

# The Life-Cycle Dynamics of Wealth Mobility

Richard Audoly  
FRBNY

Rory McGee  
UWO

Sergio Ocampo  
UWO

Gonzalo Paz-Pardo  
ECB

November, 2025

**Disclaimer:** The views below are those of the authors and do not necessarily reflect the position of the Federal Reserve Bank of New York, the Federal Reserve System, the European Central Bank or the Eurosystem.

## Wealth mobility over the life cycle

- Intergenerational “social” wealth mobility key as context for large wealth inequality
  - Literature (Charles & Hurst 2003, Benhabib, Bisin & Luo 2019) + Public debate

## Wealth mobility over the life cycle

- Intergenerational “social” wealth mobility key as context for large wealth inequality
  - Literature (Charles & Hurst 2003, Benhabib, Bisin & Luo 2019) + Public debate
- Many different motives and vehicles for wealth accumulation over the life cycle
  - Precautionary savings, housing, retirement, entrepreneurship, transfers/bequests, ...
  - Education, income, portfolio composition, returns, inheritances, ...

## Wealth mobility over the life cycle

- Intergenerational “social” wealth mobility key as context for large wealth inequality
  - Literature (Charles & Hurst 2003, Benhabib, Bisin & Luo 2019) + Public debate
- Many different motives and vehicles for wealth accumulation over the life cycle
  - Precautionary savings, housing, retirement, entrepreneurship, transfers/bequests, ...
  - Education, income, portfolio composition, returns, inheritances, ...
- As individuals accumulate wealth over their lives, their wealth rank likely varies a lot
  - How much? Who moves how? What is behind these mobility patterns?

## Wealth mobility over the life cycle

- Intergenerational “social” wealth mobility key as context for large wealth inequality
  - Literature (Charles & Hurst 2003, Benhabib, Bisin & Luo 2019) + Public debate
- Many different motives and vehicles for wealth accumulation over the life cycle
  - Precautionary savings, housing, retirement, entrepreneurship, transfers/bequests, ...
  - Education, income, portfolio composition, returns, inheritances, ...
- As individuals accumulate wealth over their lives, their wealth rank likely varies a lot
  - How much? Who moves how? What is behind these mobility patterns?

# Wealth mobility over the life cycle

- Intergenerational “social” wealth mobility key as context for large wealth inequality
  - Literature (Charles & Hurst 2003, Benhabib, Bisin & Luo 2019) + Public debate
- Many different motives and vehicles for wealth accumulation over the life cycle
  - Precautionary savings, housing, retirement, entrepreneurship, transfers/bequests, ...
  - Education, income, portfolio composition, returns, inheritances, ...
- As individuals accumulate wealth over their lives, their wealth rank likely varies a lot
  - How much? Who moves how? What is behind these mobility patterns?

**Today:** Flexibly and non-parametrically characterize lifetime wealth mobility

Possible with **Norwegian administrative data** on wealth 1993–2017

## This paper

1. Study individuals as they transition across the wealth distribution over their lives
  - Study individuals' relative and absolute mobility (within-cohort wealth ranks + wealth levels)
  - But: as many different wealth histories as individuals
  - Use clustering techniques to find “typical” trajectories responsible for mobility

## This paper

1. Study individuals as they transition across the wealth distribution over their lives
  - Study individuals' relative and absolute mobility (within-cohort wealth ranks + wealth levels)
  - But: as many different wealth histories as individuals
  - Use clustering techniques to find "typical" trajectories responsible for mobility
2. Study how "typical" trajectories relate to other observable characteristics
  - Lifetime choices and events (portfolio composition, income, etc.)
  - Role of heterogeneity in income, savings, and returns
  - To which extent do individual characteristics at age 30 predict future trajectories?

# Contributions

1. New evidence on wealth mobility and wealth accumulation: Full life cycle trajectories
  - Add to results for the super wealthy (Gomez; Ozkan, Hubmer, Salgado, Halvorsen), the role of individual factors (Huggett, Ventura, Yaron; Black, Devereux, Landaud, Salvanes), and short-run mobility and race (Hurst, Luoh, Stafford, Gale).
2. New facts documenting the distribution of changes in wealth ranks
  - Extensive literature on income (Guvenen, Ozkan, Karahan, Song; Guvenen, Pistaferri, Violante; Arellano, Blundell, Bonhomme; De Nardi, Fella, Paz-Pardo)
3. Inter-generational links to full life cycle wealth dynamics
  - Complements “snapshot” links in income (Solon; Aaronson, Mazumder; Chetty, Hendren, Kline, Saez, Turner; Chetty, Grusky, Hendren, Hell, Manduca, Narang) & wealth (Charles, Hurst; Boserup, Kopczuk, Kreiner; Fagereng, Guiso, Malacrino, Pistaferri; Fagereng, Mogstad, Rønning )
4. Dimension reduction methods in economics & applications to labor markets
  - K-Means (Bonhomme, Lamadon, Manresa; Gregory, Menzio, Wiczer), Sequence Analysis (Humphries), Hidden Markov (Ahn, Hobijn, Şahin), Finite Mixture

# Norwegian Wealth Data

## Data: Norwegian Tax Registry 1993 – 2017

- No top-coding + Limited misreporting or measurement error (third-party reporting)
  - Focus on wealth (e.g., don't include public pensions)
  - No transaction data (e.g., changing houses or selling stocks → limited info. on returns)
- We adjust the tax value of real estate to market values (Fagereng, Holm, Torstensen, 2023)
- We focus on wealth at the individual level (additional results for household wealth)
- Key: We link to administrative records (Education, Family, Civil Status, Income)

## Data: Norwegian Tax Registry 1993 – 2017

- No top-coding + Limited misreporting or measurement error (third-party reporting)
  - Focus on wealth (e.g., don't include public pensions)
  - No transaction data (e.g., changing houses or selling stocks → limited info. on returns)
- We adjust the tax value of real estate to market values (Fagereng, Holm, Torstensen, 2023)
- We focus on wealth at the individual level (additional results for household wealth)
- Key: We link to administrative records (Education, Family, Civil Status, Income)

**Sample selection:** Norwegian residents 1993–2017 (no immigrants after 25/2011, no emigrants)

- Focus on birth cohort born between 1960 and 1965 (first observed in early 30s)
  - 292,222 individuals in this sample (279,002 after balancing)

# Key Variables

- **Wealth:** Net worth = assets-debt → **Primary Variable**
- **Assets & Debt:** Total assets and debt, and major asset categories
  - Domestic, foreign, property, vehicles, “safe,” publicly and privately traded
  - Leverage, some assets are net positions
- **Income:** Including gifts/bequests, transfers, asset income, & earnings
- **Demographics:** Age, sex, education, civil status, place-of-birth
- **Lineage:** Match individuals to their parents and siblings

## Ranks and Histories

- Compute **within cohort ranks** as

$$r_{i,t} = 100 \times F_w(w_{i,t} | t, i \in BC(i))$$

- Computed separately for each year and each cohort

## Ranks and Histories

- Compute **within cohort ranks** as

$$r_{i,t} = 100 \times F_w(w_{i,t} | t, i \in BC(i))$$

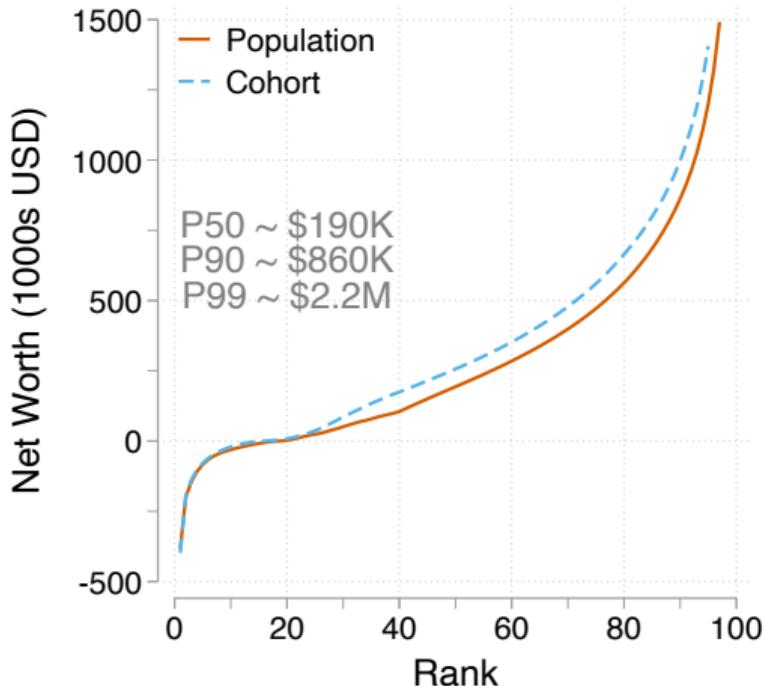
- Computed separately for each year and each cohort
- **Trajectories:** Histories of ranks

$$\mathbf{R}_i = (r_{i,1993}, r_{i,1994}, \dots, r_{i,2016}, r_{i,2017}) \in [0, 100]^{25}$$

We are interested in the distribution of the trajectories  $\mathbf{R}_i$

# Ranks vs Wealth Levels

## Net Worth Inverse CDF (2014)



- US: p90≈\$620K, p99≈\$3.5M (SZZ, 2022)

- Substantial wealth inequality in Norway

▶ Context

- Relative mobility in rank  $\implies$  absolute mobility in wealth level

- e.g. at the median, 10 ranks  $\approx$  60k USD

▶ BC vs Pop Ranks

# Wealth and Income Mobility

# Measuring average intra-generational mobility

## Relative Mobility Measures

# Measuring average intra-generational mobility

## Relative Mobility Measures

- Rank-rank persistence:  $r_{i,t} = \alpha_t + \rho_t r_{i,0} + u_{i,t}$ ;  $M_t^R \equiv 1 - \rho_t$ .
- Shorrocks Index: Transitions out of quintiles;  $M_t^S \equiv 1 - \sum_i \mathbb{1}\{Q_{it} = Q_{i,0}\}$ .

# Measuring average intra-generational mobility

## Relative Mobility Measures

- Rank-rank persistence:  $r_{i,t} = \alpha_t + \rho_t r_{i,0} + u_{i,t}$ ;  $M_t^R \equiv 1 - \rho_t$ .
- Shorrocks Index: Transitions out of quintiles;  $M_t^S \equiv 1 - \sum_i \mathbb{1}\{Q_{it} = Q_{i,0}\}$ .

## Absolute Mobility Measures

# Measuring average intra-generational mobility

## Relative Mobility Measures

- Rank-rank persistence:  $r_{i,t} = \alpha_t + \rho_t r_{i,0} + u_{i,t}; M_t^R \equiv 1 - \rho_t.$
- Shorrocks Index: Transitions out of quintiles;  $M_t^S \equiv 1 - \sum_i \mathbb{1}\{Q_{it} = Q_{i,0}\}.$

## Absolute Mobility Measures

- Fields and Ok: Absolute log-wealth change;  $M_t^{F\&O} \equiv \frac{|\log w_{i,t} - \log w_{i,0}|}{N}.$
- Ray and Genicot: Cumulative instantaneous upward mobility;  
$$M_t^{R\&G} \equiv \log \left( \frac{1}{N} \sum_i w_{i,t}^{-\alpha} \right)^{\frac{-1}{\alpha}} - \log \left( \frac{1}{N} \sum_j w_{j,0}^{-\alpha} \right)^{\frac{-1}{\alpha}}.$$

# Measuring average intra-generational mobility

## Relative Mobility Measures

- Rank-rank persistence:  $r_{i,t} = \alpha_t + \rho_t r_{i,0} + u_{i,t}; M_t^R \equiv 1 - \rho_t.$
- Shorrocks Index: Transitions out of quintiles;  $M_t^S \equiv 1 - \sum_i \mathbb{1}\{Q_{it} = Q_{i,0}\}.$

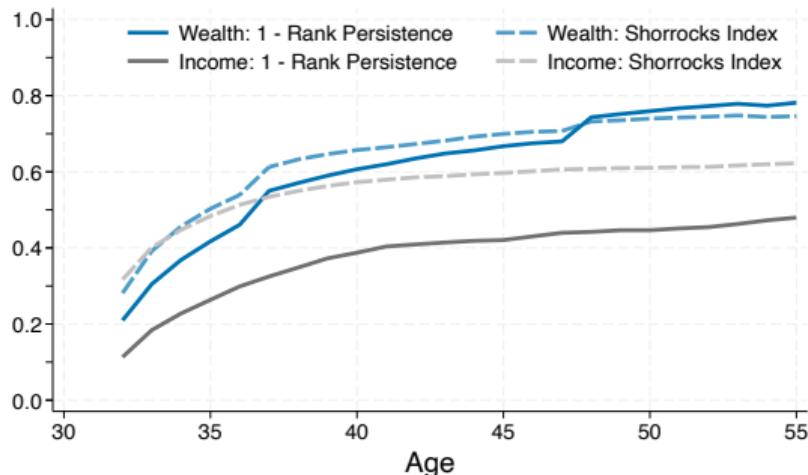
## Absolute Mobility Measures

- Fields and Ok: Absolute log-wealth change;  $M_t^{F\&O} \equiv \frac{|\log w_{i,t} - \log w_{i,0}|}{N}.$
- Ray and Genicot: Cumulative instantaneous upward mobility;  
$$M_t^{R\&G} \equiv \log \left( \frac{1}{N} \sum_i w_{i,t}^{-\alpha} \right)^{\frac{-1}{\alpha}} - \log \left( \frac{1}{N} \sum_j w_{j,0}^{-\alpha} \right)^{\frac{-1}{\alpha}}.$$

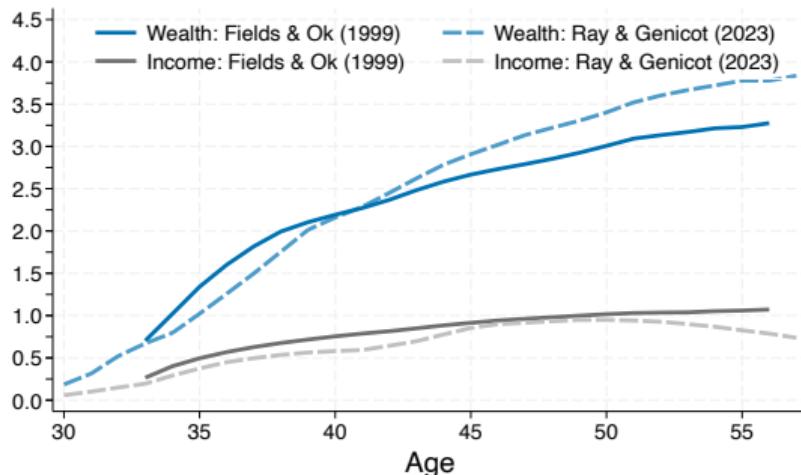
**Exercise:** Plot intra-generational mobility for income and wealth

# Wealth is more mobile than income (!)

## Relative Mobility



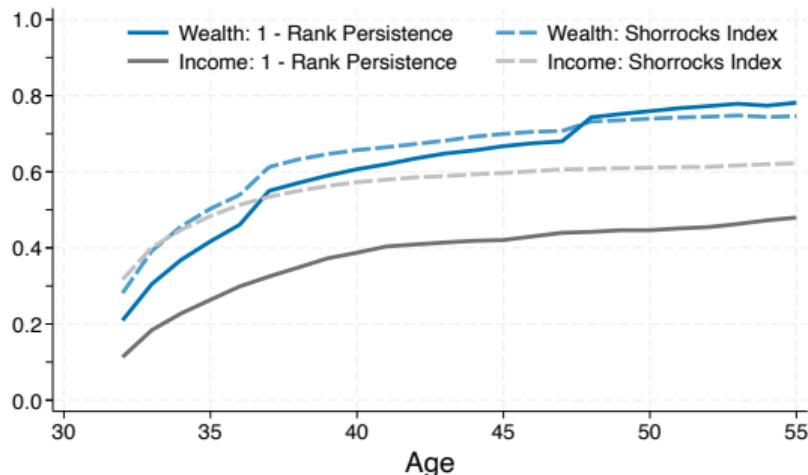
## Absolute Mobility



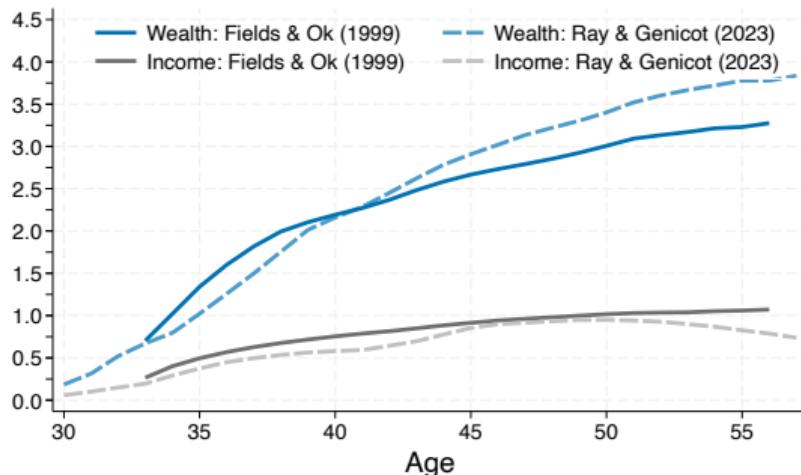
- Declining intra-generational persistence → Increased (cumulative) mobility

# Wealth is more mobile than income (!)

## Relative Mobility



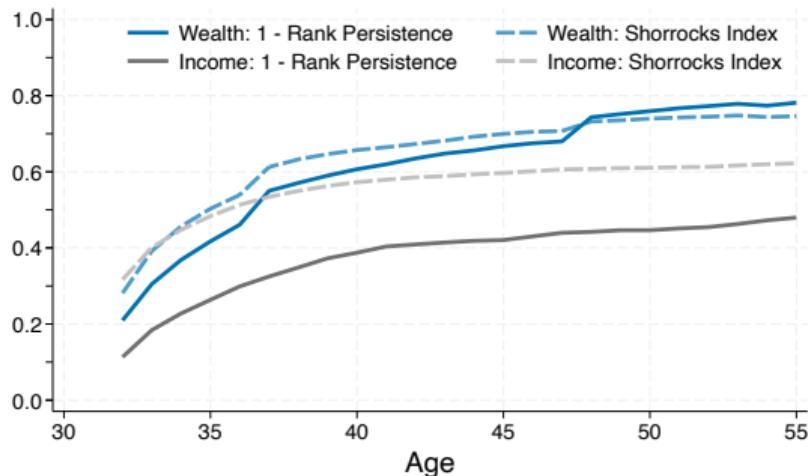
## Absolute Mobility



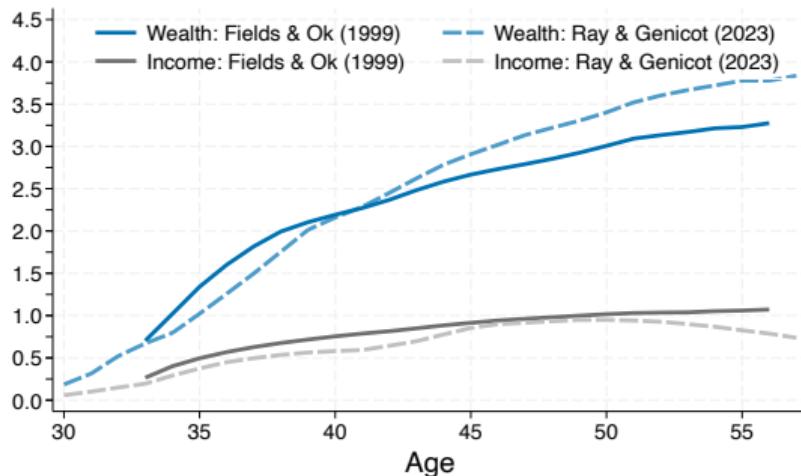
- Declining intra-generational persistence → Increased (cumulative) mobility
  - Wealth:  $M_t^R = 0.78$  and  $M_t^S = 0.75$  by age 55
  - Income:  $M_t^R = 0.48$  and  $M_t^S = 0.58$  by age 55

# Wealth is more mobile than income (!)

## Relative Mobility



## Absolute Mobility



- Declining intra-generational persistence → Increased (cumulative) mobility
  - Wealth:  $M_t^R = 0.78$  and  $M_t^S = 0.75$  by age 55
  - Income:  $M_t^R = 0.48$  and  $M_t^S = 0.58$  by age 55
- How broad-based is mobility? What (who) drives patterns?

# Clustering Wealth Histories

## Grouping Individuals Into Typical Histories

**Goal:** Identify patterns in (ex-post) life cycle paths without restricting to a single statistic

# Grouping Individuals Into Typical Histories

**Goal:** Identify patterns in (ex-post) life cycle paths without restricting to a single statistic

**Method:** Agglomerative Hierarchical Clustering to group rank histories

- Start with  $G = N$  groups (one for each individual)
- Recursively merge groups by selecting *similar* pairs:  $\underset{g,g' \in G, g \neq g'}{\operatorname{argmin}} d(g, g')$ .

# Grouping Individuals Into Typical Histories

**Goal:** Identify patterns in (ex-post) life cycle paths without restricting to a single statistic

**Method:** Agglomerative Hierarchical Clustering to group rank histories

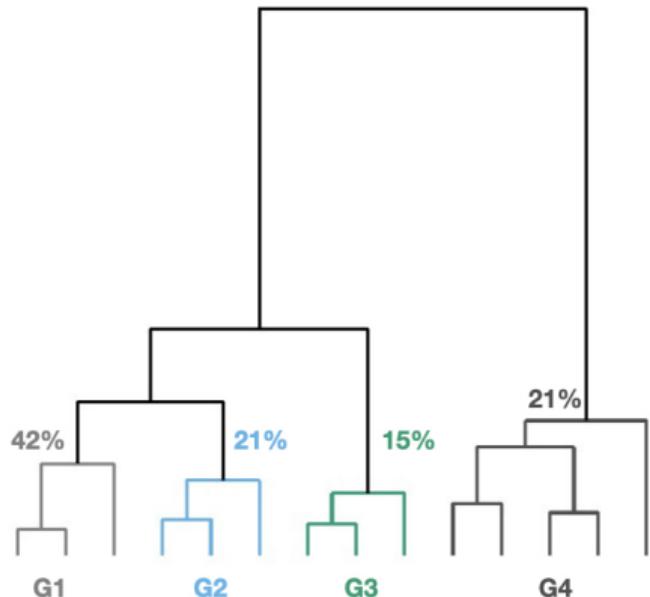
- Start with  $G = N$  groups (one for each individual)
- Recursively merge groups by selecting *similar* pairs:  $\underset{g, g' \in G, g \neq g'}{\operatorname{argmin}} d(g, g')$ .

**Result:** Hierarchy of partitions ranging from  $G = N$  to  $G = 1$ .

- Global result with nested clusters (feasible in large datasets)
- Asymptotically consistent as we observe longer trajectories, even for fixed  $N$   
(Borysov, Hannig, Marron, 2014; Egashira, Yata, Aoshima, 2024)

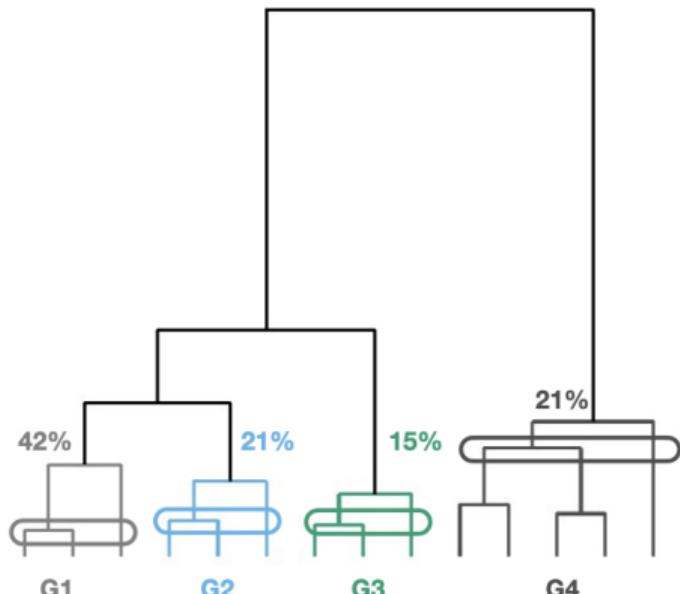
# Two Levels of Clustering

Clustering Tree

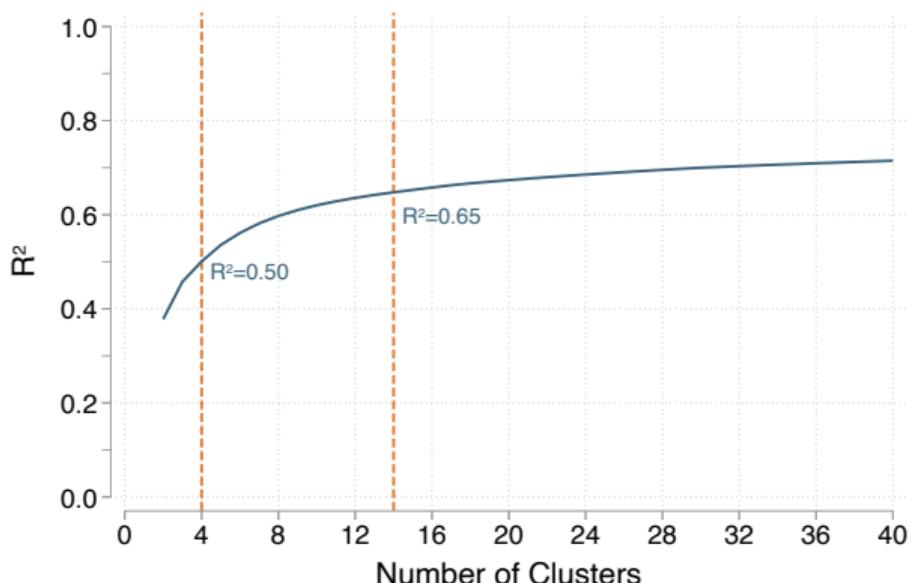


# Two Levels of Clustering

Clustering Tree

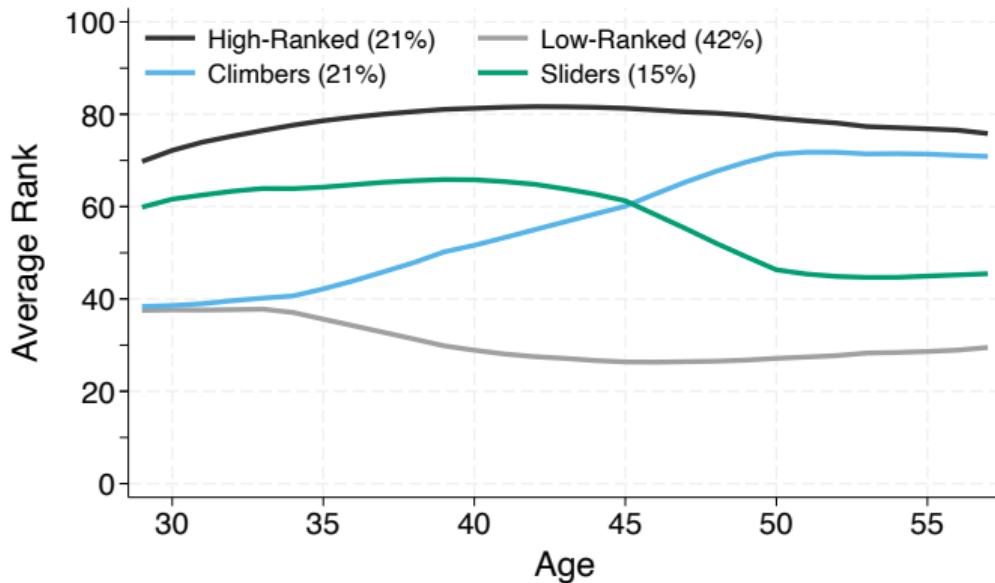


Variation Explained



# Typical Rank Histories

## Cohort Ranks



## Four largest groups

- Wealthy/High Ranked: always at top of the distribution
- Poor/Low Ranked: always at the bottom of the distribution
- Middle: one group of **Climbers** and one group of **Sliders**

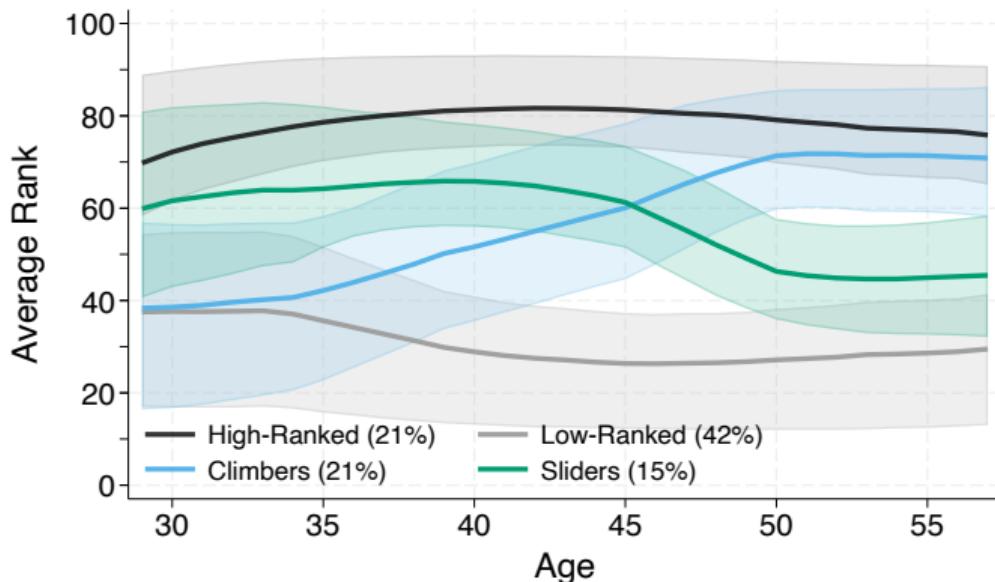
▶ Alt. Clustering

▶ Inc. Clustering

▶ Rnd Clustering

# Typical Rank Histories

Cohort Ranks, interquartile range



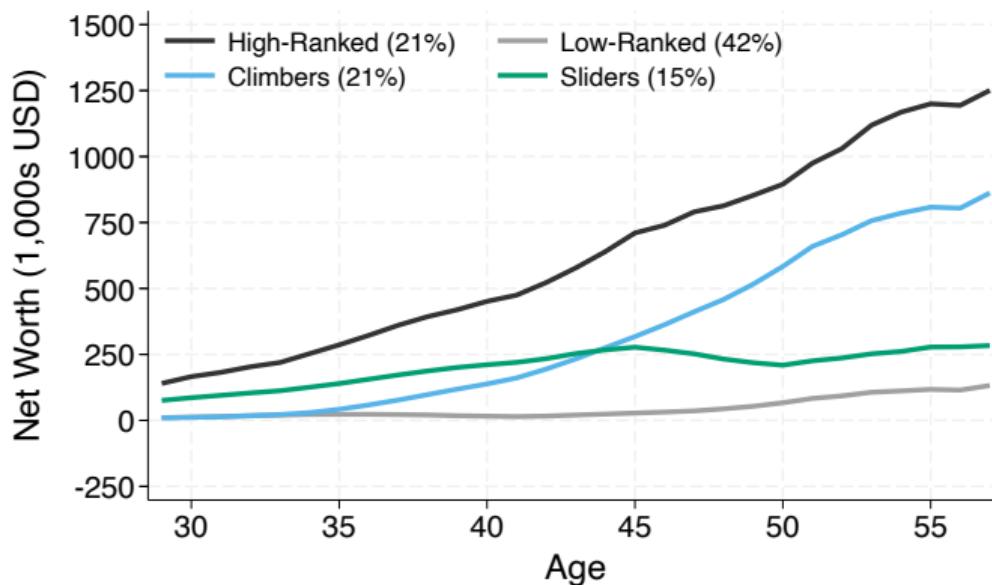
## Segmented mobility

- Individuals move within segments of the distribution
- The mean trajectory of a group hides rank swaps within
  - Subclusters reveal patterns
- Segments overlap:  
Middle 60% Top & Bottom 40%

▶ Subclusters

# Wealth Histories Across Segments of the Distribution

Net Worth (\$1000s)



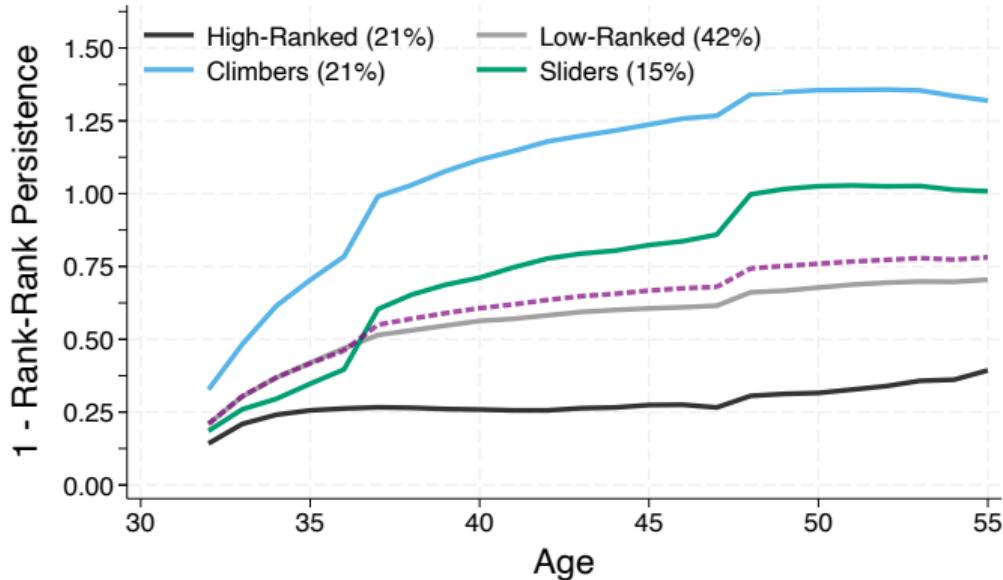
Significant diff. in wealth profiles

- Top: Maintaining rank means level growth (8-10%)
- Bottom: Stay very low
- Climbers: Grow on avg. 18%/y
- Sliders: ahead in 30s + low growth (5%) + Great Recession

Absolute Mobility

# Decomposing Mobility

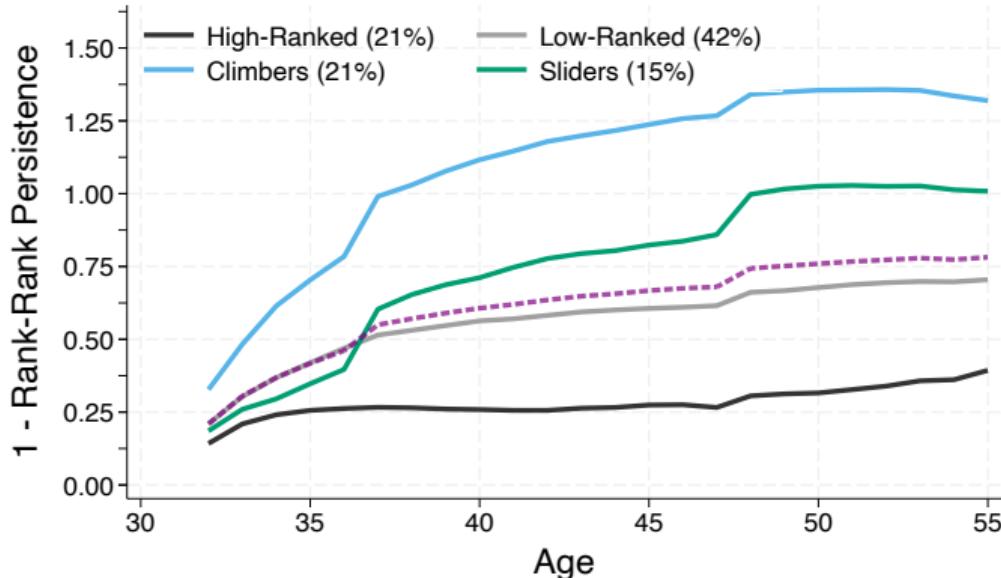
Linear rank-rank persistence:  $y_{i,t}^k = \alpha_t + \rho_t^{g(i)} y_{i,0}^k + u_{i,t}$



- Top: Immobile over 25y
- Bottom: Track population movements *within segment*
- Climbers: Reversal of fortune within 1 decade
- Sliders: No memory in long run

# Decomposing Mobility

Linear rank-rank persistence:  $y_{i,t}^k = \alpha_t + \rho_t^{g(i)} y_{i,0}^k + u_{i,t}$



- Middle-class mobility drives population mobility patterns. Climbers are key.

- Top: Immobile over 25y
- Bottom: Track population movements *within segment*
- Climbers: Reversal of fortune within 1 decade
- Sliders: No memory in long run

# Interpreting Mobility Groups

# Wealth mobility in models of wealth dynamics

# Wealth mobility in models of wealth dynamics

Three exercises to contextualize our results:

1. Buffer-stock models of savings (Zeldes, 1989; Deaton, 1991; Carroll, 1992; Straub, 2019) [► details](#)
  - Income differences (alone) cannot generate observed wealth+income dynamics

# Wealth mobility in models of wealth dynamics

Three exercises to contextualize our results:

## 1. Buffer-stock models of savings (Zeldes, 1989; Deaton, 1991; Carroll, 1992; Straub, 2019) ► details

- Income differences (alone) cannot generate observed wealth+income dynamics

## 2. Portfolio choice and return heterogeneity ► details

- Differences in wealth growth capable of matching wealth dynamics

# Wealth mobility in models of wealth dynamics

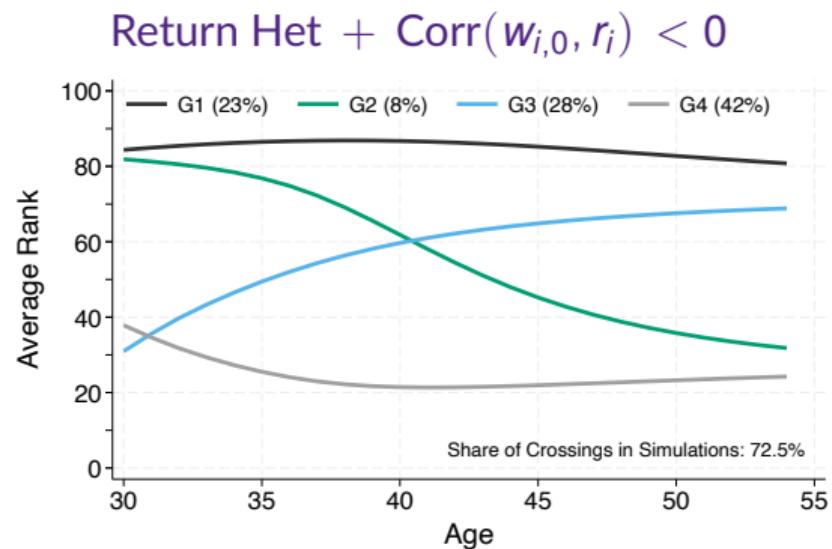
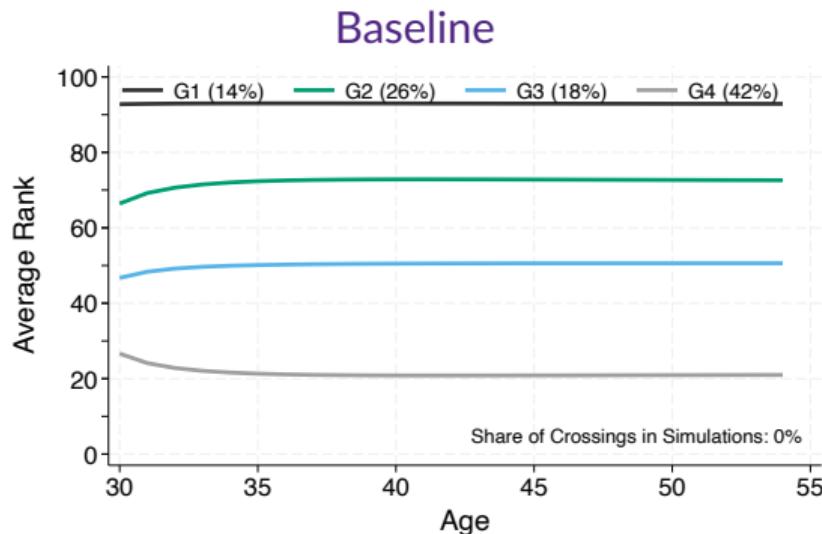
Three exercises to contextualize our results:

1. Buffer-stock models of savings (Zeldes, 1989; Deaton, 1991; Carroll, 1992; Straub, 2019) ► details
  - Income differences (alone) cannot generate observed wealth+income dynamics
2. Portfolio choice and return heterogeneity ► details
  - Differences in wealth growth capable of matching wealth dynamics
3. Statistical models of wealth (Benhabib & Bisin, 2018; Gomez, 2023) ► details
  - Microfounded from canonical 2-asset model
  - Same results from full household heterogeneity model (Fagereng, Holm, Natvik, 2021, AEJ)

# Wealth mobility in models of wealth dynamics

$$w_{i,t+1} = (1 + r_i) w_{i,t} + s y_{i,t}; \quad \log y_{i,t+1} = \rho \log y_{i,t} + \epsilon_{i,t}^y; \quad \epsilon_{i,t}^y \sim N(0, \sigma(\epsilon^y))$$

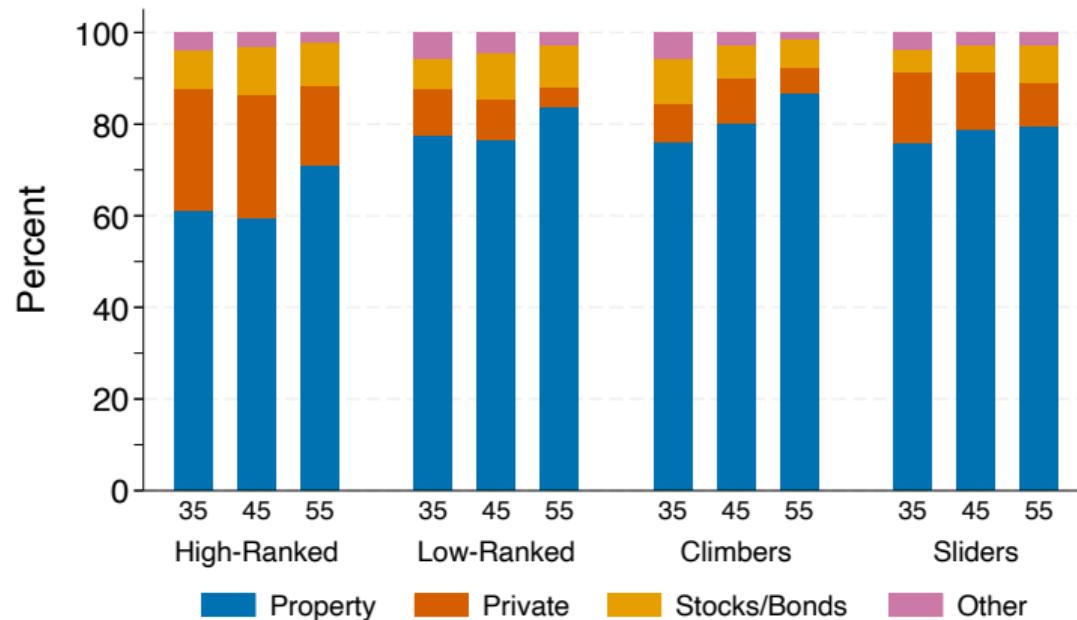
Baseline:  $\sigma(r) = 0$  and  $s = 0.25$  (Fagereng, Holm, Moll, Natvik, 2019) and  $\rho, \sigma(\epsilon^Y)$  (Fagereng, Holm, Natvik, 2021)



- Return or savings rate heterogeneity is key along with distribution of initial conditions

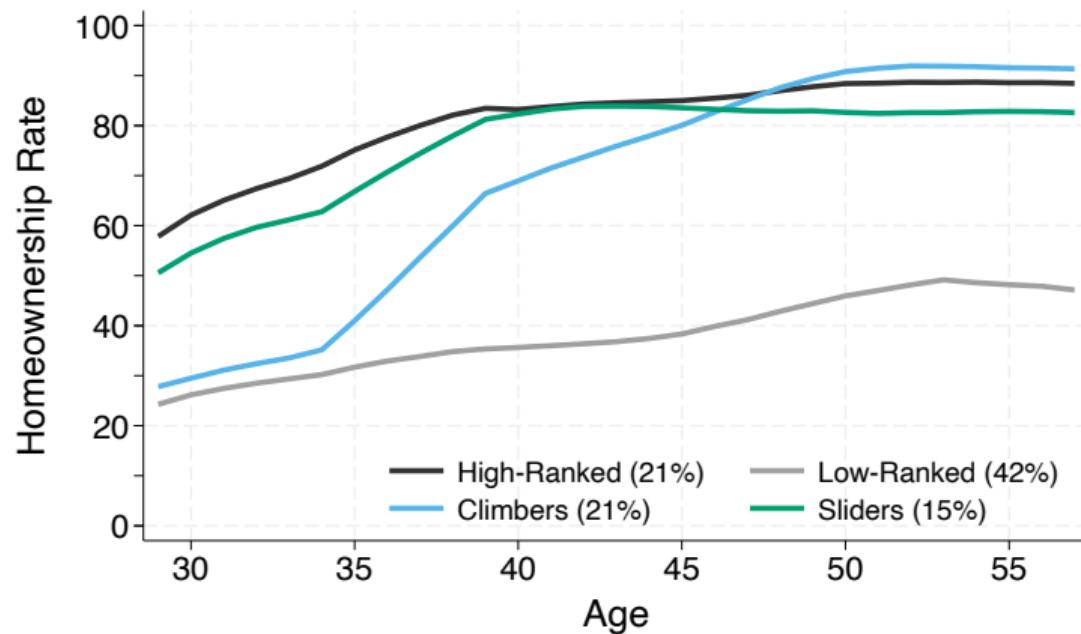
# Drivers of Wealth Accumulation

# Portfolio composition: Mostly housing (except at the top!)



- Private business wealth more important at the top and for sliders

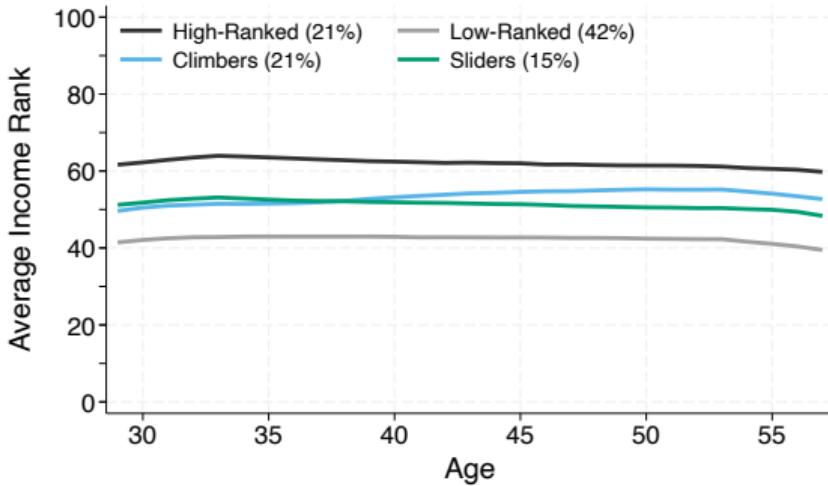
## Homeownership Rates by Cluster



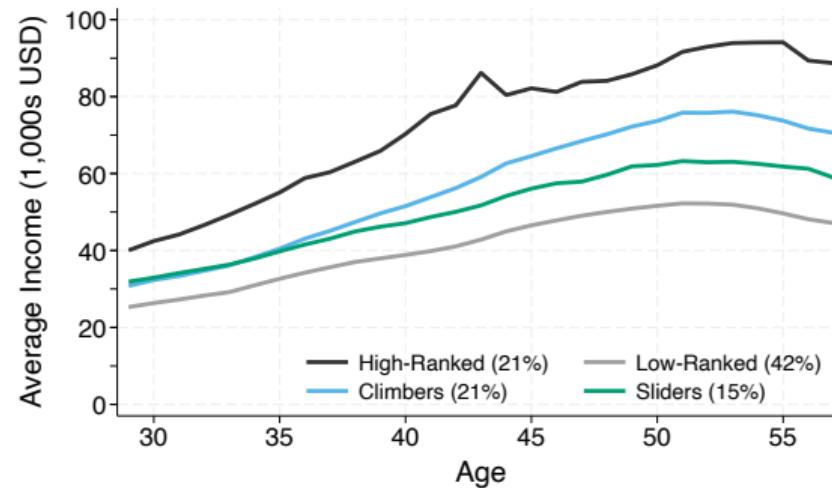
- Climbers: Catching up in homeownership. Relevant for wealth divergence.

# Income Histories Across Segments of the Distribution

Income Cohort Ranks



Income (\$1000s)



- Distribution of income across clusters compressed relative to wealth
- Clustering on income reveals parallel groups of permanent income
- Similar for HH income; Climbers same inc. as high-ranked on average

► Median Income

► Inc. Clusters

► HH Inc. CS

# Towards Determinants of Trajectories

## Hereditary Advantage: Wealth vs Human Capital

**Goal:** Understand role of different circumstances/characteristics in determining trajectories

## Hereditary Advantage: Wealth vs Human Capital

**Goal:** Understand role of different circumstances/characteristics in determining trajectories

$$Pr(g = j) = F \left( \alpha_0^j + \beta_{q(i)}^j + \gamma_{educ(i)}^j + \delta_{subj(i)}^j + \lambda_{male(i)}^j + \mu_{bcounty(i)}^j \right)$$

- $\beta_{q(i)}^j$ : Indicators for 1993 parental wealth (cohort rank by ventile)

# Hereditary Advantage: Wealth vs Human Capital

**Goal:** Understand role of different circumstances/characteristics in determining trajectories

$$Pr(g = j) = F \left( \alpha_0^j + \beta_{q(i)}^j + \gamma_{\text{educ}(i)}^j + \delta_{\text{subj}(i)}^j + \lambda_{\text{male}(i)}^j + \mu_{\text{bcounty}(i)}^j \right)$$

- $\beta_{q(i)}^j$ : Indicators for 1993 parental wealth (cohort rank by ventile)
- $\gamma_{\text{educ}(i)}^j, \delta_{\text{subj}(i)}^j$ : Indicators for education level and subject (only for higher ed.) ► Levels

# Hereditary Advantage: Wealth vs Human Capital

**Goal:** Understand role of different circumstances/characteristics in determining trajectories

$$Pr(g = j) = F \left( \alpha_0^j + \beta_{q(i)}^j + \gamma_{educ(i)}^j + \delta_{subj(i)}^j + \lambda_{male(i)}^j + \mu_{bcounty(i)}^j \right)$$

- $\beta_{q(i)}^j$ : Indicators for 1993 parental wealth (cohort rank by ventile)
- $\gamma_{educ(i)}^j, \delta_{subj(i)}^j$ : Indicators for education level and subject (only for higher ed.) ▶ Levels
- $\lambda_{male(i)}^j$ : Indicator for sex ▶ Sex APE
- $\mu_{bcounty(i)}^j$ : Indicator for birth location ▶ Location APE

# Hereditary Advantage: Wealth vs Human Capital

**Goal:** Understand role of different circumstances/characteristics in determining trajectories

$$Pr(g = j) = F \left( \alpha_0^j + \beta_{q(i)}^j + \gamma_{educ(i)}^j + \delta_{subj(i)}^j + \lambda_{male(i)}^j + \mu_{bcounty(i)}^j \right)$$

- $\beta_{q(i)}^j$ : Indicators for 1993 parental wealth (cohort rank by ventile)
- $\gamma_{educ(i)}^j, \delta_{subj(i)}^j$ : Indicators for education level and subject (only for higher ed.) ▶ Levels
- $\lambda_{male(i)}^j$ : Indicator for sex ▶ Sex APE
- $\mu_{bcounty(i)}^j$ : Indicator for birth location ▶ Location APE

Predictors explain at most 6% of cross-group variation (same as rank-rank inter-gen reg)

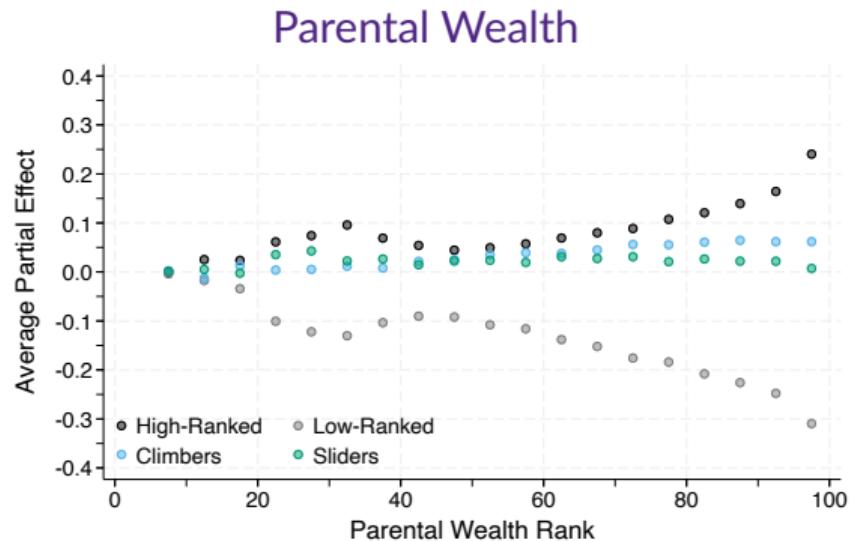
▶ Results

# Non-Linear Effects of Parental Wealth and Education

PW Cls

ED Cls

ED Field



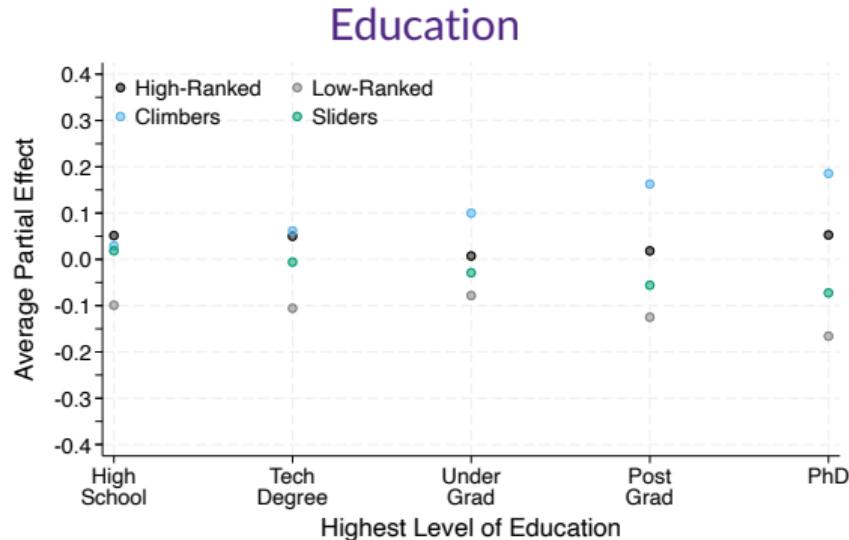
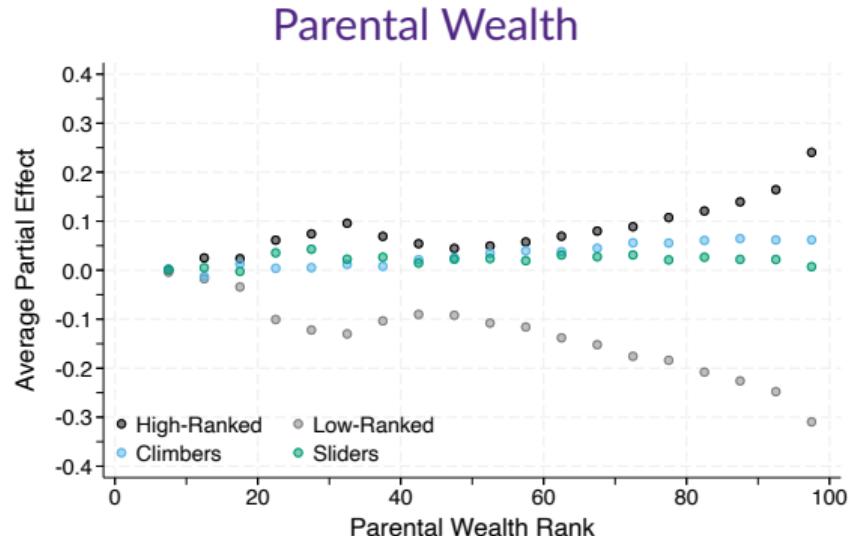
- Parental wealth's explanatory power: High for top/bottom, limited for middle groups

# Non-Linear Effects of Parental Wealth and Education

PW Cls

ED Cls

ED Field



- Parental wealth's explanatory power: High for top/bottom, limited for middle groups
- Education tells risers/fallers apart: Equalizing effect but doesn't overcome initial cond.

# Ex Ante and Ex Post Heterogeneity Together

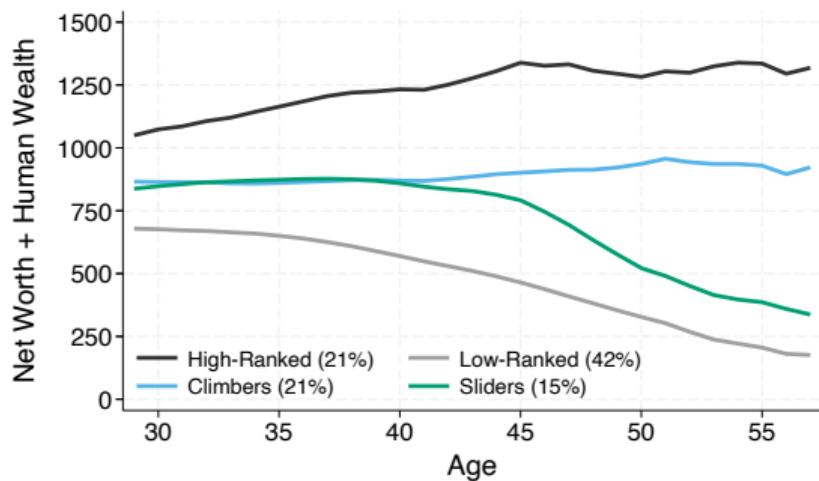
## Mobility of Human Wealth

- Education matters for mobility through incomes; Parents through initial conditions.
- Human Wealth: Assets + present value of future labor income

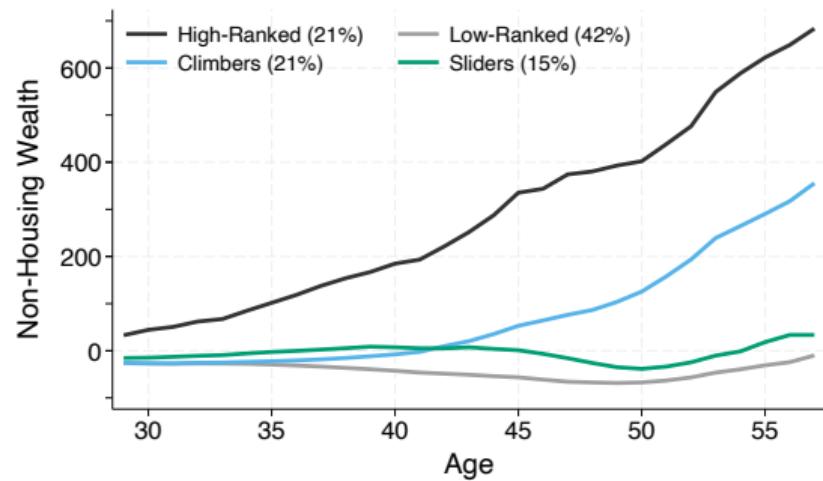
# Mobility of Human Wealth

- Education matters for mobility through incomes; Parents through initial conditions.
- Human Wealth: Assets + present value of future labor income

## Human Wealth



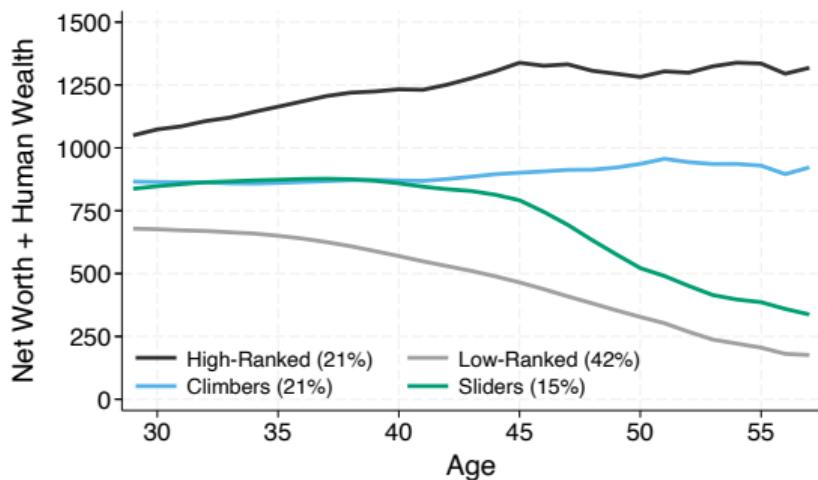
## Non-Housing Wealth



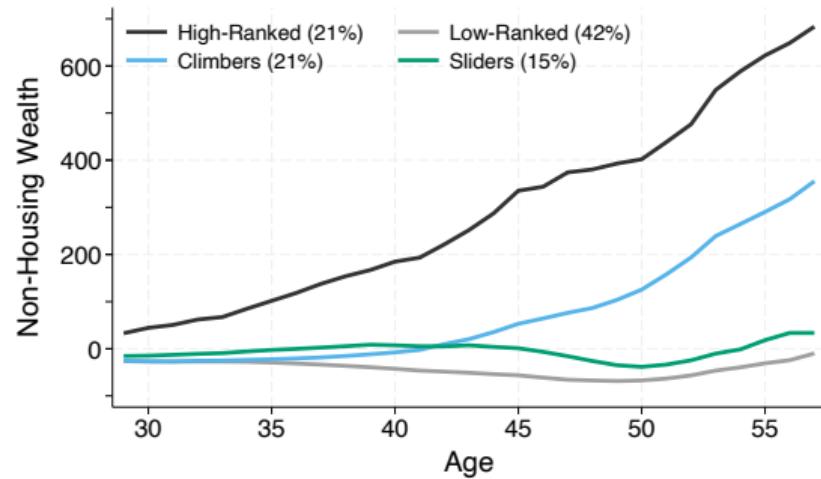
# Mobility of Human Wealth

- Education matters for mobility through incomes; Parents through initial conditions.
- Human Wealth: Assets + present value of future labor income

## Human Wealth



## Non-Housing Wealth



- Initial Climber/Slider gap closed by future earnings
- Divergence as Climbers move from housing to fin. assets & Sliders' businesses stall

# Conclusions

# Conclusions

**Contribution:** Flexibly and non-parametrically characterize lifetime wealth mobility

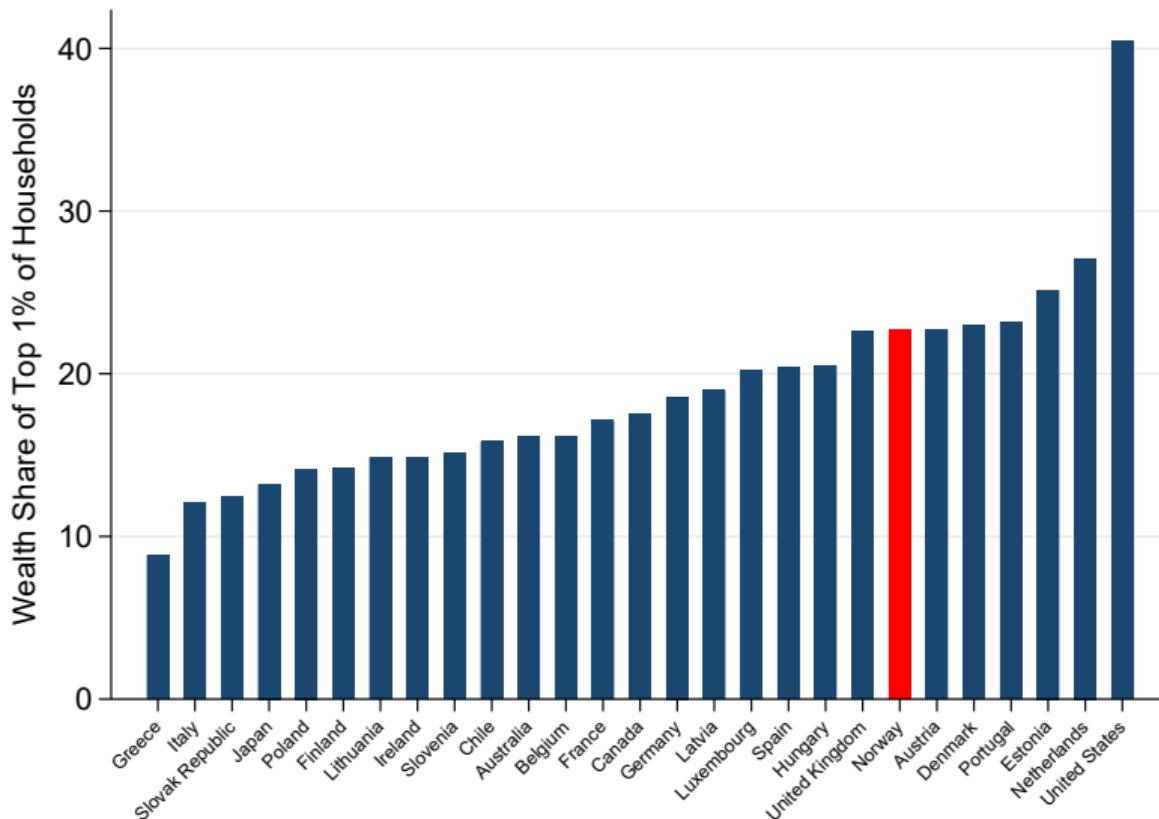
**Key takeaways:**

1. Find evidence of substantial changes in wealth ranks over a quarter century
2. Mobility driven by selected groups in the middle of the distribution
3. Persistent differences in saving behavior across groups beyond income
4. Parental background and education predict distinct wealth trajectories

# Details on Wealth Measurement

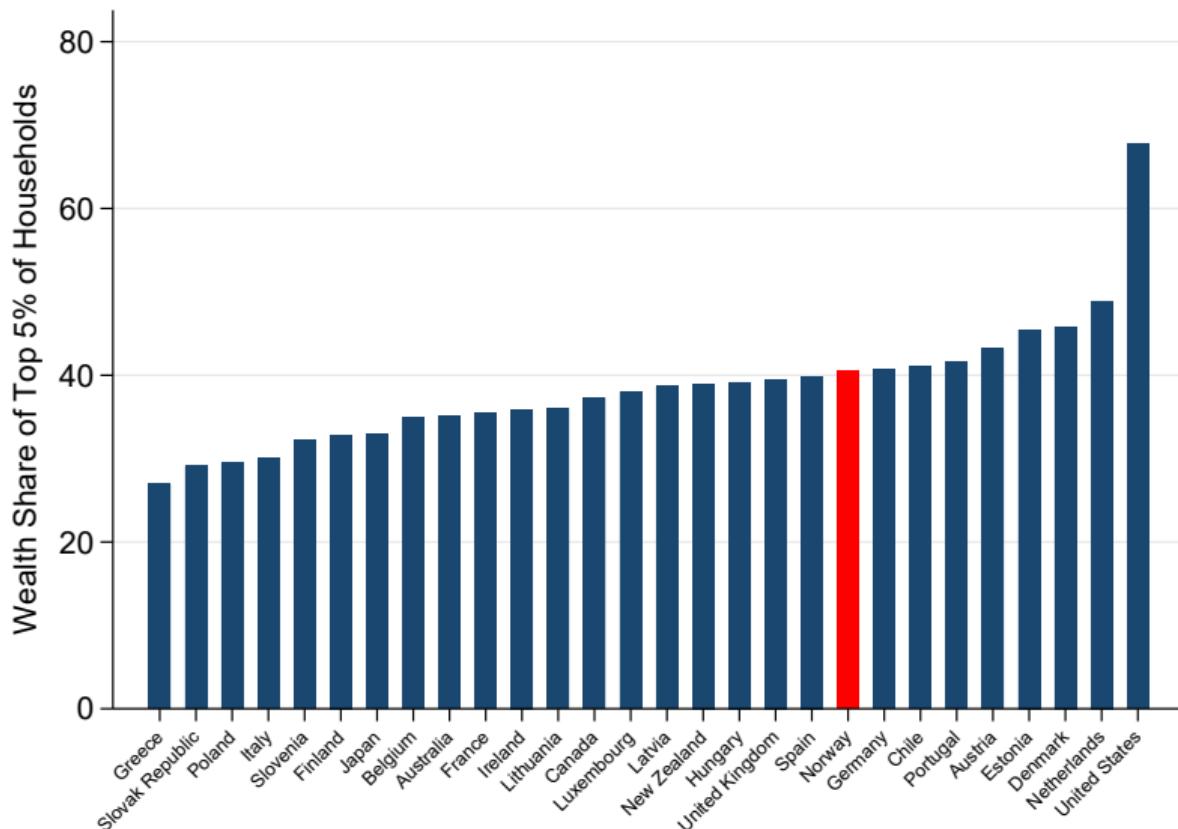
# Norway in Context

◀ Back



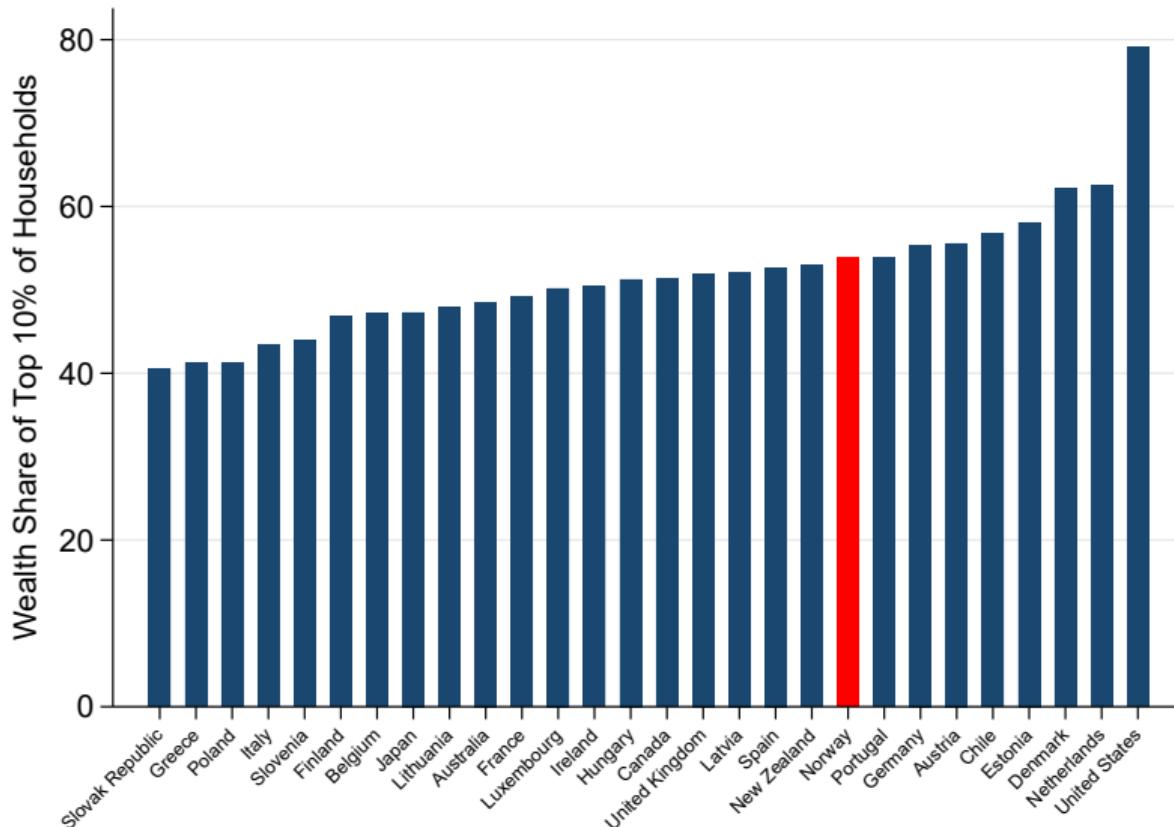
# Norway in Context: Top 5% Share

[◀ Back](#)



# Norway in Context: Top 10% Share

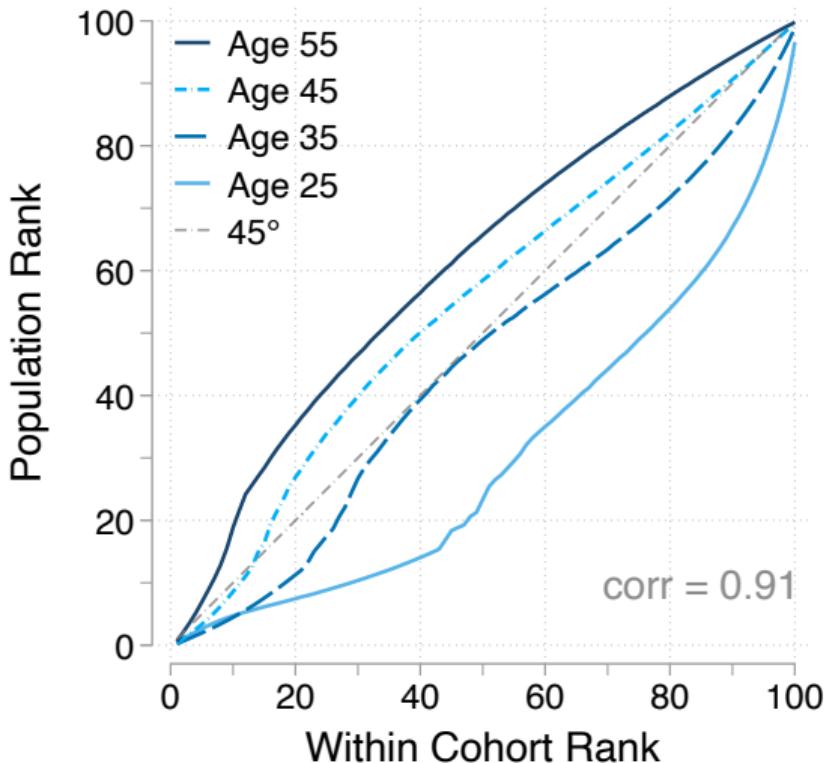
◀ Back



# Birth Cohort Ranks vs Population Ranks

◀ back

## BC Ranks vs Pop Ranks



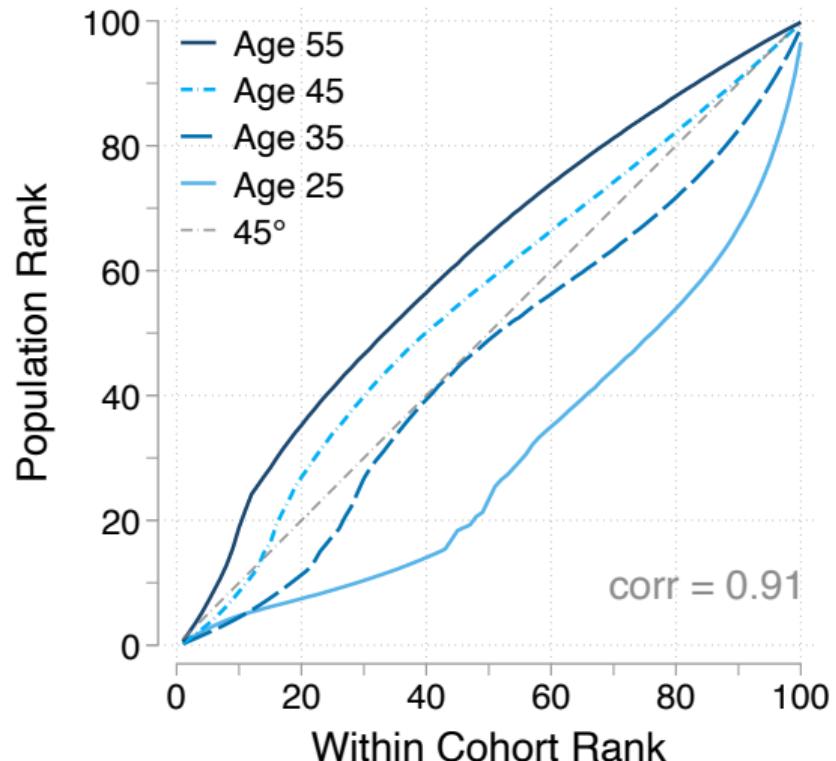
- Changes in wealth levels at each rank as the cohort ages
- 75 percent of age 25 individuals are below the median
- 35 percent of age 55 individuals are below the median

▶ Household Ranks

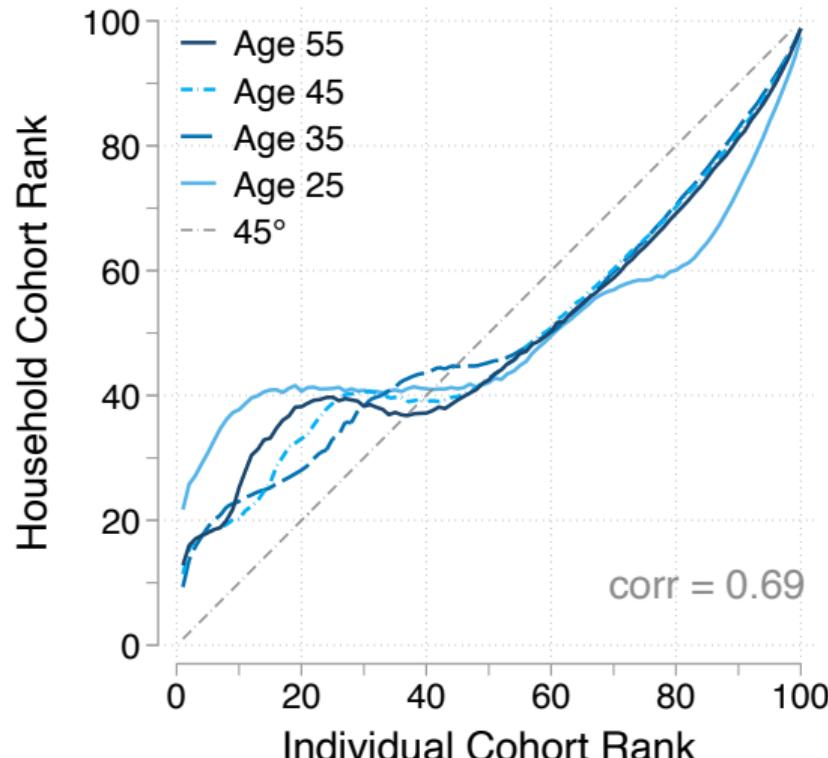
# Birth Cohort Individual Ranks vs Household Ranks

◀ back

## BC Ranks vs Pop Ranks



## BC Individual Ranks vs Household Ranks

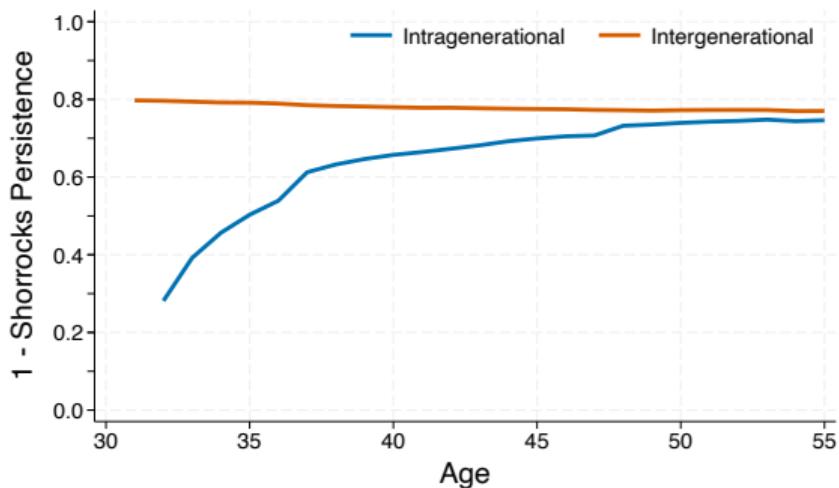


# Shorrocks Mobility Index

# Shorrocks Mobility Index

◀ back

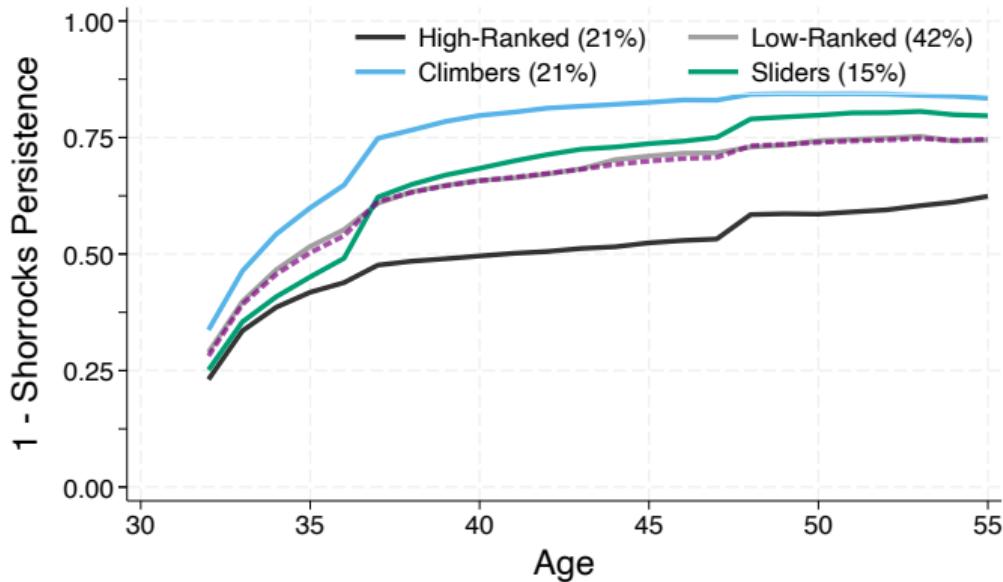
Trace of transition matrix: Divide individuals by quintiles.



- Declining intra-generational persistence  
→ Increased mobility
- Increasing inter-generational persistence  
→ Decreased mobility

# Intra-Generational Shorrocks Mobility Index

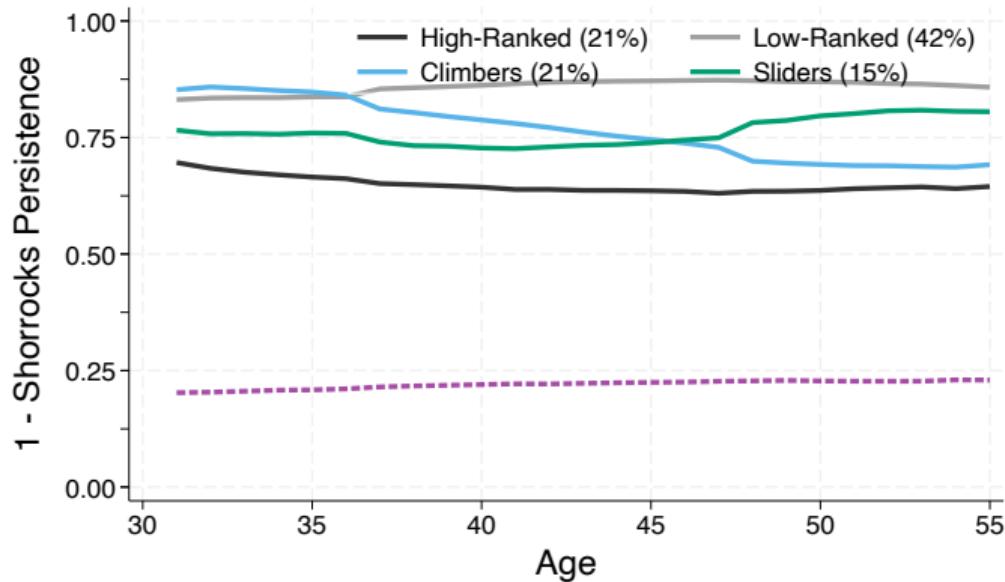
◀ back



- **Top:** Higher persistence than population
- **Fallers:** Lower persistence than population

# Inter-Generational Shorrocks Mobility Index

◀ back



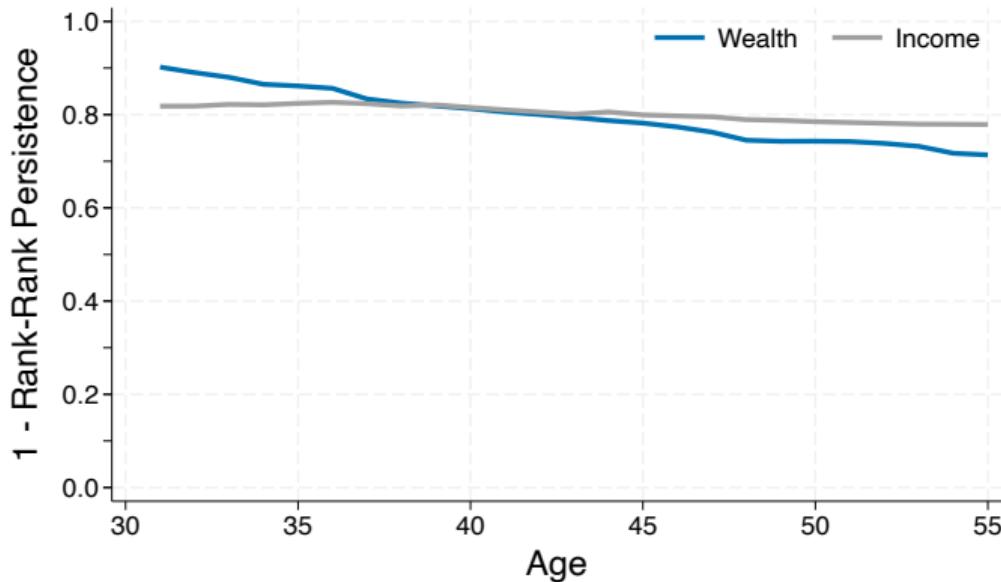
- Risers have clear upwards persistence trend
- Flat patterns for other groups

# Intergenerational Mobility

# Decreasing Inter-Generational Mobility

◀ back

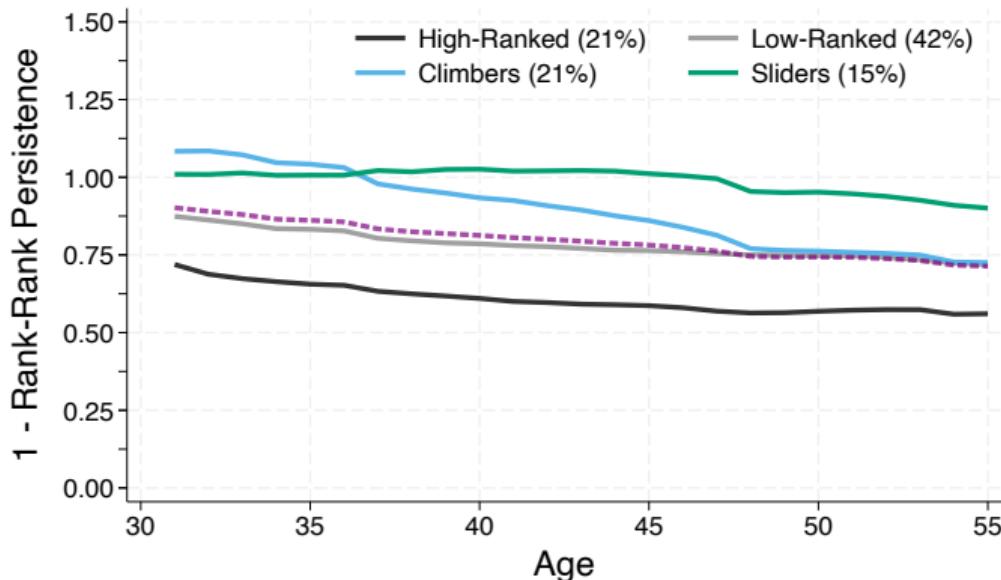
Linear rank-rank persistence:  $y_{i,t}^k = \alpha_t + \rho_t y_{i,0}^p + u_{i,t}$



- Compute measure of mobility with respect to wealth of parents at age  $\sim 55$
- Mobility slightly dropping over life cycle
- People become more like their parents as they age
- Income has no trend, consistent with permanent income types

# Decreasing Inter-Generational Mobility

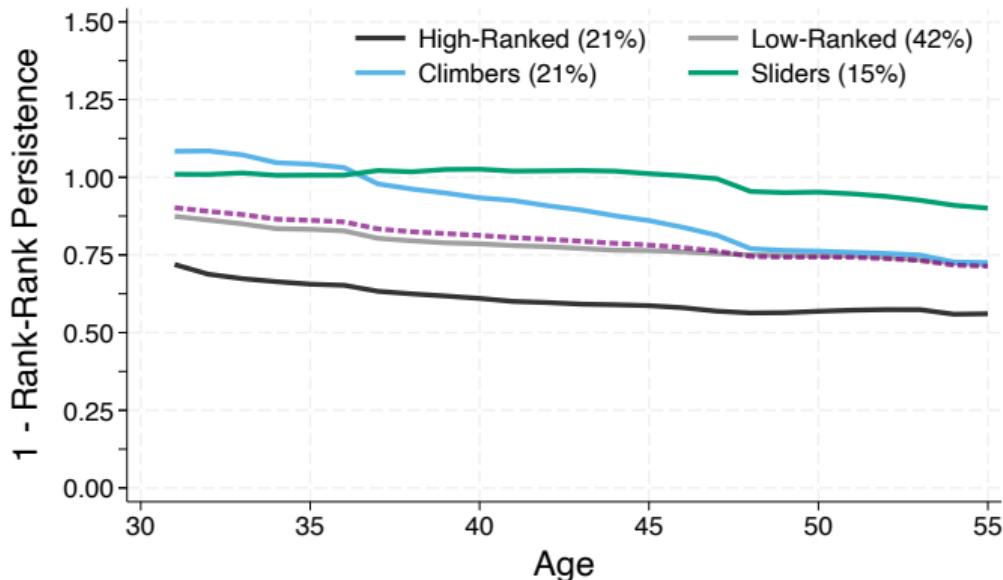
Linear rank-rank persistence:  $y_{i,t}^k = \alpha_t + \rho_t^{g(i)} y_{i,0}^p + u_{i,t}$



- Persistence rises for all groups
- Level differences look parallel

# Decreasing Inter-Generational Mobility

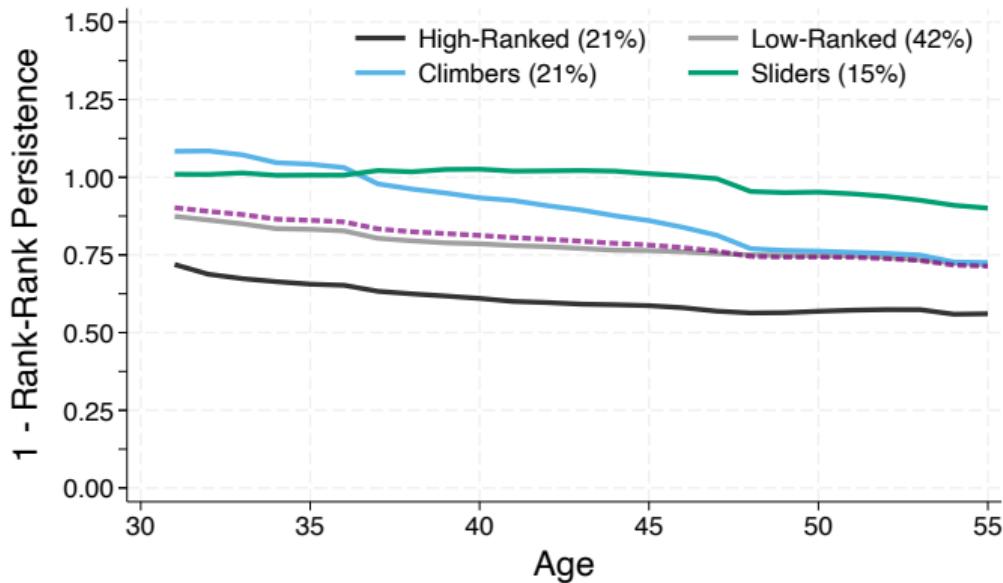
Linear rank-rank persistence:  $y_{i,t}^k = \alpha_t + \rho_t^{g(i)} y_{i,0}^p + u_{i,t}$



- Persistence rises for all groups
- Level differences look parallel
- Except for **Climbers**! Clear upward trend increasing inter-generational persistence
- **Sliders** are clearly below ( $\rho_t^{g(i)} \approx 0$ ) and dampen inter-generational persistence

# Decreasing Inter-Generational Mobility

Linear rank-rank persistence:  $y_{i,t}^k = \alpha_t + \rho_t^{g(i)} y_{i,0}^p + u_{i,t}$



- Clustering of trajectories captures persistent differences in mobility

- Persistence rises for all groups
- Level differences look parallel
- Except for **Climbers**! Clear upward trend increasing inter-generational persistence
- **Sliders** are clearly below ( $\rho_t^{g(i)} \approx 0$ ) and dampen inter-generational persistence

# Contextualize Clusters

# Grouping wealth trajectories within the buffer-stock model

◀ back

Standard model w/ permanent skill differences ( $\textcolor{brown}{l}$ ) and homothetic preferences ( $\textcolor{brown}{u}(\cdot)$ ,  $\textcolor{brown}{v}(\cdot)$ )

$$\begin{aligned} & \max_{\{c_t, a_{t+1}\}} \mathbb{E}_0 \left[ \sum_{t=0}^T \beta^t S_t \left( \textcolor{brown}{u}(c_t) + \frac{S_{t+1}}{S_t} \textcolor{brown}{v}(a_{t+1}) \right) \right] \\ \text{s.t. } & c_t + a_{t+1} = (1+r) a_t + \textcolor{brown}{l} y_t(z_t); \quad a_{t+1} \geq 0; \quad a_0 = 0 \end{aligned}$$

# Grouping wealth trajectories within the buffer-stock model

◀ back

Standard model w/ permanent skill differences ( $I$ ) and homothetic preferences ( $u(\cdot)$ ,  $v(\cdot)$ )

$$\begin{aligned} & \max_{\{c_t, a_{t+1}\}} \mathbb{E}_0 \left[ \sum_{t=0}^T \beta^t S_t \left( u(c_t) + \frac{S_{t+1}}{S_t} v(a_{t+1}) \right) \right] \\ \text{s.t. } & c_t + a_{t+1} = (1+r) a_t + I y_t(z_t); \quad a_{t+1} \geq 0; \quad a_0 = 0 \end{aligned}$$

1. Average of income & wealth scaled by  $I$  at each age  $t$  (Straub 2019)
  - Grouping on income or wealth is equivalent + No rank swaps
  - This is not what we find in the data!
2. We can make precise the conditions for consistency:  $I$  should be different enough (Egashira, Yata, Aoshima, 2024)

# Wealth growth with heterogeneous returns

◀ back

Risky returns vary around *permanent return*  $I_R$

$$\max_{\{c_t, b_{t+1}, x_{t+1}\}} \mathbb{E}_0 \left[ \sum_{t=0}^T \beta^t u(c_t) + v(a_{T+1}) \right]$$

s.t.  $c_t + b_{t+1} + x_{t+1} = a_t + Y_t; \quad a_{t+1} = R_f b_{t+1} + R_{t+1} x_{t+1};$

# Wealth growth with heterogeneous returns

◀ back

Risky returns vary around *permanent return*  $I_R$

$$\max_{\{c_t, b_{t+1}, x_{t+1}\}} \mathbb{E}_0 \left[ \sum_{t=0}^T \beta^t u(c_t) + v(a_{T+1}) \right]$$

s.t.  $c_t + b_{t+1} + x_{t+1} = a_t + Y_t; \quad a_{t+1} = R_f b_{t+1} + R_{t+1} x_{t+1};$

1. Wealth growth independent of permanent income
  - Total wealth = Assets + Human Wealth
  - When initial assets are correlated with permanent income, income differences imply permanent wealth differences
2. Expected wealth growth depends on permanent return differences (Fagereng, et al, 2020)
  - Differences in discount factor work similar in theory, not in practice

Two-asset model of savings with labor income risk + non-homothetic bequest motive

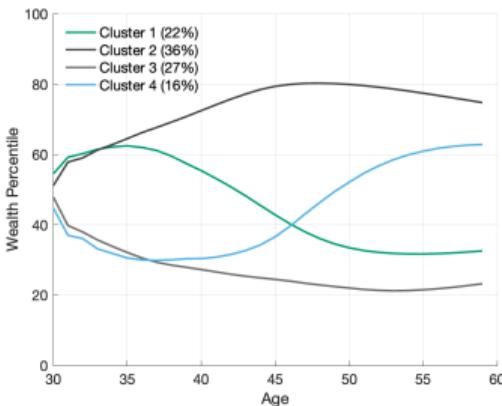
$$\begin{aligned} \max \mathbb{E}_0 & \left[ \sum_{t=0}^T \beta^t \frac{(c_t)^{1-\gamma}}{1-\gamma} + \beta^T \psi_0 \frac{(a_T + b_T + \psi_1)^{1-\gamma}}{1-\gamma} \right] \\ \text{s.t. } & b_t = b_{t-1} + r a_{t-1} + \exp(y_t) - d_t - \kappa \mathbb{1}_{a_t \neq a_{t-1}} - c_t; \quad a_t = a_{t-1} + d_t; \\ & y_t = \tau_t + p_t + \varepsilon_t^Y; \quad p_t = \rho p_{t-1} + \varepsilon_t^P; \end{aligned}$$

- Liquid and illiquid assets to match distribution of MPC (wealthy hand-to-mouth)
- Parameters estimated with Norwegian Tax Registry data (incl. life cycle earnings)
- Matches income dynamics + MPC-Age profile + MPC-Wealth correlation

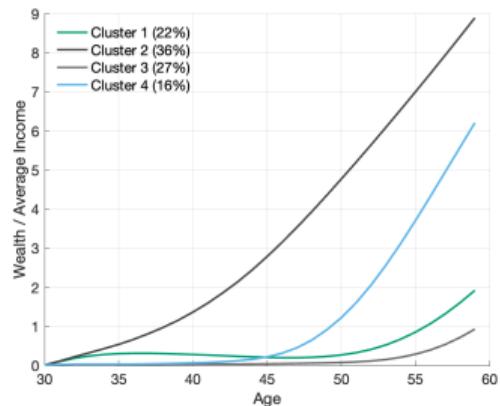
# Wealth mobility in Fagereng, Holm, Natvik (2021)

◀ back

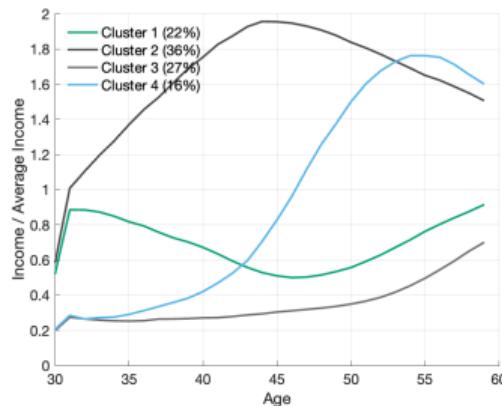
## Wealth Ranks



## Wealth Levels



## Income Levels



- Model captures crossing pattern (despite low initial dispersion)
  - Age-profile of wealth is off (increased speed at older ages)
- Crossing pattern is not enough: Joint income-wealth dynamics are off
  - Wealth follows income too closely
  - Not enough difference in wealth accumulation speed (returns, savings)

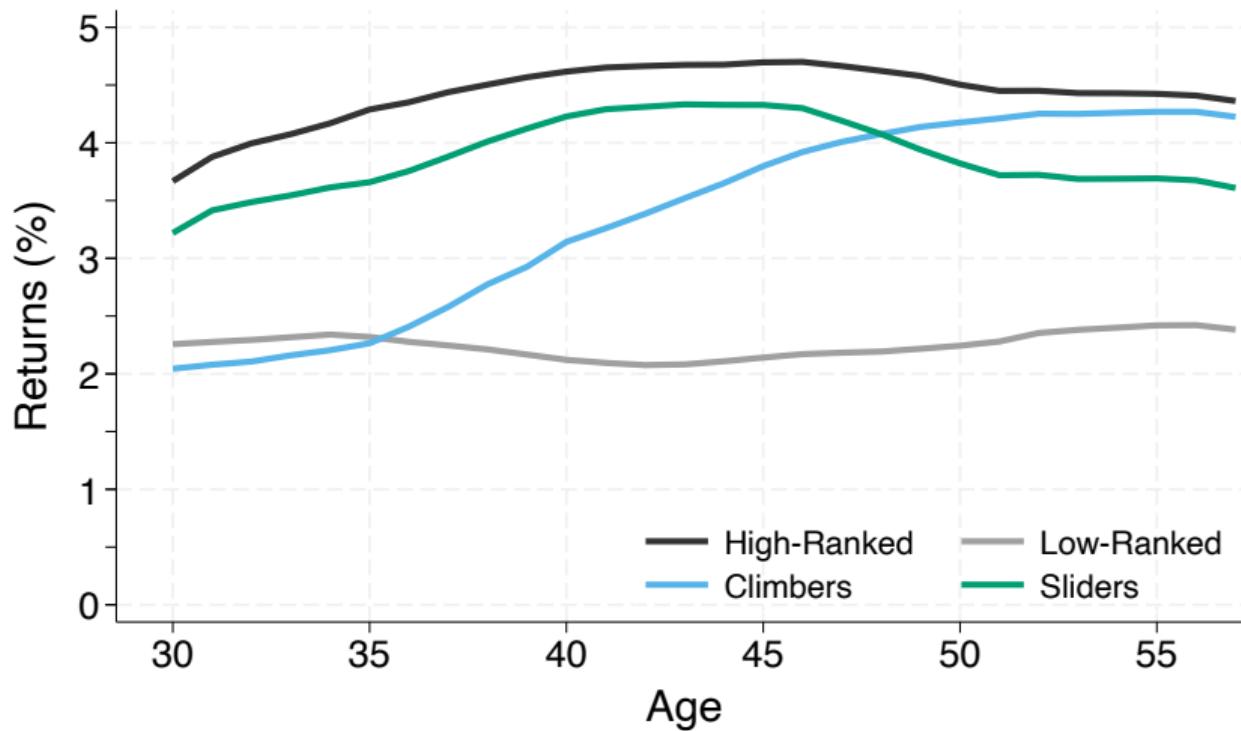
# Counterfactual wealth trajectories

**Goal:** Get a handle on role of income, returns, and savings rate

1. Income: observed
2. Construct returns implied by portfolio differences (Fagereng, Guiso, Malacrino, Pistaferri 2020)
3. Active vs Passive saving rates (Fagereng, Holm, Moll, Natvik 2019)

We can use the budget constraint to simulate counterfactual wealth paths by group!

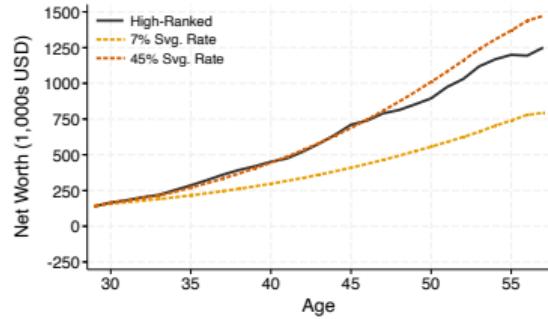
## Implied portfolio returns by groups



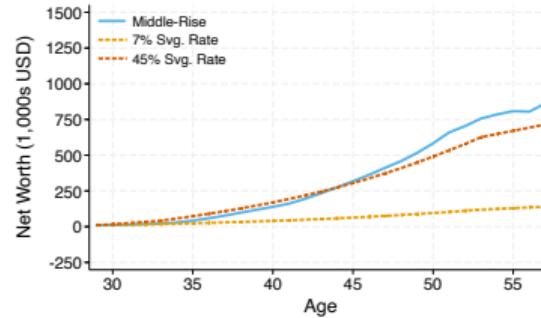
Assumption: No return heterogeneity within asset class across groups

# Wealth counterfactuals: More than income heterogeneity

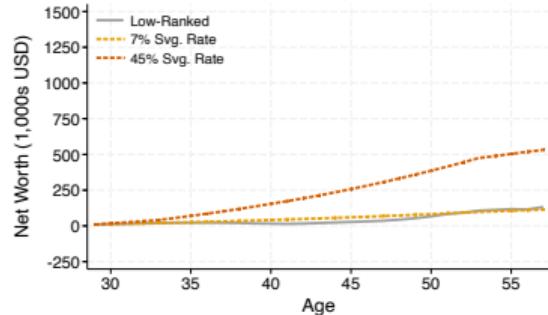
## High-ranked



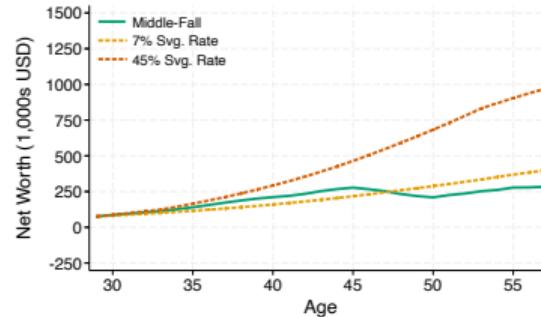
## Middle-Rise



## Low-ranked



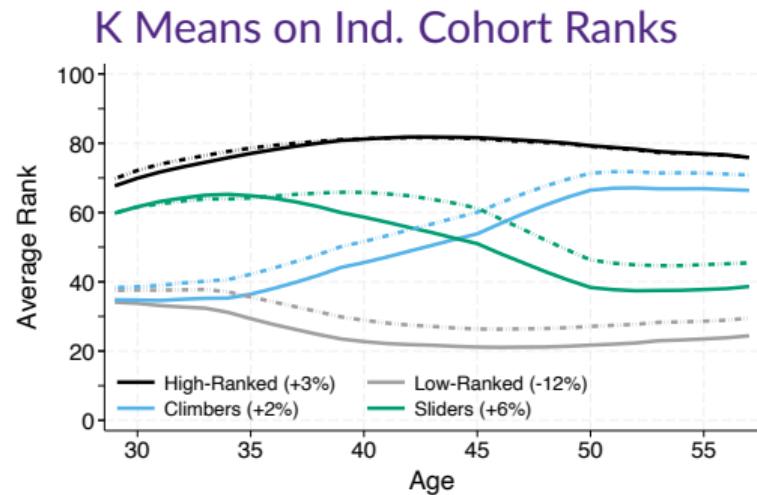
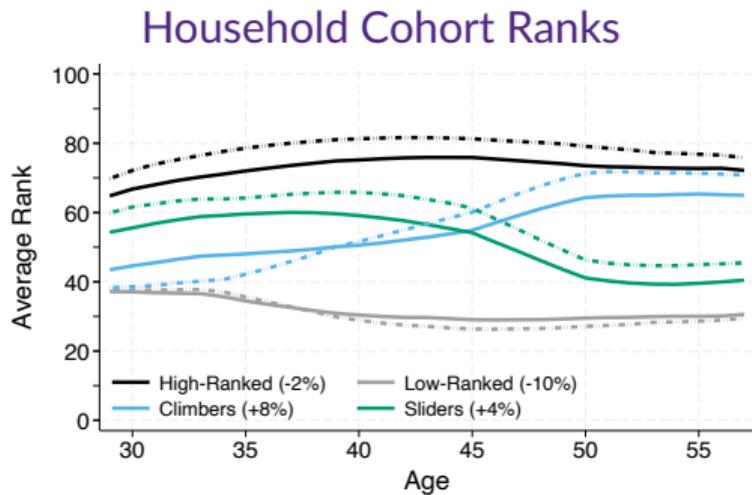
## Middle-Fall



# Characteristics of Main Clusters

# Alternative Clustering

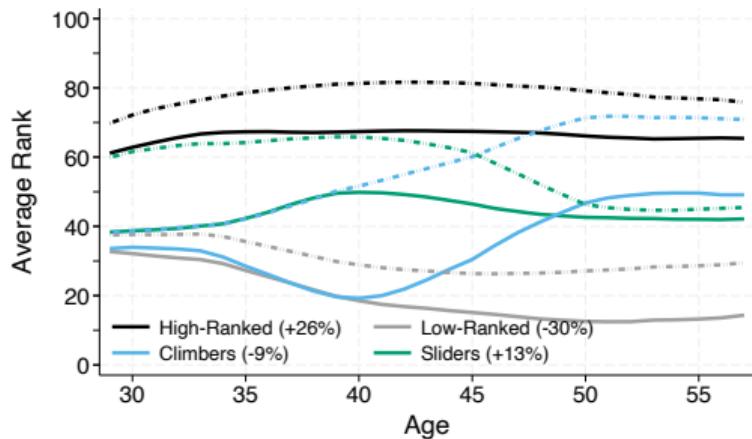
◀ Back



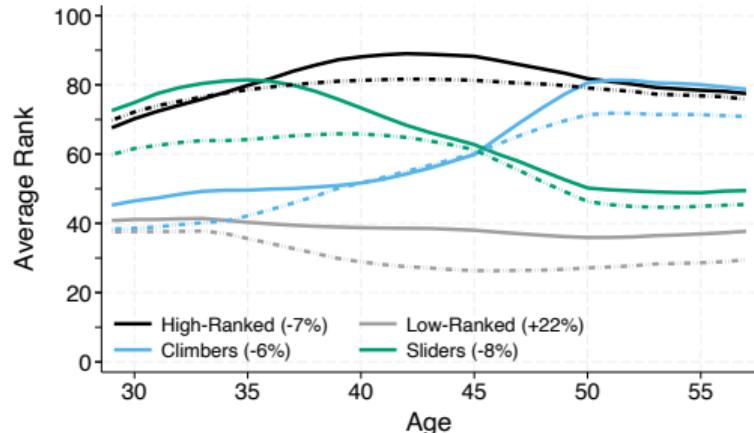
# Absolute Mobility

◀ Back

## Log Net Worth



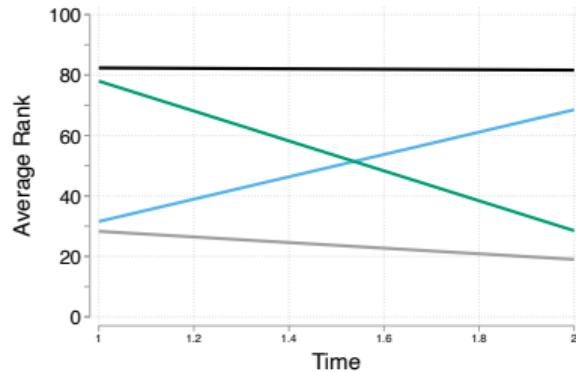
## "Lorenz" Ordinates



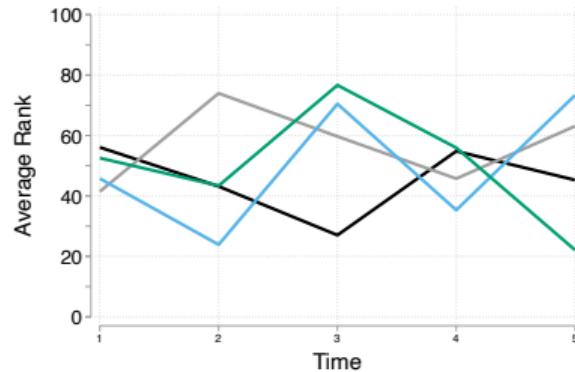
# Clustering Random Ranks

[Back](#)

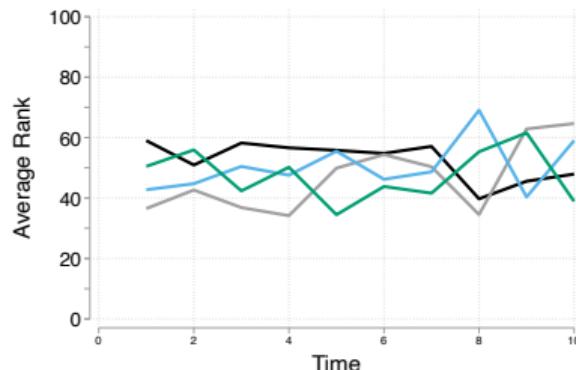
## 2 Periods



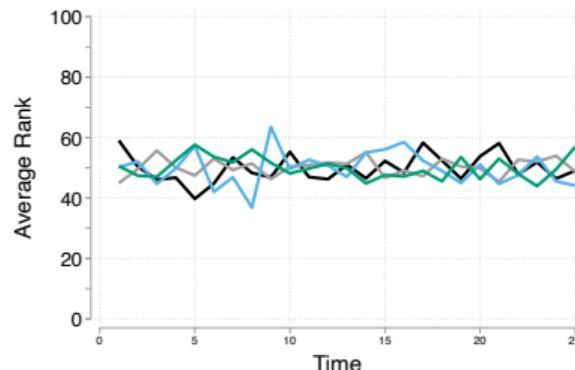
## 5 Periods



## 10 Periods

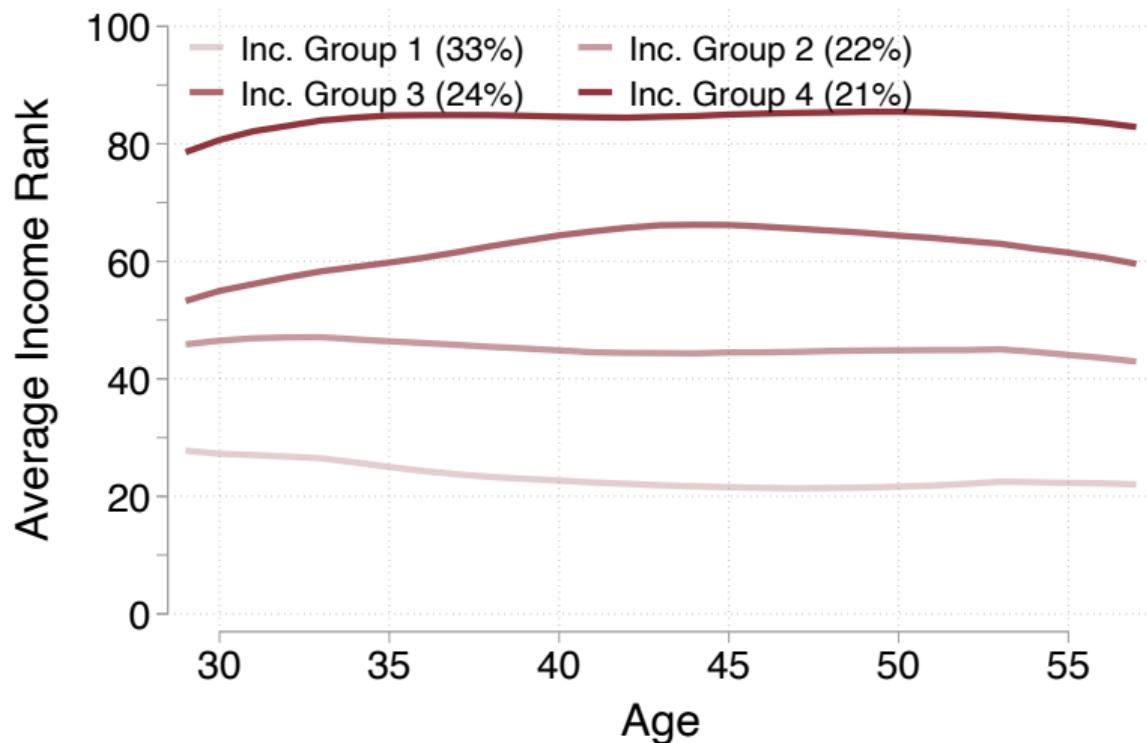


## 25 Periods



# Clustering on Income

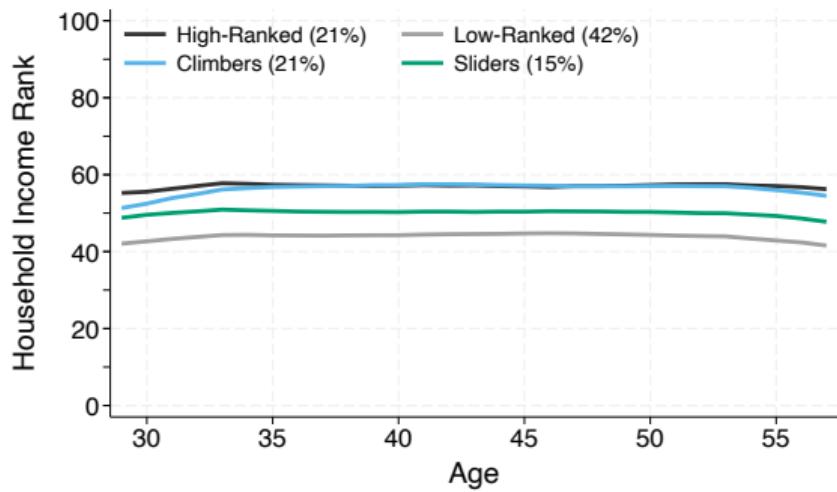
◀ Back



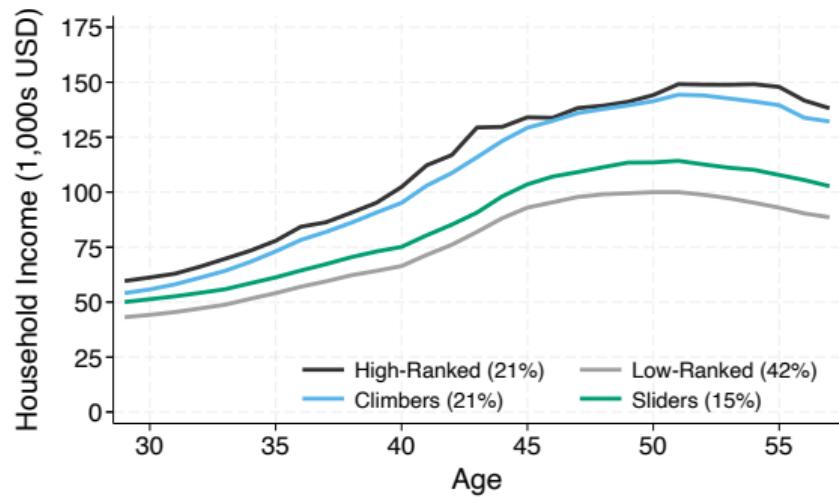
# Household Income

Back

## Household Income Cohort Ranks



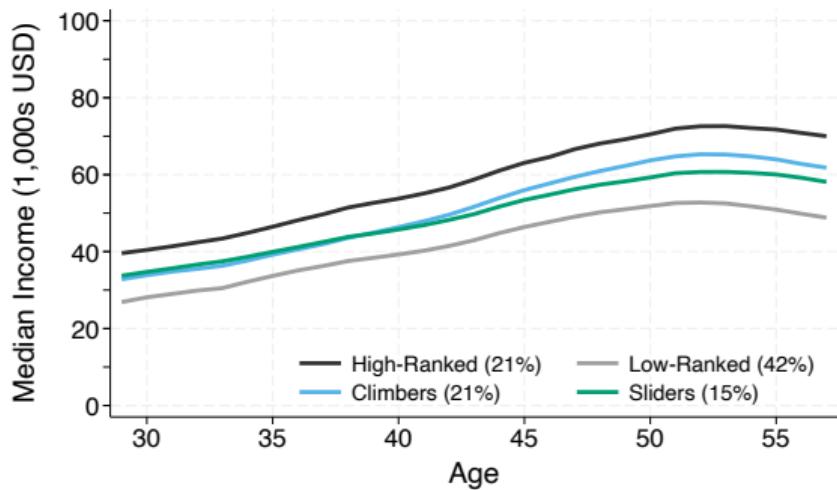
## Household Income (\$1000s)



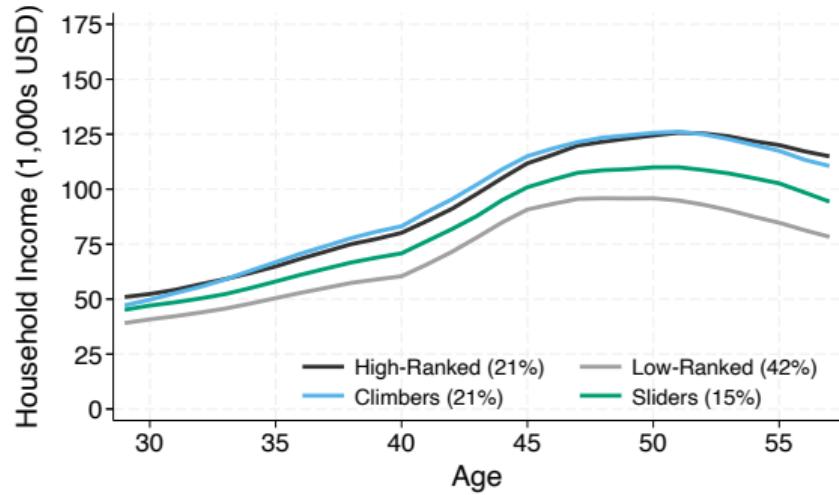
# Median Income Histories

◀ Back

## Median Income

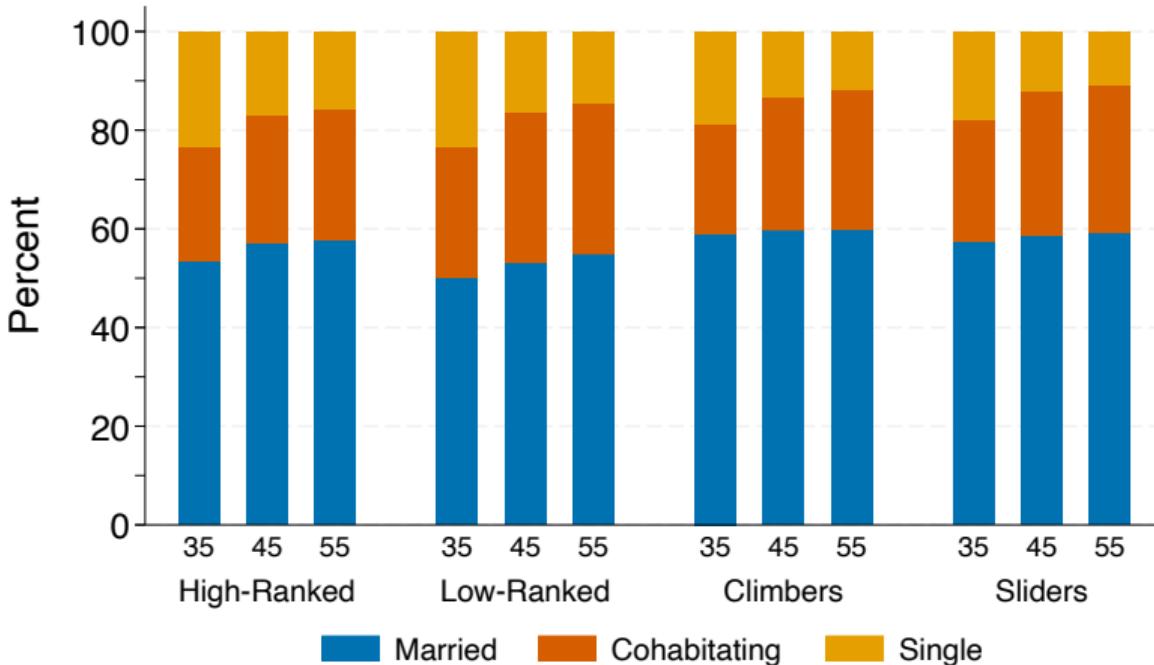


## Household Median Income (\$1000s)



# Civil Status

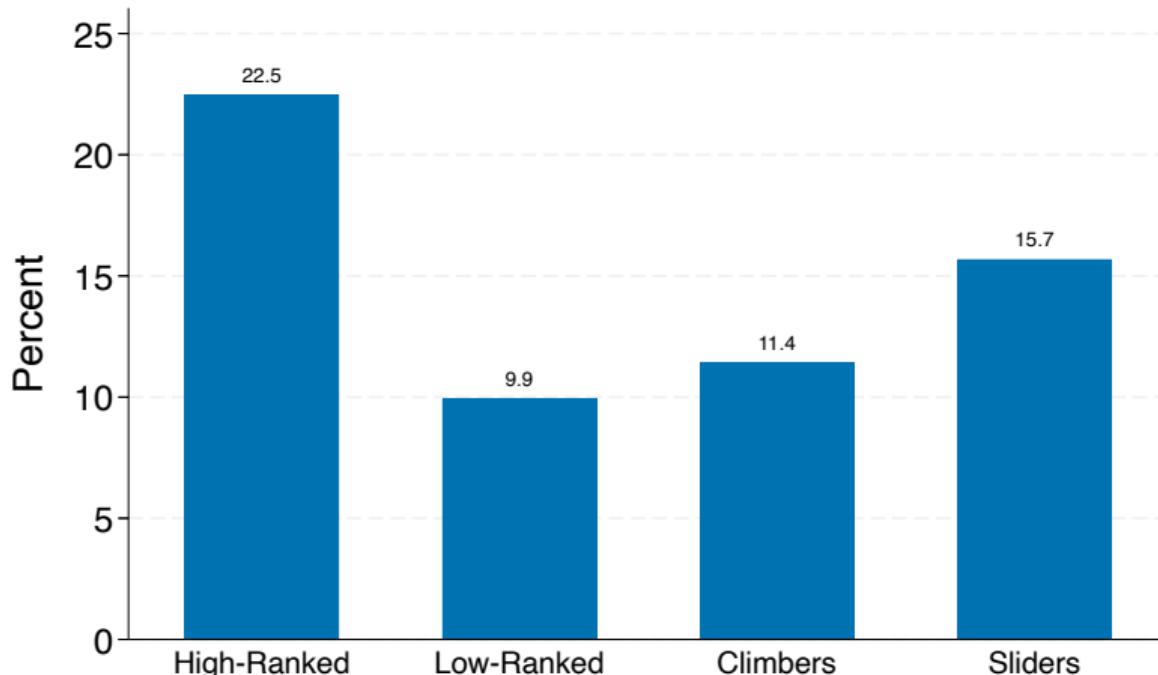
◀ Back



# Self-Employment Rates, Age 45

◀ Back

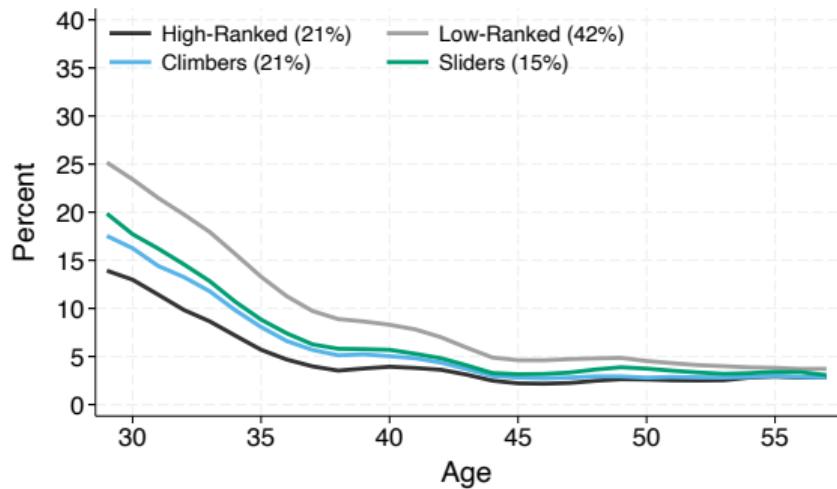
Share with Self-Employment Income (%)



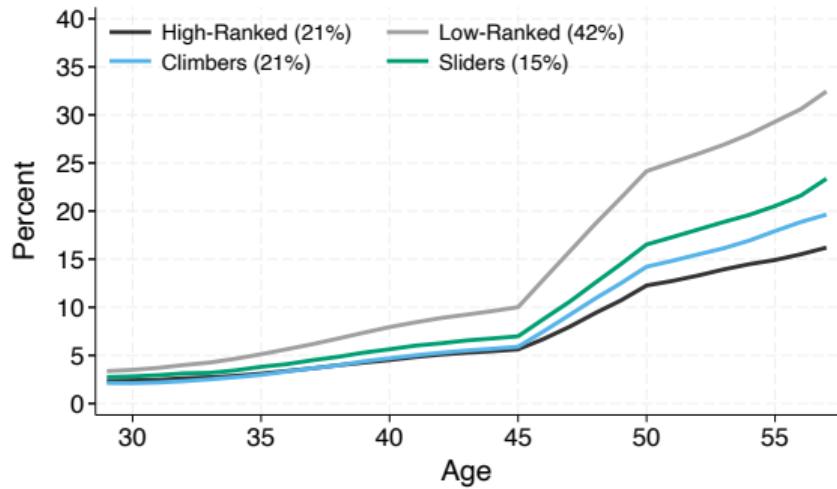
# Transfers: Unemployment, Disability, Sick Leave, Nursing

◀ Back

## Share with Unemployment Benefits (%)



## Share with Health-Related Transfers (%)



# Characteristics of Sub-Clusters

# Heterogeneity in Trajectories

► Wealth

► Portfolio

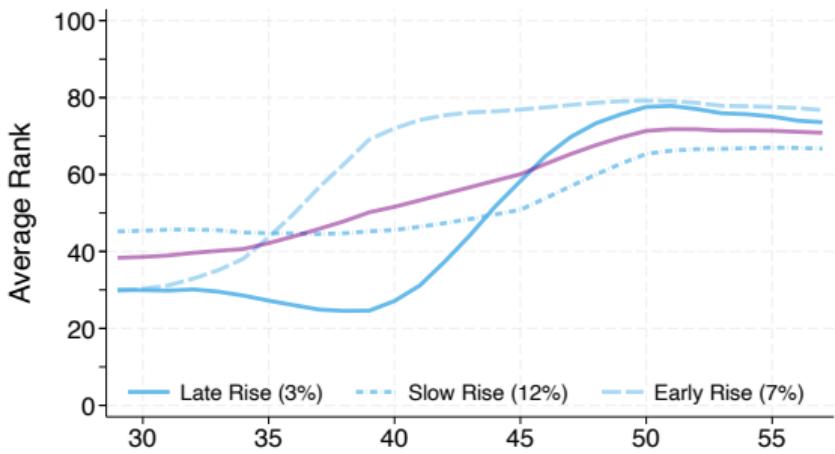
► Homeownership

► Inc.

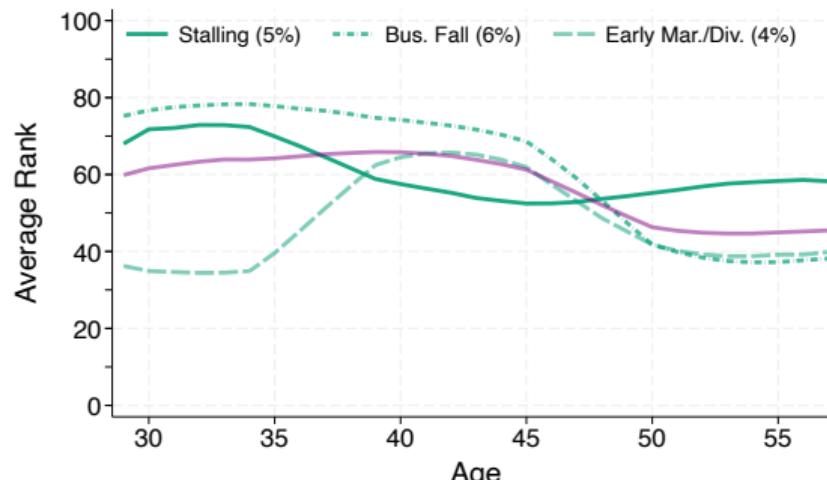
► SE

► Edu.

## Middle-Risers



## Middle-Fallers



- Risers differ mainly in timing of changes (similar initial conditions)
- Fallers differ in initial conditions and timing of changes (similar final conditions)

# Heterogeneity in Trajectories

► Wealth

► Portfolio

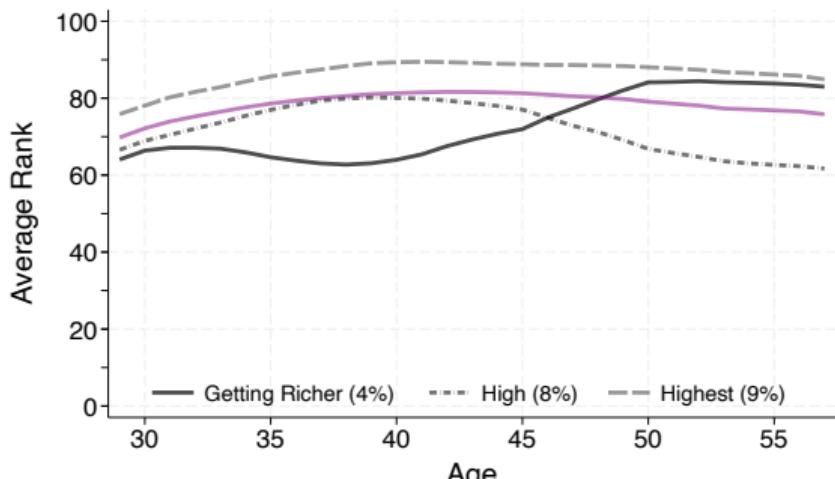
► Homeownership

► Inc.

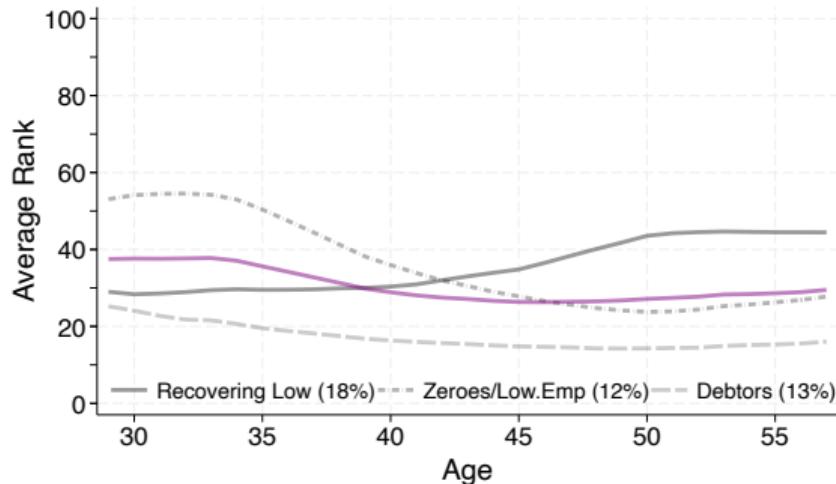
► SE

► Edu.

## High-Ranked



## Low-Ranked



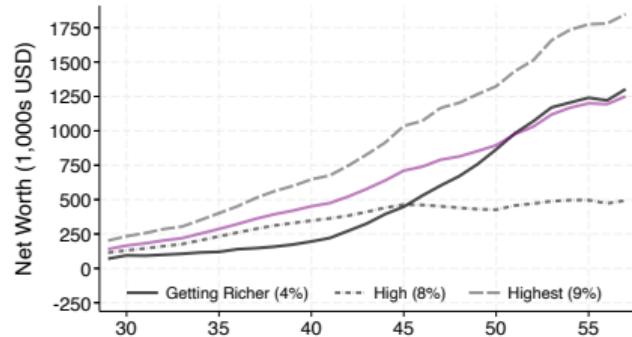
- Top and bottom groups differ mainly in avg. levels
- Zeros are quite different from debtors

**Next Step:** Relate differences in timing/level to individual circumstances

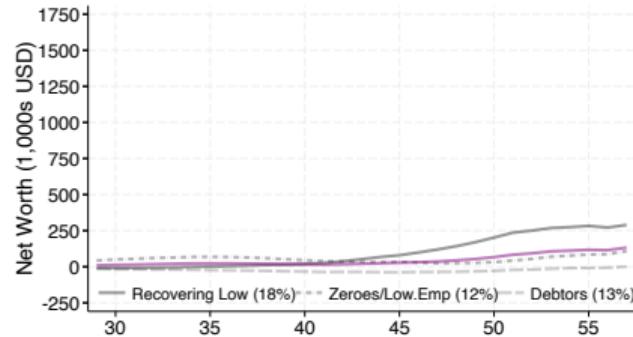
# Sub-Clusters: Wealth Levels

◀ Back

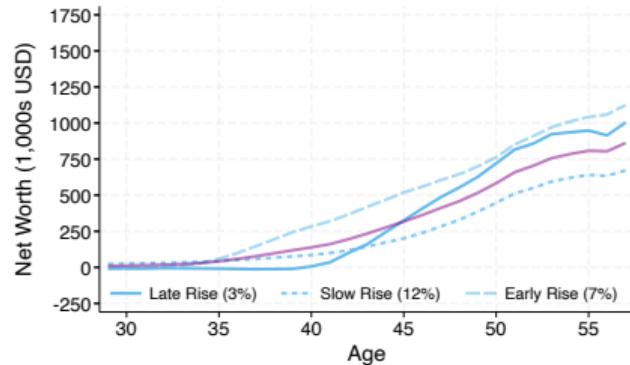
## High Ranked



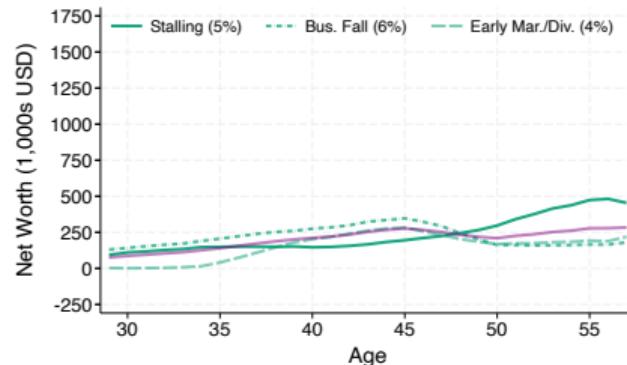
## Low Ranked



## Middle Risers



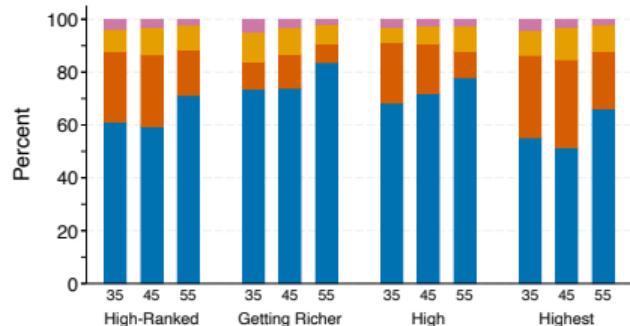
## Middle Fallers



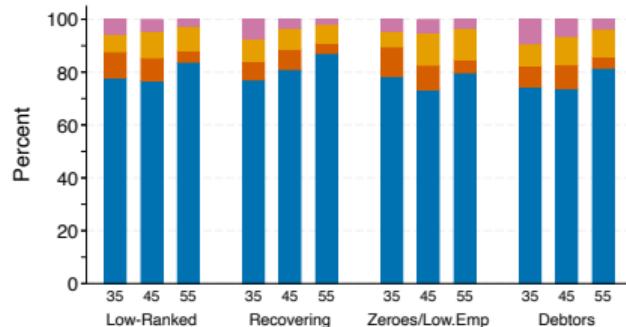
# Sub-Clusters: Portfolio

◀ Back

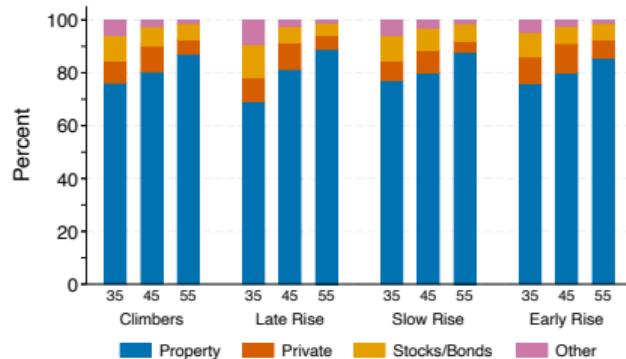
## High Ranked



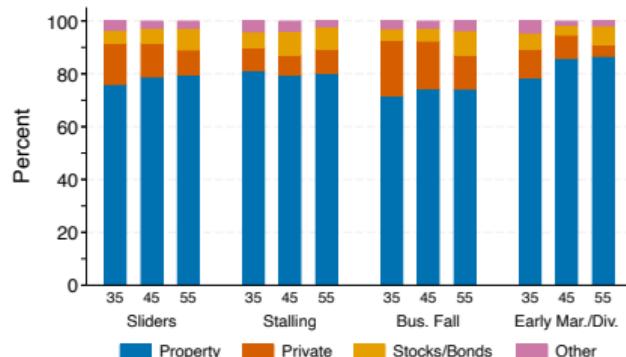
## Low Ranked



## Middle Risers



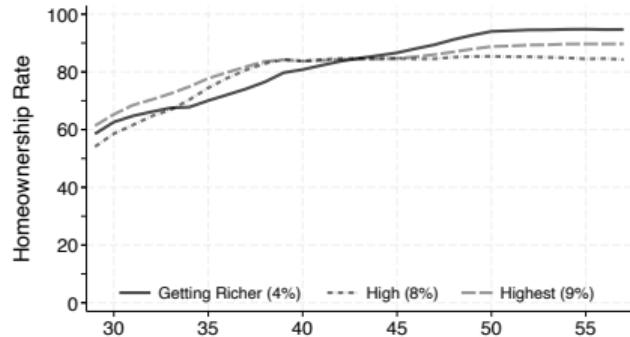
## Middle Fallers



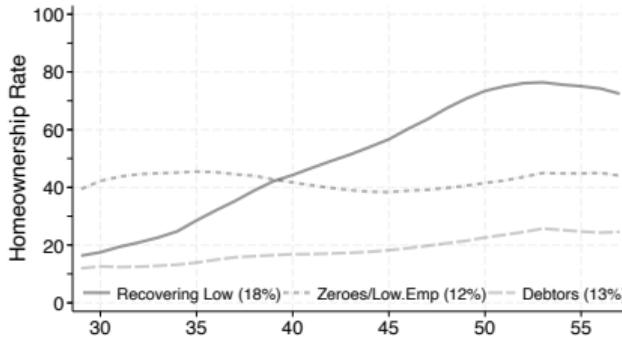
# Sub-Clusters: Homeownership

◀ Back

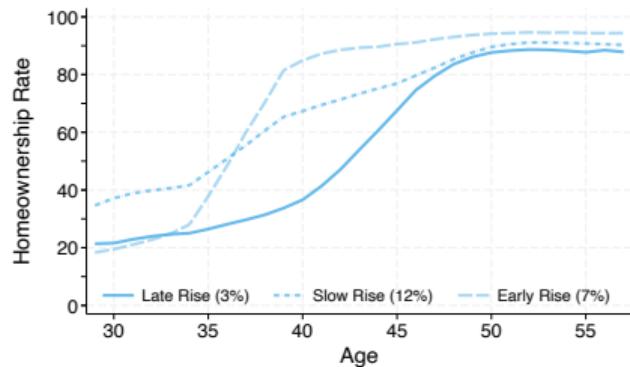
## High Ranked



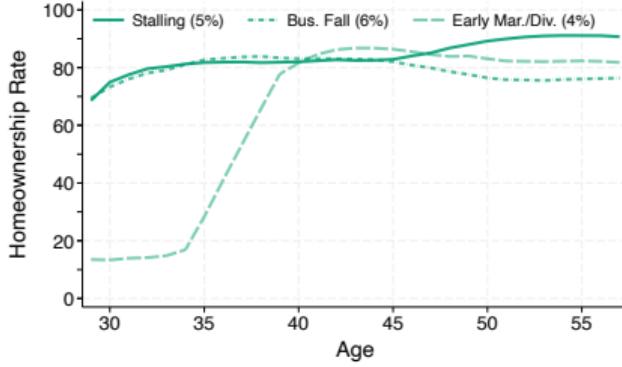
## Low Ranked



## Middle Risers



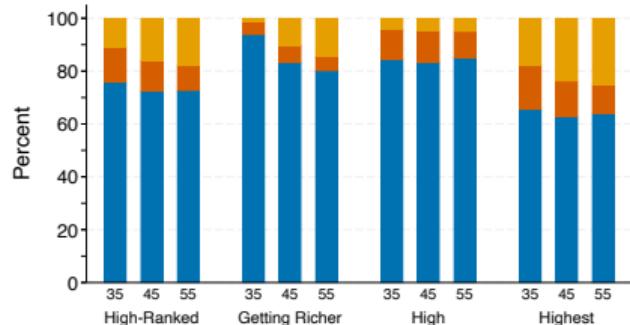
## Middle Fallers



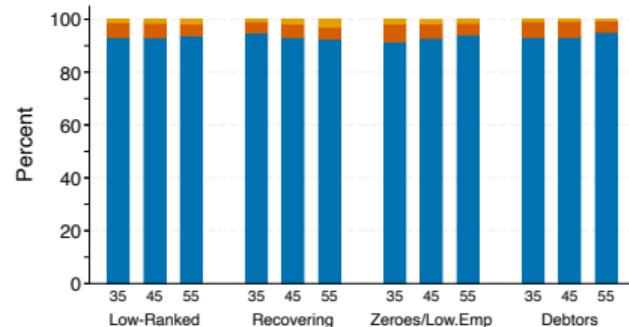
# Sub-Clusters: Income Composition

◀ Back

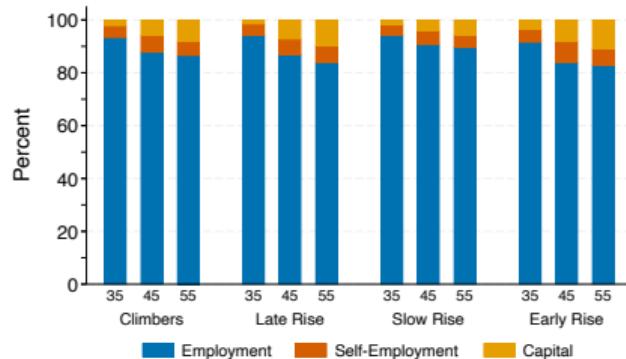
## High Ranked



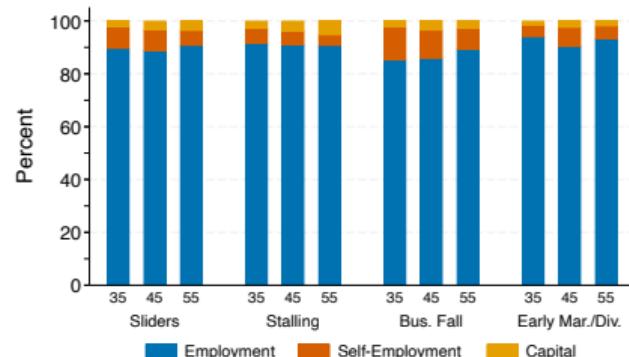
## Low Ranked



## Middle Risers



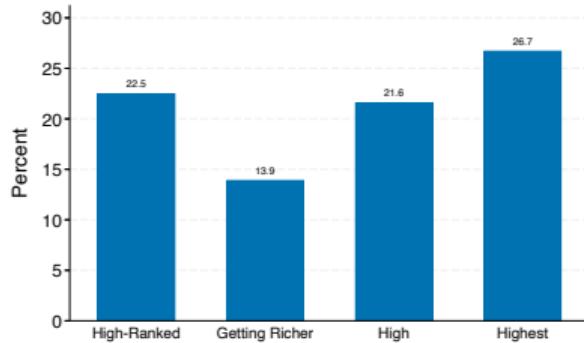
## Middle Fallers



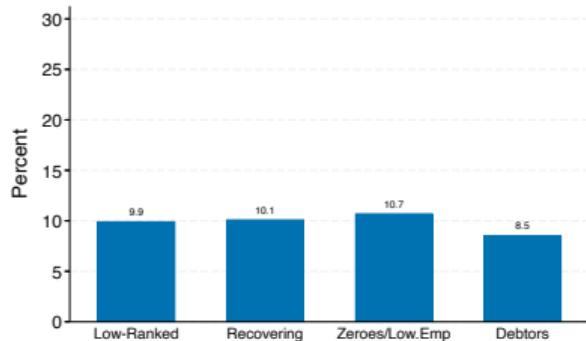
# Sub-Clusters: Self-Employment

◀ Back

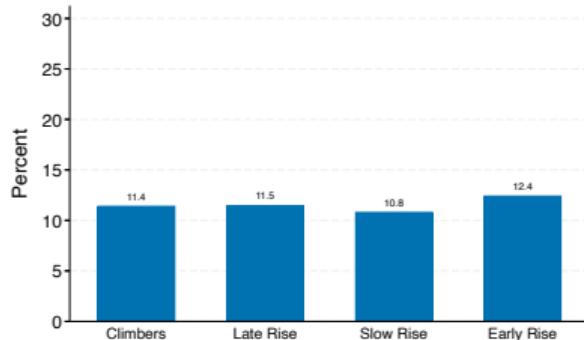
## High Ranked



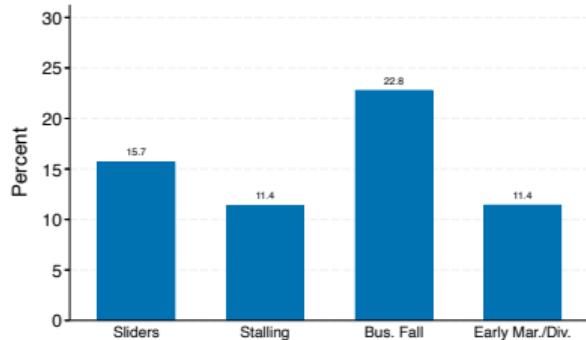
## Low Ranked



## Middle Risers



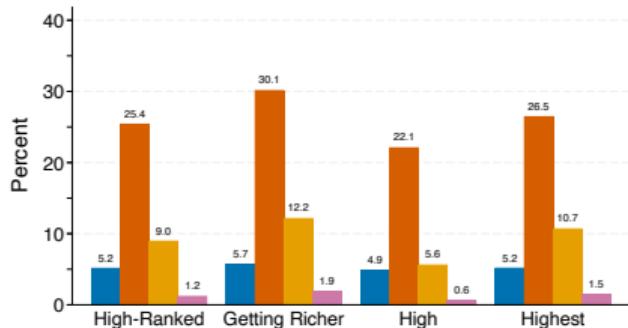
## Middle Fallers



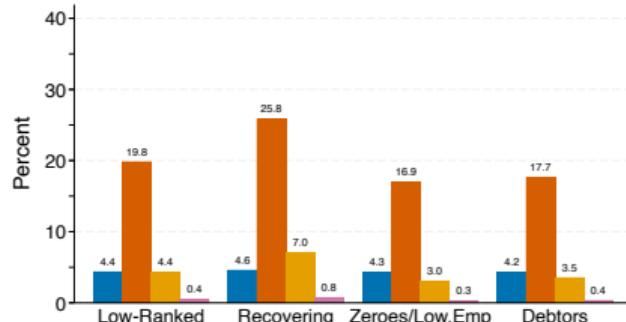
# Sub-Clusters: Education

◀ Back

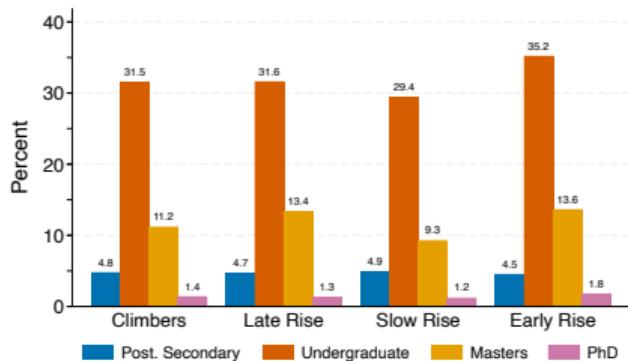
## High Ranked



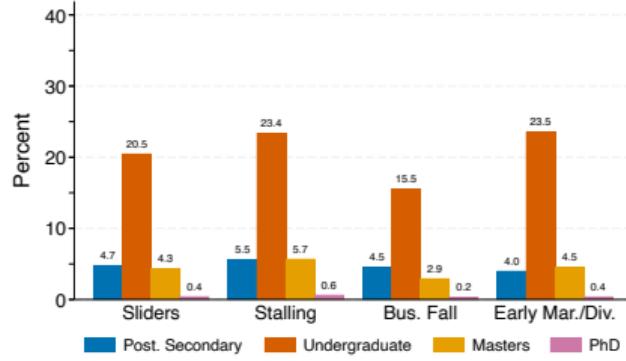
## Low Ranked



## Middle Risers



## Middle Fallers



# Shapley-Owen Decomposition

# How Important Are Ex-Ante Explanations? ◀ Back

Two measures:

1. Distance Weighted Classification Rate  $\in [0, 1]$

$$1 - \frac{\sum_{i=1}^N \sum_{k=1}^G \widehat{Pr}(g = k | X_i) D(g(i), k)}{\sum_{i=1}^N \sum_{k=1}^G \widehat{Pr}(g = k) D(g(i), k)} \quad \left( \text{in spirit of } \frac{ESS}{TSS} \right)$$

# How Important Are Ex-Ante Explanations? ◀ Back

Two measures:

1. Distance Weighted Classification Rate  $\in [0, 1]$

$$1 - \frac{\sum_{i=1}^N \sum_{k=1}^G \widehat{Pr}(g = k | X_i) D(g(i), k)}{\sum_{i=1}^N \sum_{k=1}^G \widehat{Pr}(g = k) D(g(i), k)} \quad \left( \text{in spirit of } \frac{ESS}{TSS} \right)$$

2. Correct Classification Rate  $\in [0, 1]$

$$\frac{1}{N} \sum_{i=1}^N \sum_{k=1}^G \widehat{Pr}(g = k | X_i) \mathbb{1}[g(i) = k]$$

# How Important Are Ex-Ante Explanations? ◀ Back

Two measures:

1. Distance Weighted Classification Rate  $\in [0, 1]$

$$1 - \frac{\sum_{i=1}^N \sum_{k=1}^G \widehat{Pr}(g = k | X_i) D(g(i), k)}{\sum_{i=1}^N \sum_{k=1}^G \widehat{Pr}(g = k) D(g(i), k)} \quad \left( \text{in spirit of } \frac{ESS}{TSS} \right)$$

2. Correct Classification Rate  $\in [0, 1]$

$$\frac{1}{N} \sum_{i=1}^N \sum_{k=1}^G \widehat{Pr}(g = k | X_i) \mathbb{1}[g(i) = k]$$

- Report Shapley-Owen decomposition of covariates
  - Order invariant & sums to statistic + Single value per covariate category

# How Important Are Ex-Ante Explanations? ◀ Back

Total Contribution*	Partial Contribution			
	Parent	Education	Sex	Birth Place
<b>Share of Distance Variation Explained by Variable (pp)</b>				
5.9	2.4	2.3	0.8	0.4
<hr/> <b>Share of Individuals Correctly Classified (pp)</b>				
3.1	1.1	1.3	0.6	1.2

\*Contribution relative to random classification using population shares.

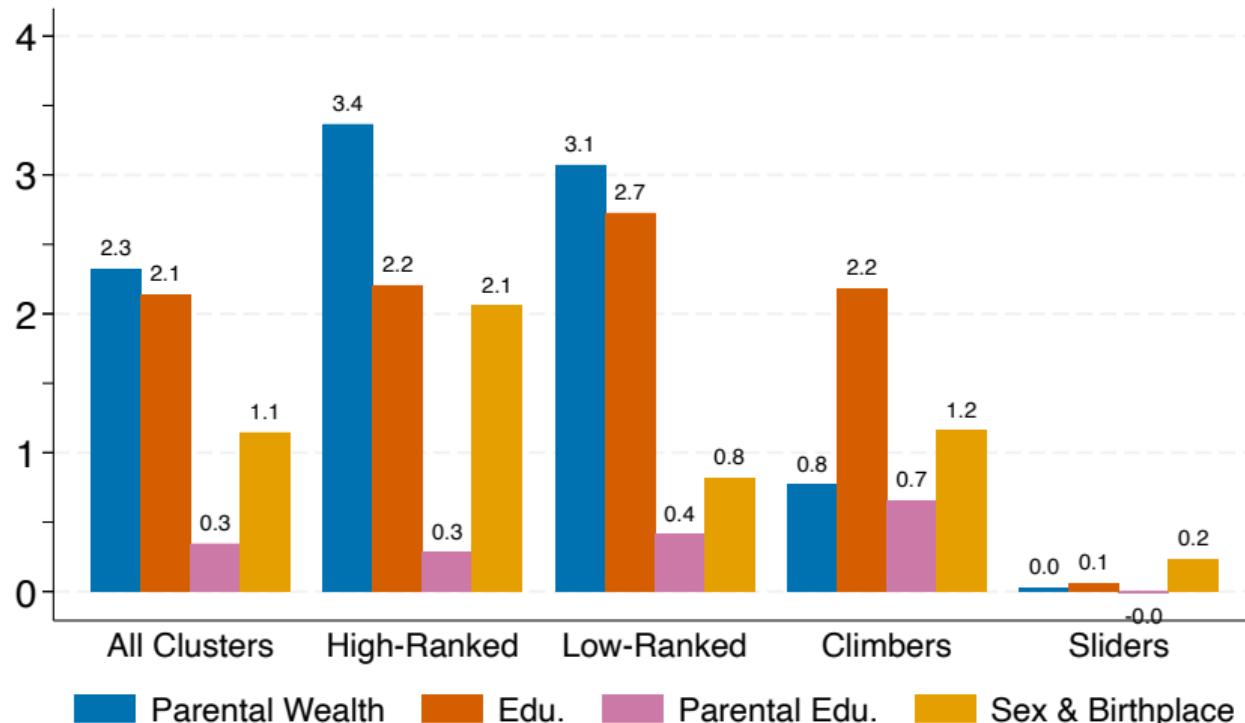
Share of individuals correctly classified by random classification 29.3% vs 32.5% with full model.

▶ D by Cluster

▶ C by Cluster

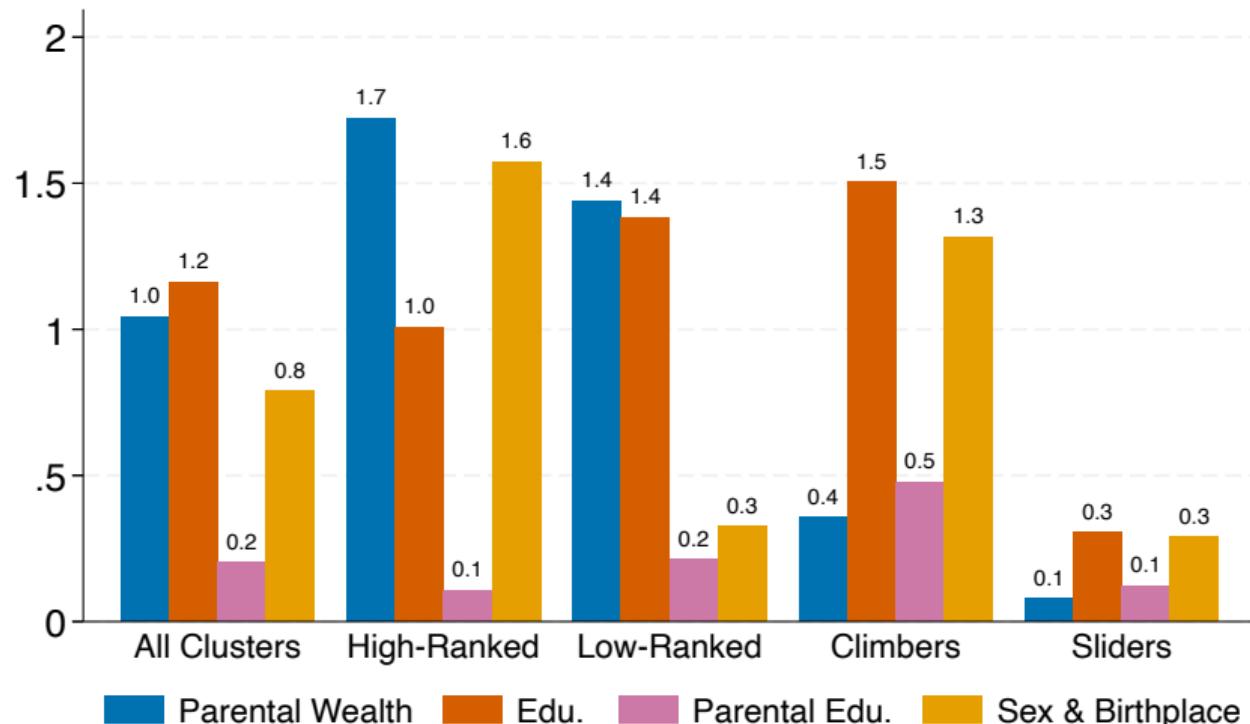
# How Important Are Ex-Ante Explanations? [◀ back](#)

## Share of Cross-Group Variation Explained by Variable



# How Important Are Ex-Ante Explanations? [◀ back](#)

## Share of Individuals Correctly Classified



# How Important Are Ex-Ante Explanations? Extra controls

◀ Back

Total Contribution*	Partial Contribution					
	Parent	Education	Sex	Birth Place	Par. Bus.	Own State
<b>Share of Distance Variation Explained by Variable (pp)</b>						
20.0	1.6	2.0	0.6	0.3	0.6	15.0
<b>Share of Individuals Correctly Classified (pp)</b>						
10.6	0.8	1.1	0.4	0.2	0.3	7.9

\*Contribution relative to random classification using population shares.

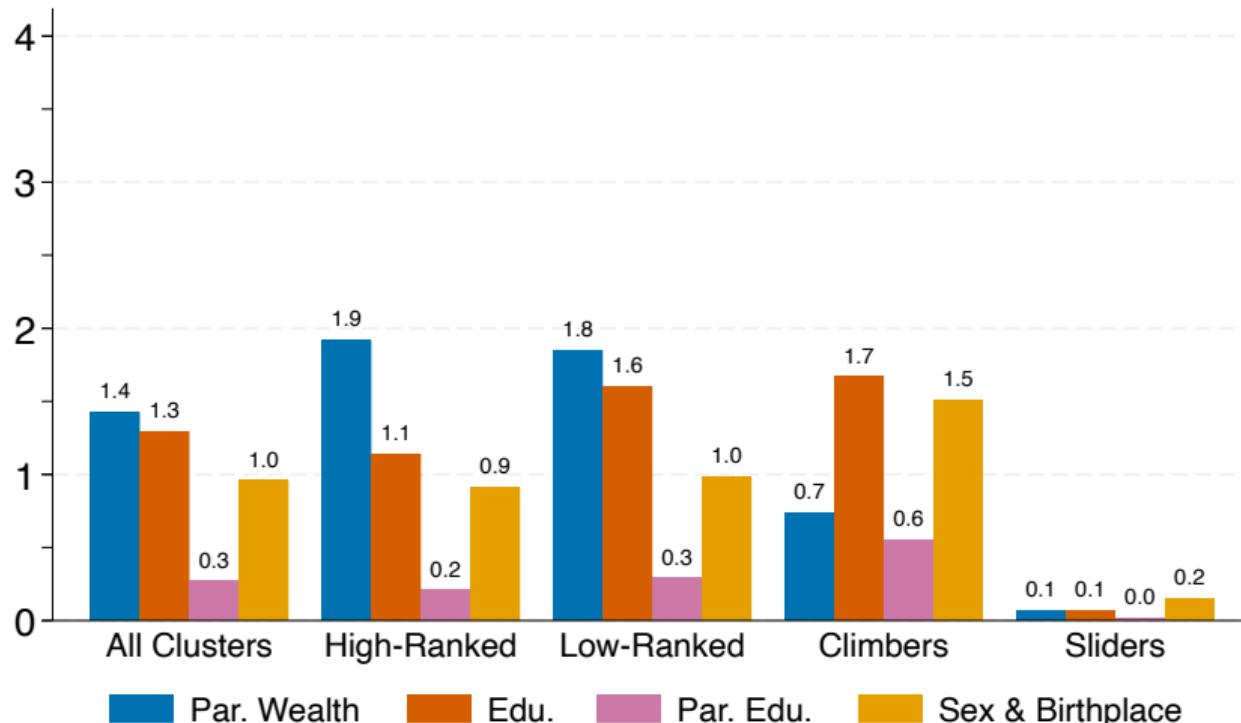
Share of individuals correctly classified by random classification 29.3% vs 40.0% with full model.

▶ D by Cluster

▶ C by Cluster

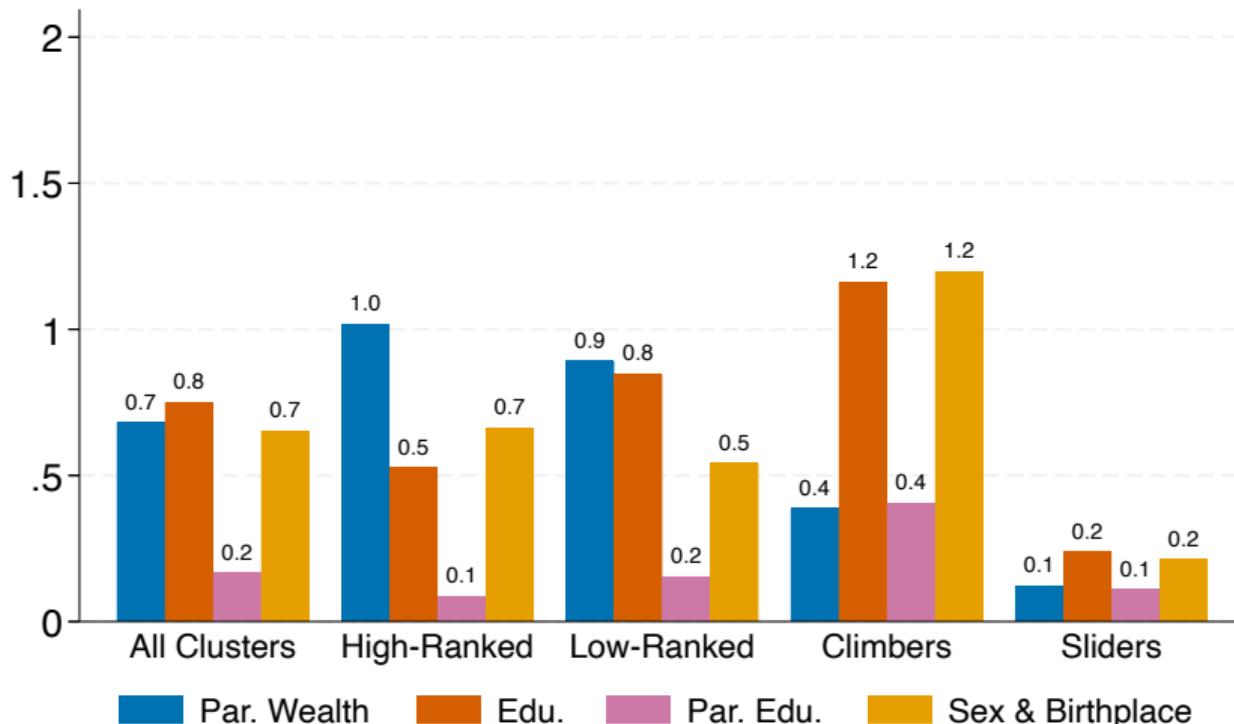
# How Important Are Ex-Ante Explanations? [◀ back](#)

## Share of Cross-Group Variation Explained by Variable



# How Important Are Ex-Ante Explanations? [◀ back](#)

## Share of Individuals Correctly Classified

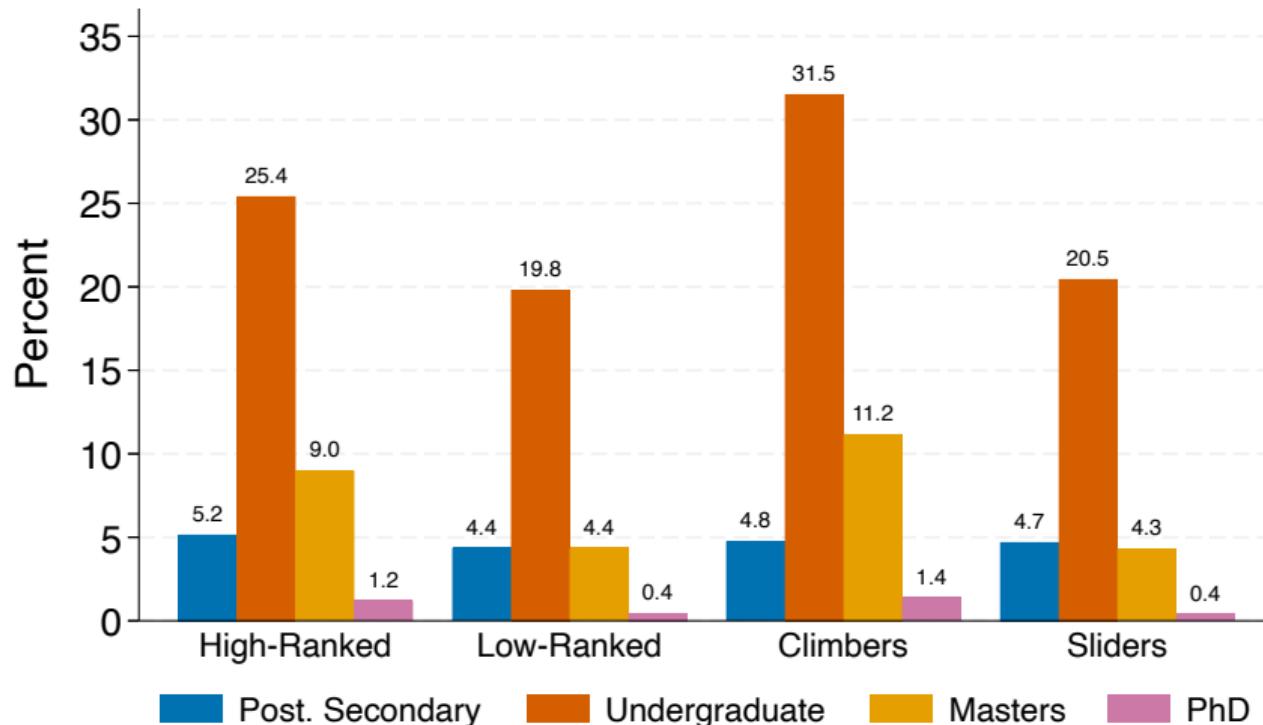


# Additional Classification Results: Main Clusters

# Education: Highest among risers

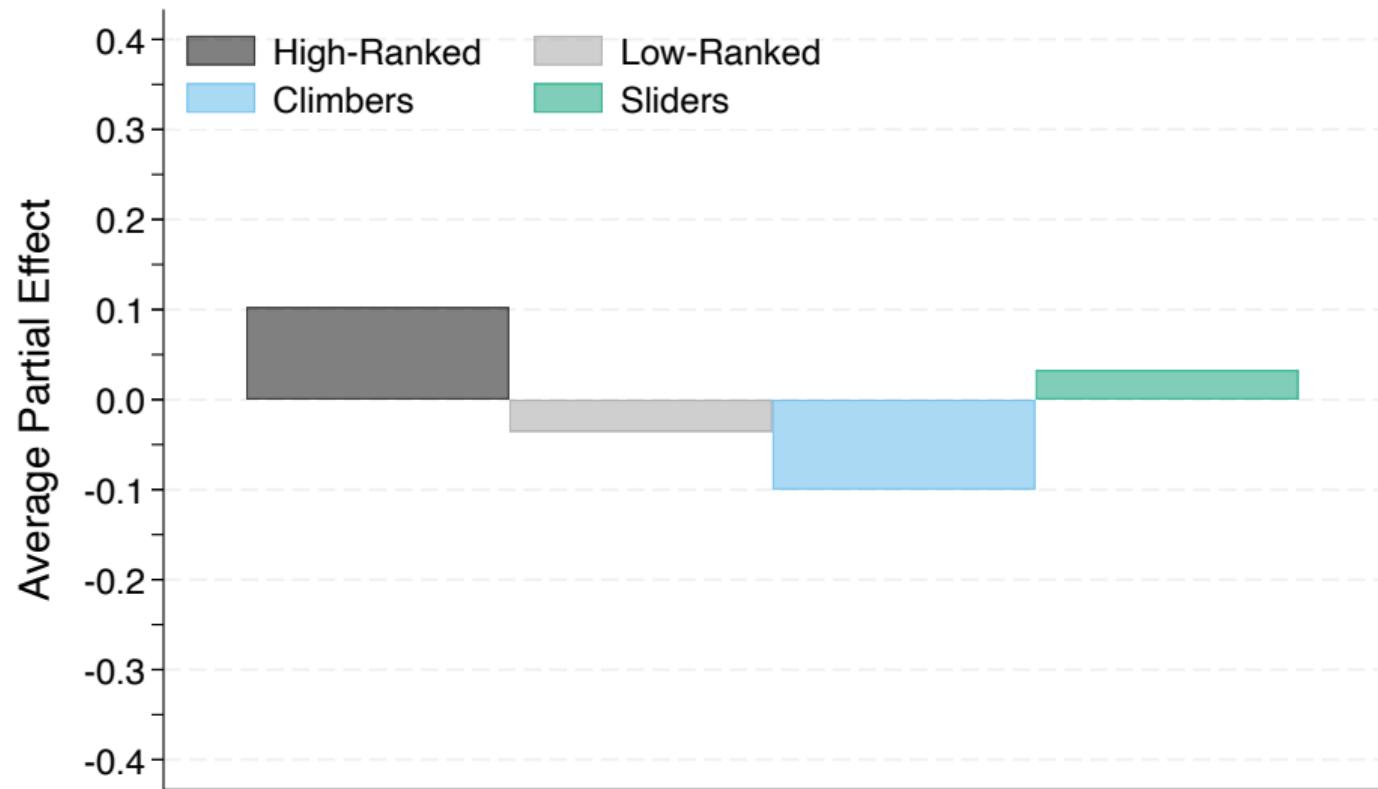
[back](#)

## Highest Education Level Shares (%)



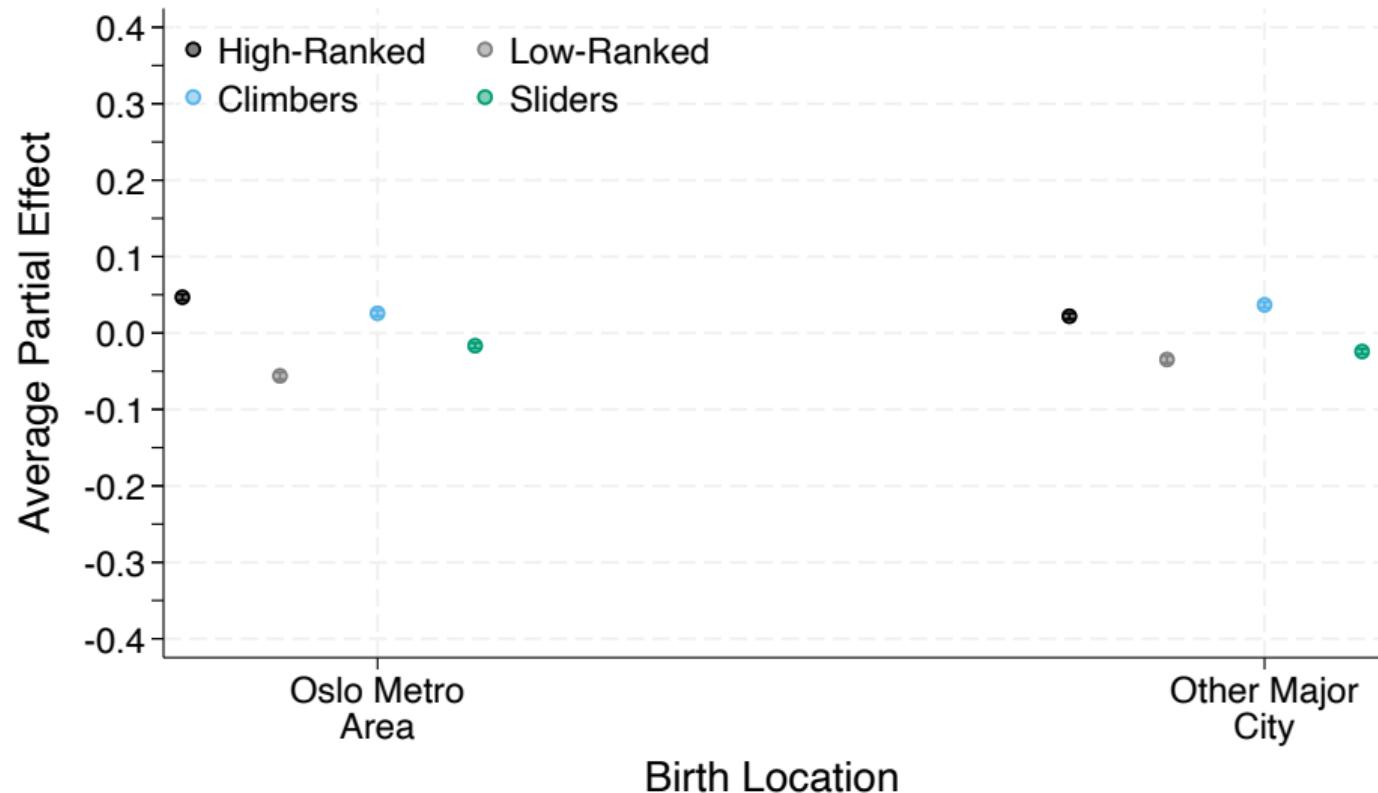
# Sex Average Partial Effect

◀ back



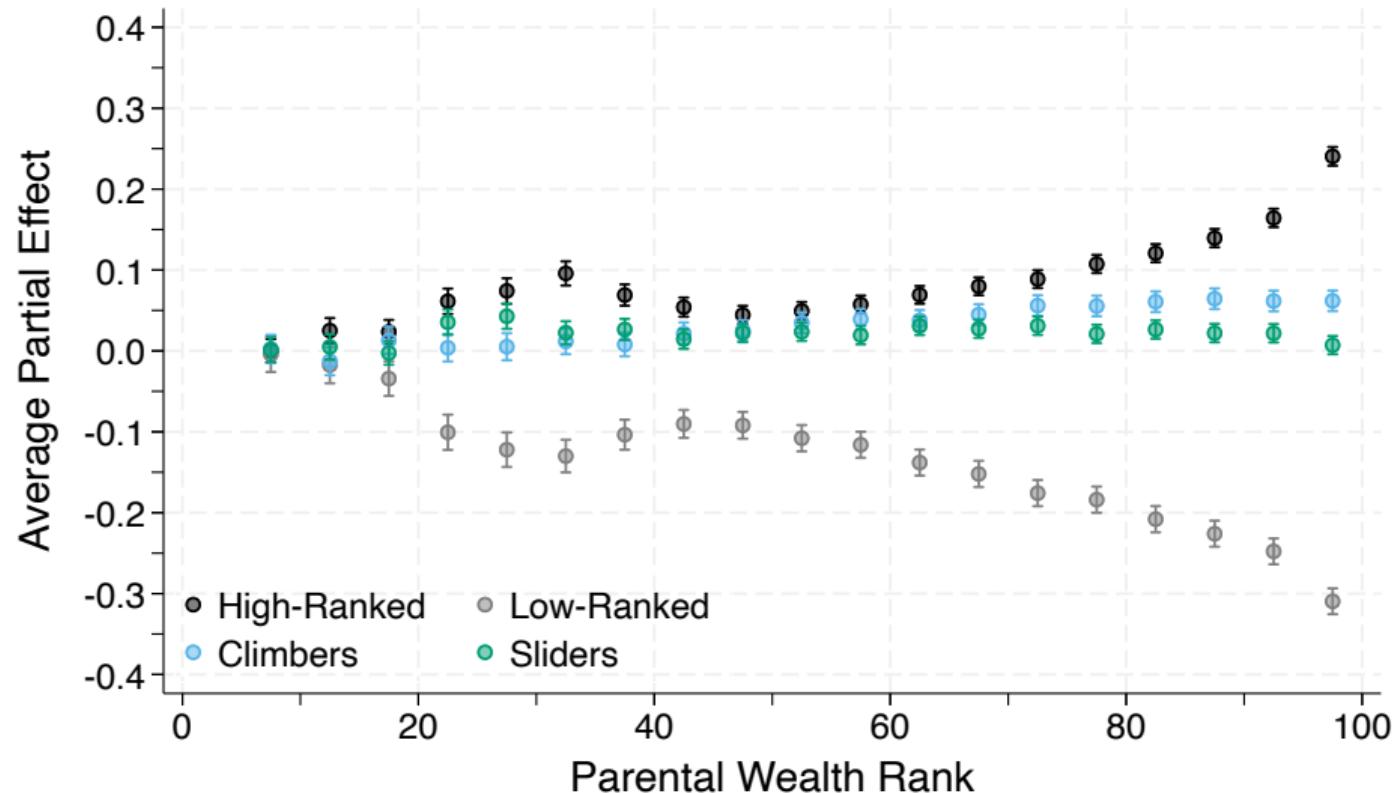
# Where Is The Land of Opportunity? Norway

◀ back



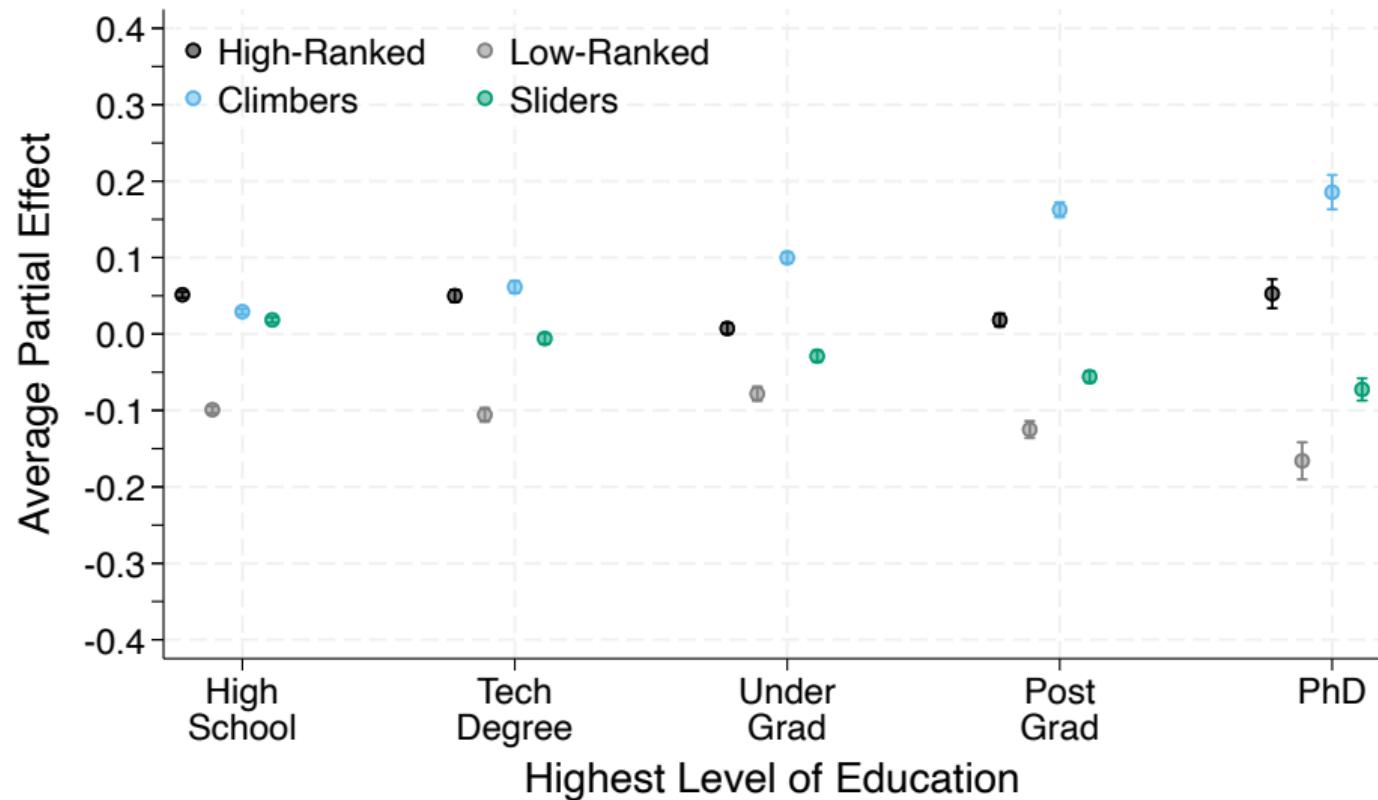
# The Non-Linear Effect of Parental Wealth: CI

◀ back



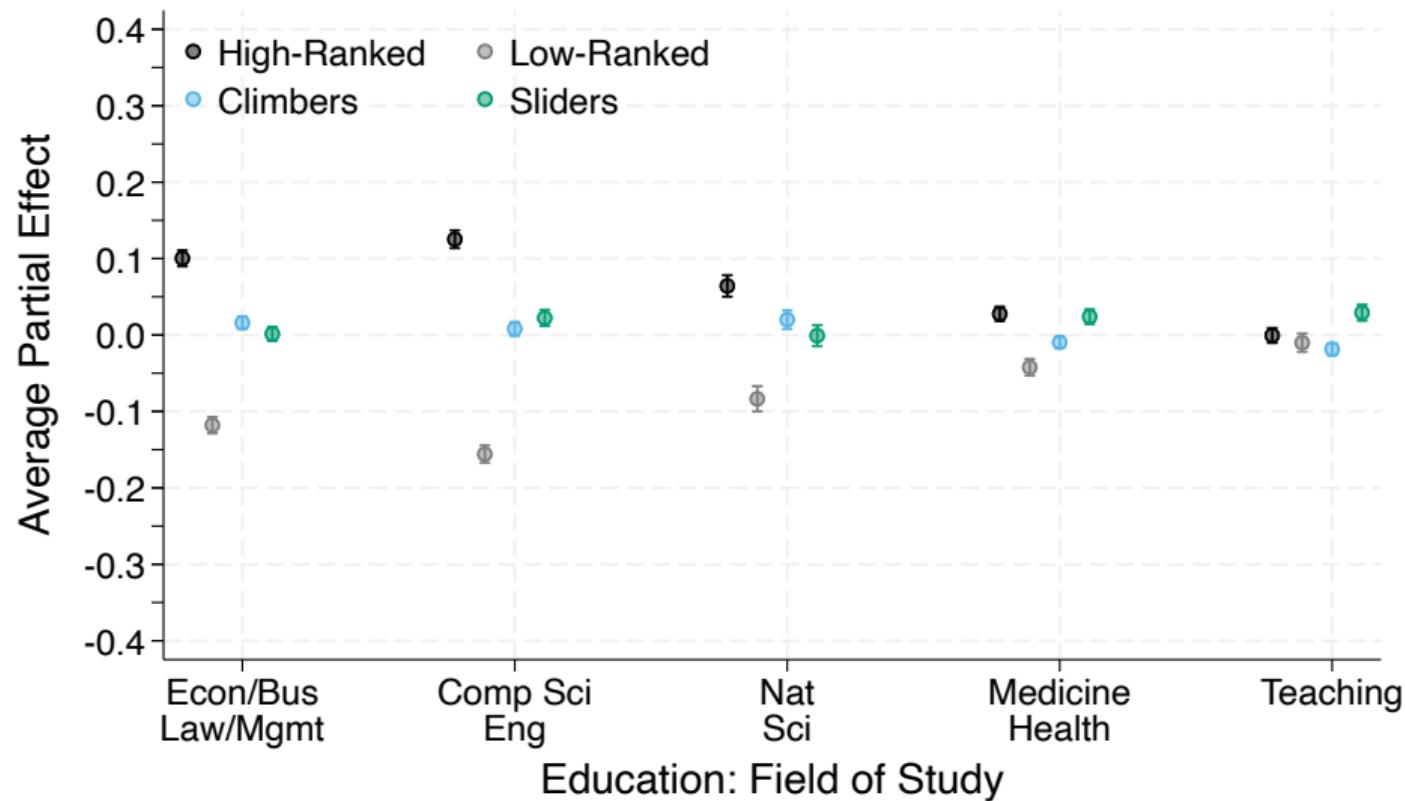
# Learn & Rise?: CI

◀ back



# Education: Fields

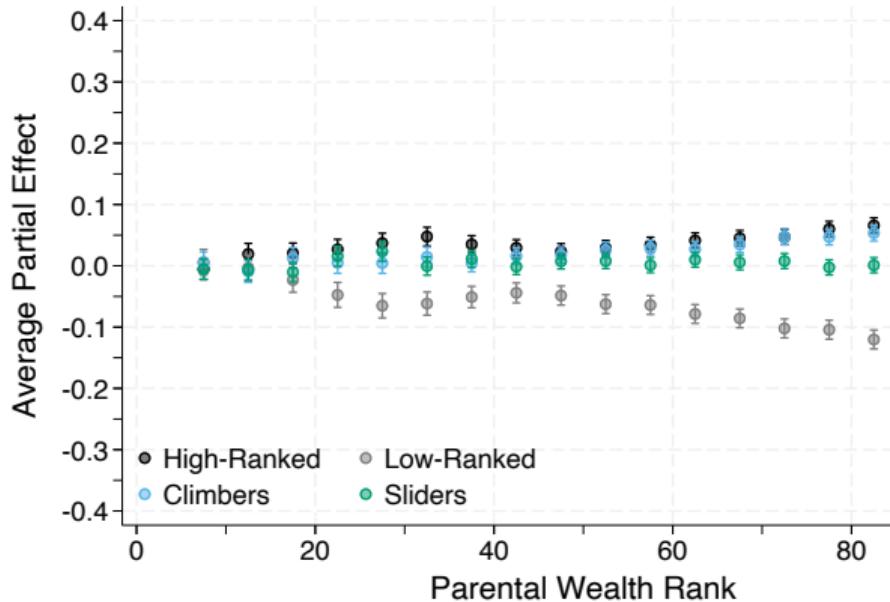
◀ Back



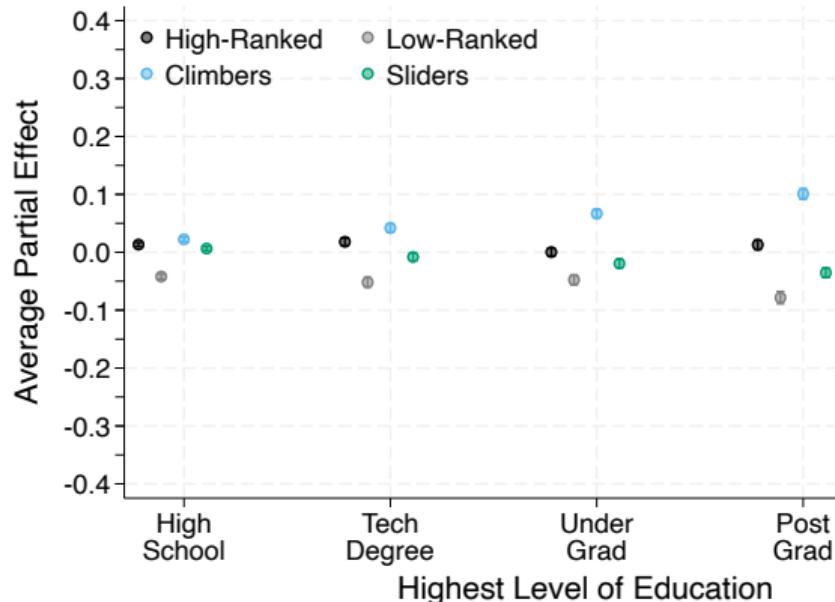
# Patterns still present after conditioning on own initial wealth

◀ Back

## Parental Wealth



## Education



- Robust to controlling for individuals' initial wealth rank + parent portfolio (1993)
  - ↓ Effect sizes by 25-40% (+ explained variation)
  - ↑ Overall variation explained ( $\times 4$ )