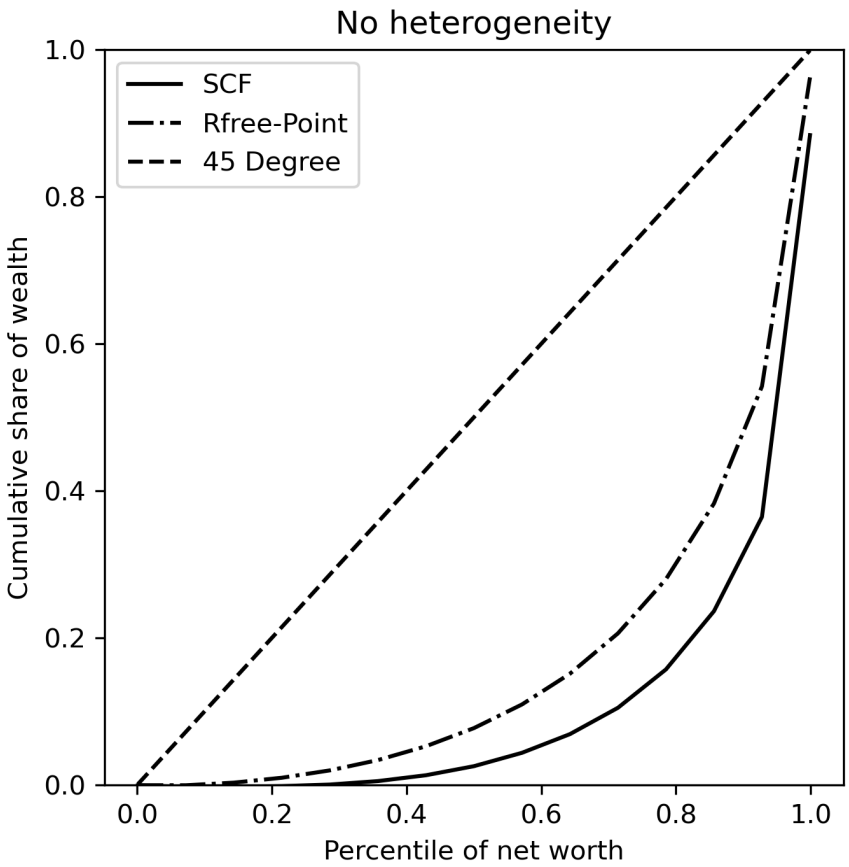
- Education cohort $e \in \{D, HS, C\}$
- Initial wealth-to-income k_0 and income p_0 levels
- Education-age dependent mortality rates
  (Brown, Liebman, and Pollet 2007)
- Modified labor income uncertainty $y_t = \xi_t \psi_t \overline{\psi}_{es} p_{t-1}$
  (Cagetti 2003)

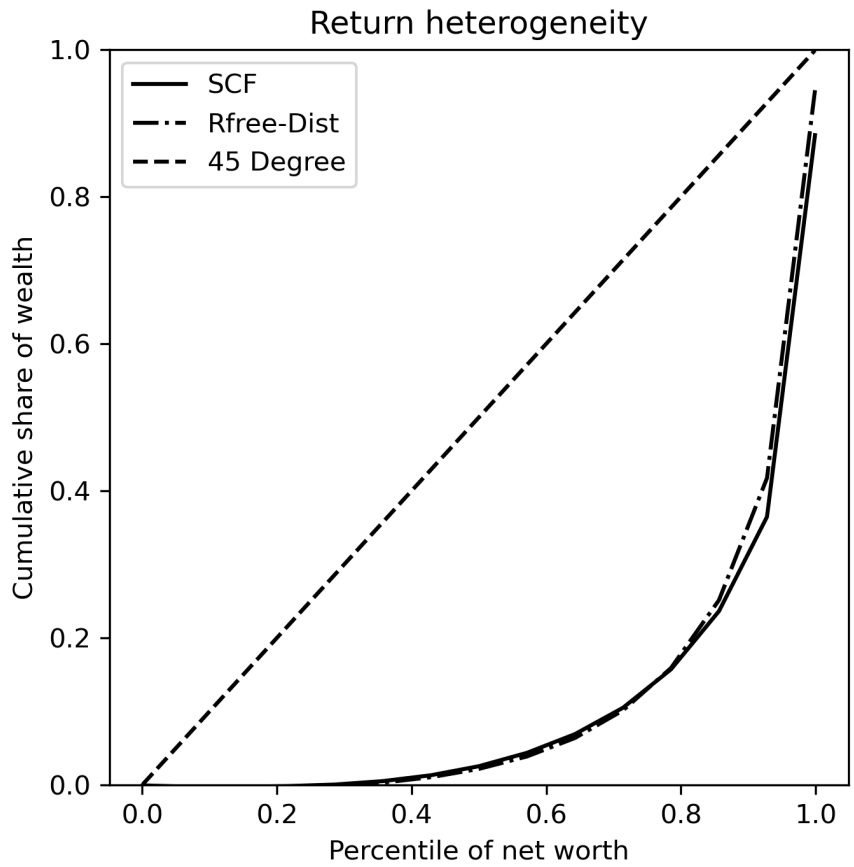
Calibration

Description	Parameter	Value
Population growth rate	N	0.0025
Technological growth rate	Γ	0.0037
Rate of high school dropouts	θ_D	0.11
Rate of high school graduates	θ_{HS}	0.55
Rate of college graduates	θ_C	0.34
Labor income tax rate	τ	0.0942

Table: Parameter values (annual frequency) for the lifecycle model.

How good is the fit?





Model performance: returns distribution

Empirical values from Fagereng et al. 2020

	Mean	St. Dev
Net worth (after tax)	0.0365	0.0781

Values from the structural estimation (uniform distribution for R)

	Mean	St. Dev
PY-Point	0.060	0.0
PY-Dist	0.021	0.011
LC-Point	0.040	0.0
LC-Dist	0.023	0.009

Model performance: untargeted moments

Empirical Lorenz Shares (10-Year)

age	20th	40th	60th	80th
25-30	-0.0723	-0.0657	-0.0266	0.1099
30-40	-0.008	0.0054	0.057	0.1813
40-50	-0.0001	0.0187	0.0776	0.2178
50-60	0.0018	0.0215	0.0766	0.2126
60-70	0.0011	0.0188	0.0726	0.2081

Simulated Lorenz Shares (10-Year)

age	20th	40th	60th	80th
25-30	-0.0024	0.0242	0.0859	0.2242
30-40	-0.0124	0.0064	0.0662	0.2221
40-50	-0.0088	0.0046	0.0545	0.2077
50-60	-0.0006	0.0157	0.069	0.2234
60-70	0.0038	0.0239	0.0809	0.2341

Potential sources of return heterogeneity

- Entrpreneurship - "high levels of capital, low MPK"
- Financial literacy - closer, but generally aimed at risky assets

Remember, there is het. returns even when holding only safe assets.

Business Insider - "Average Bank Account Interest rates"

- *On average, interest-bearing checking accounts earn* 0.07% *APY.*
- However, many checking accounts exist whiuch offer up to 3.3% APY.

Is there a mechanism we can exploit?

Mechanism

- "Transmission channel of monetary policy" by Drechsler, Savov, and Schnabl 2017
  - Sensitivity of bank deposits to market interest rate changes
- Δ in market rate $\rightarrow$ variation in Δ in deposits held at banks
  - Sarkisyan and Viratyosin 2021 - globally integrated vs local banks
  - Adrien d'Avernas et al. 2024 - small vs large banks

$\Longrightarrow$ variation in deposit rates offered across banks

A simple model of bank heterogeneity

Let R^m be the market rate of return, R^d be the rate of return offered on deposits by a bank, and $S(R^d, R^m)$ be the level of deposits held at a given bank.

Banks solve:

$$\max(R^m - R^d) \cdot S(R^d, R^m)$$

subject to:

$$S(R^d, R^m) = A\left(\frac{R^d}{R^m}\right)^{\varepsilon}$$

Show interpretation of ε

Interpreting the Elasticity Parameter ε

So ε has a clear interpretation as the elasticity of deposits to changes in the market interest rate:

$$-\varepsilon = \frac{\partial S(\cdot)}{\partial R^m} \cdot \frac{R^m}{S(\cdot)}$$

Back to model

First order condition

Bank's optimal choice of R^d

The first order condition for the bank's optimization problem implies that:

$$R^d = \frac{\varepsilon}{1+\varepsilon} R^m$$

Back to model

Estimation procedure

Simulated method of moments (SMM) estimation for R using 2004 SCF wealth data.

3. Implied distribution of elasticities ϵ

   The solution to the bank's optimization problem implies

$$\varepsilon = \frac{R^d}{R^m - R^d} \tag{1}$$

   $\Longrightarrow$ SMM procedure pins down a dist. of elasticites describing banking heterogeneity.

Model performance: implied elasticites

PY		LC	
Estimated returns	Implied elasticities	Estimated returns	Implied elasticities
0.964	7.329	0.976	8.165
0.983	8.755	0.991	9.564
1.001	10.771	1.007	11.468
1.021	13.837	1.023	14.208
1.040	19.064	1.039	18.492
1.060	29.974	1.055	26.136
1.079	66.891	1.071	43.645

Genay and Halcomb 2004 - "A 1% increase in the fed funds rate over four quarters is associated with a 2.96% decline in the growth of core deposits at small banks and a 3.66% decline at large banks."

Work to be done

- Better empirical moments from Fagereng et al. 2020 to compare results to
- Implications of wealth tax vs capital income tax when het. returns are present Guvenen et al. 2023

References I

- Adrien d'Avernas et al. (Aug. 2024). *The Deposit Business at Large vs. Small Banks*. URL: https://www.fdic.gov/system/files/2024-09/wallace-paper-091224.pdf.
- Benhabib, Jess and Alberto Bisin (2018). "Skewed Wealth Distributions: Theory and Empirics". In: *Journal of Economic Literature* 56.4, pp. 1261–91. DOI: 10.1257/jel.20161390. URL: https://www.aeaweb.org/articles?id=10.1257/jel.20161390.
- Brown, Jeffrey R, Jeffrey B Liebman, and Joshua Pollet (Nov. 2007). "Appendix: Estimating Life Tables That Reflect Socioeconomic Differences in Mortality". en. In: *The Distributional Aspects of Social Security and Social Security Reform*. University of Chicago Press, pp. 447–458. ISBN: 9780226241890. URL: https://www.degruyter.com/document/doi/10.7208/9780226241890-013/html?lang=en.

References II


Cagetti, Marco (2003). "Wealth Accumulation over the Life Cycle and Precautionary Savings". In: *J. Bus. Econ. Stat.* 21.3, pp. 339–353. ISSN: 0735-0015. URL: http://www.jstor.org/stable/1392584.


Drechsler, Itamar, Alexi Savov, and Philipp Schnabl (Nov. 2017). "The deposits channel of monetary policy". en. In: *Q. J. Econ.* 132.4, pp. 1819–1876. ISSN: 0033-5533,1531-4650. DOI: 10.1093/qje/qjx019. URL: https://dx.doi.org/10.1093/qje/qjx019.


Fagereng, Andreas et al. (2020). "Heterogeneity and Persistence in Returns to Wealth". In: *Econometrica* 88.1, pp. 115–170. DOI: https://doi.org/10.3982/ECTA14835. eprint: https://onlinelibrary.wiley.com/doi/pdf/10.3982/ECTA14835. URL: https://onlinelibrary.wiley.com/doi/abs/10.3982/ECTA14835.

References III


Genay, Hesna and Darrin R Halcomb (Nov. 2004). *Rising Interest Rates, Bank Loans and Deposits - Federal Reserve Bank of Chicago*. en. https://www.chicagofed.org/publications/chicago-fed-letter/2004/november-208. Accessed: 2025-8-4.


Guvenen, Fatih et al. (Apr. 2023). "Use It or Lose It: Efficiency and Redistributional Effects of Wealth Taxation". In: *Q. J. Econ.* 138.2, pp. 835–894. ISSN: 0033-5533. DOI: 10.1093/qje/qjac047. URL: https://academic.oup.com/qje/article-pdf/138/2/835/49730065/qjac047.pdf.


Sarkisyan, Sergey and Tasaneeya Viratyosin (2021). "The impact of the deposit channel on the international transmission of monetary shocks". en. In: *SSRN Electron. J.* ISSN: 1556-5068. DOI: 10.2139/ssrn.3938284. URL: http://dx.doi.org/10.2139/ssrn.3938284.