The Life-Cycle Dynamics of Wealth Mobility

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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.

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- Intergenerational “social” wealth mobility key as context for large wealth inequality
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Today: Flexibly and non-parametrically characterize lifetime wealth mobility

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

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2. Study how our clusters relate to other observable characteristics
   - Life cycle choices and events (Housing, civil status, portfolio composition, etc.)
   - Relative role of heterogeneity in income, savings, and returns
   - To which extent do individual characteristics at age 30 predict future trajectories?

Norwegian Wealth Data

Data: Norwegian Tax Registry 1993 – 2017

- Net-worth, assets, debt, portfolio (individual level)
- No top-coding + Limited misreporting or measurement error (third-party reporting)
  - Focus on wealth (e.g., don't include public pensions)
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- Key: We link to administrative records (Education, Family, Civil Status, Income)
- Focus on cohort born between 1960 and 1965 (first observed in early 30s)
  - 292,222 individuals in this sample (279,002 after balancing)

Ranks and Histories

- Compute within cohort ranks as

▸ Wealth Levels

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

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- Trajectories: Histories of ranks

$$\mathbf{Y}_i = \left(y_{i,1993}, y_{i,1994}, \ldots, y_{i,2016}, y_{i,2017}\right) \in [0, 100]^{25}$$

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

Intra-Generational Wealth Mobility

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

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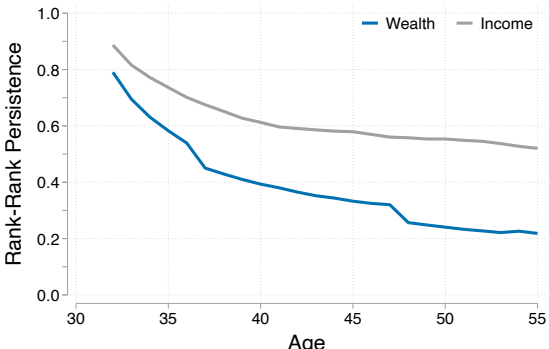

- Declining intra-generational persistence $\longrightarrow$ Increased (cumulative) mobility
- Rank-rank persistence: $\rho_t = 0.22$ by age 55 (Income $\rho_t = 0.52$)
- By age 55 only 25% of individuals remain in age 30 quintile

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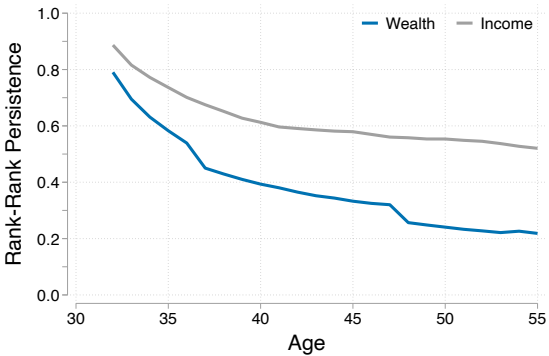

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- How broad-based is mobility? What (who) drives patterns?

Clustering Wealth Histories

Grouping Individuals Into Typical Histories

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Method: Agglomerative Hierarchical Clustering to group rank histories

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

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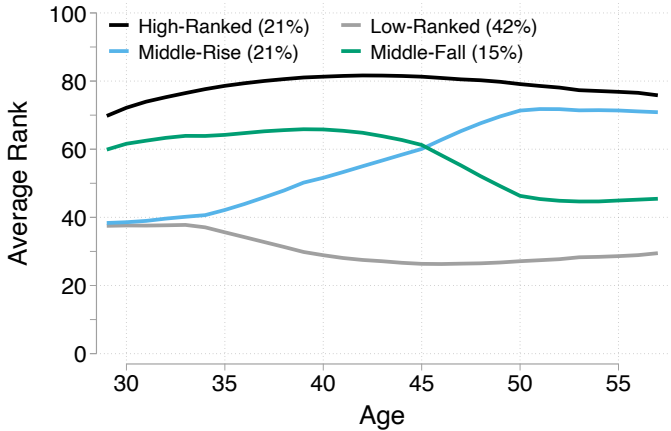
Result: Hierarchy of partitions ranging from $G = N$ to $G = 1$. ▸ Details

- Asymptotically consistent as we observe longer trajectories, even for fixed N

(Borysov, Hannig, Marron, 2014; Egashira, Yata, Aoshima, 2024)

Typical Rank Histories

Cohort Ranks



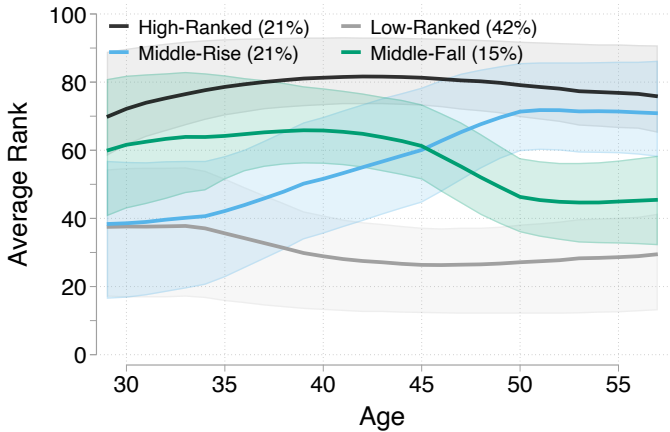
▸ Alt. Clustering ▸ Rnd Clustering

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 Risers and one group of Fallers

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%

▸ Wealth Levels ▸ Absolute Mobility

Intra-Generational Mobility

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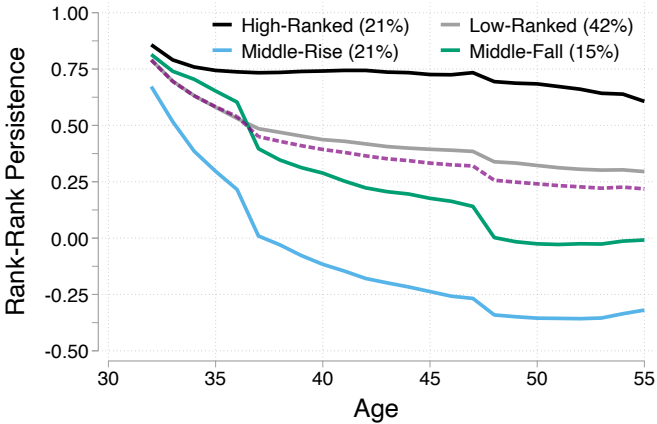

- Top: Immobile over 25y
- Bottom: Track population movements *within segment*
- Risers: Reversal of fortune within 1 decade
- Fallers: No memory in long run

▸ Shorrocks

- Mobility in the middle drives population mobility patterns. Risers are key.

Heterogeneity Across and Within Groups

Income trajectories + sources

Portfolio composition

Private business + self-employment

Household formation

Main sub-groups

Parental Wealth

Education

Sex & Birthplace

Everything Everywhere All at Once

- Lots of heterogeneity to dissect (go check the paper out!)
- Income of risers is higher than other groups (Human vs Financial Wealth)
- Property is main asset... but business assets and self-employment also matter

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Initial Circumstance:

▸ Inter-Generational Mobility

- Average partial effects of (i) Parental Wealth, and (ii) Education ▸ Details
  - Parental wealth tells top and bottom apart: Effect concentrated at the top
  - Education tells risers/fallers apart: Equalizing effect but doesn't overcome initial cond.
- Initial factors still have limited classification power across groups ▸ Results

Income, Savings, & Returns

Goal: Identify role of income, savings, and returns for wealth trajectories

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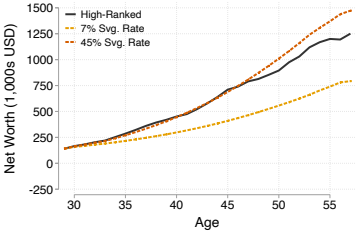
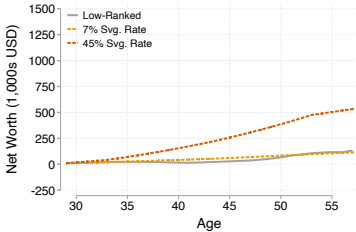
- Clustering compatible with standard buffer-stock savings model (Zeldes–Deaton–Carroll)
- Joint Income–Wealth trajectories not consistent with model (Straub 19)
- Counterfactual wealth trajectories based on savings and returns
  1. Observed income realizations
  2. Construct portfolio returns (Fagereng, Guiso, Malacrino, Pistaferri 20)
  3. Active vs Passive saving rates (Fagereng, Holm, Moll, Natvik 19)

Income, Savings, & Returns

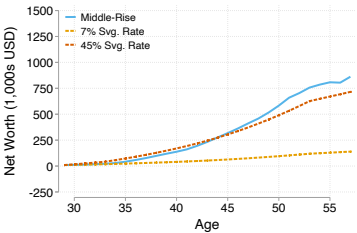
High-Ranked



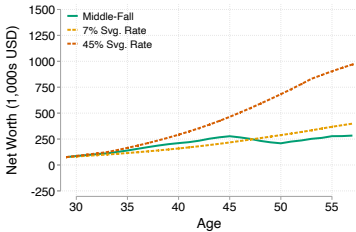
Low-Ranked



Middle-Rise



Middle-fall



Conclusions

Contribution

Flexibly and non-parametrically characterize lifetime wealth mobility

- Find evidence of substantial changes in wealth ranks over a quarter century
- Mobility driven by selected groups in the middle of the distribution

Take Away:

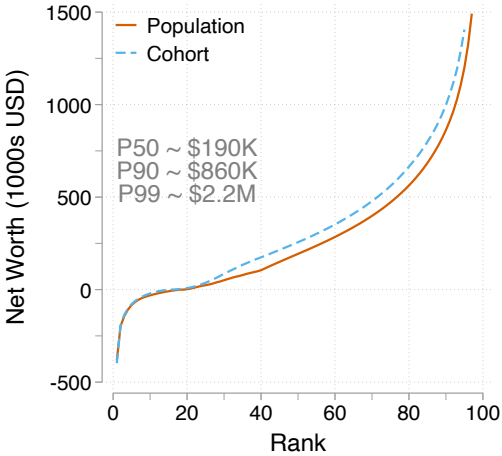
Data shows that income fluctuations and portfolio choices are insufficient to account for wealth dynamics throughout the distribution and not just at the top

Extra

Ranks vs Wealth Levels

back

Net Worth Inverse CDF (2014)



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

- Substantial wealth inequality in Norway

Context

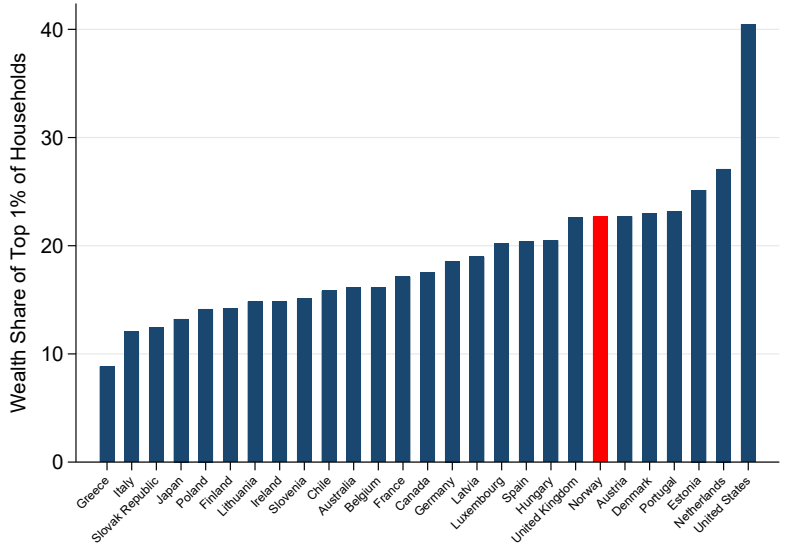
- Relative mobility in rank $\Longrightarrow$ absolute mobility in wealth level

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

BC vs Pop Ranks

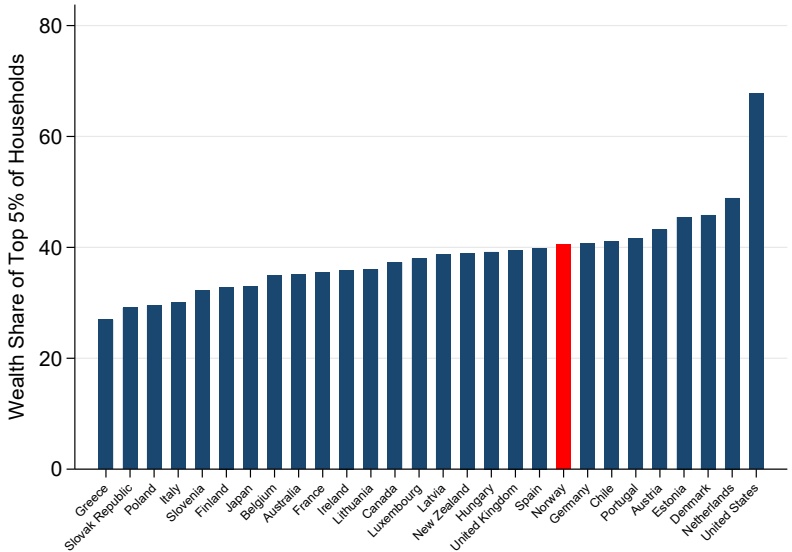
Norway in Context

Back



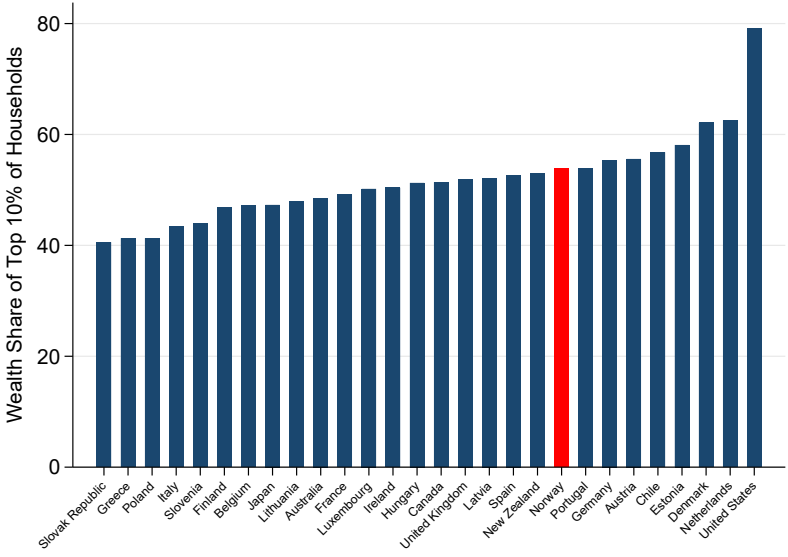
Norway in Context: Top 5% Share

Back



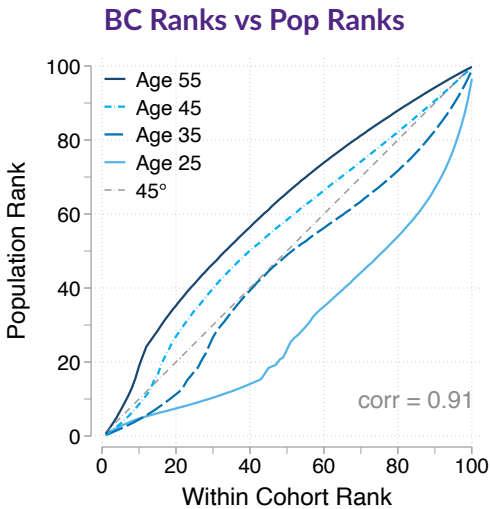
Norway in Context: Top 10% Share

Back



Birth Cohort Ranks vs Population Ranks

back



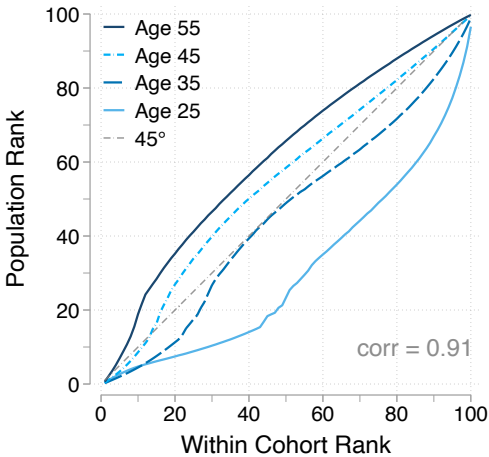
- Changes in wealth levels at each rank as the cohort ages
- 75 percent of age 25 individuals are below the median
- 35 percent of age 55 individuals are below the median

Household Ranks

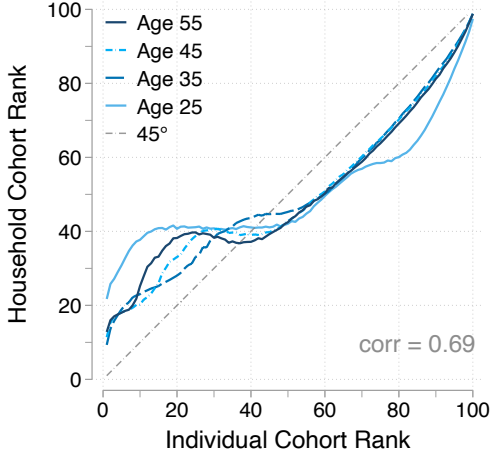
Birth Cohort Individual Ranks vs Household Ranks

back

BC Ranks vs Pop Ranks



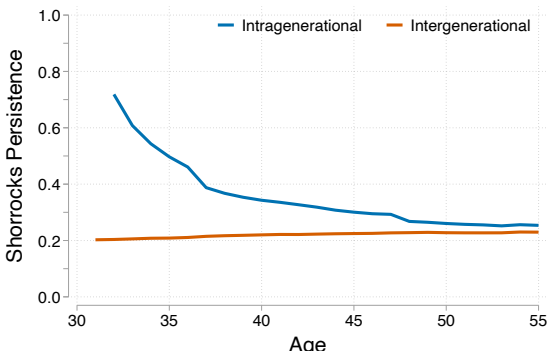
BC Individual Ranks vs Household Ranks



Shorrocks Mobility Index

back

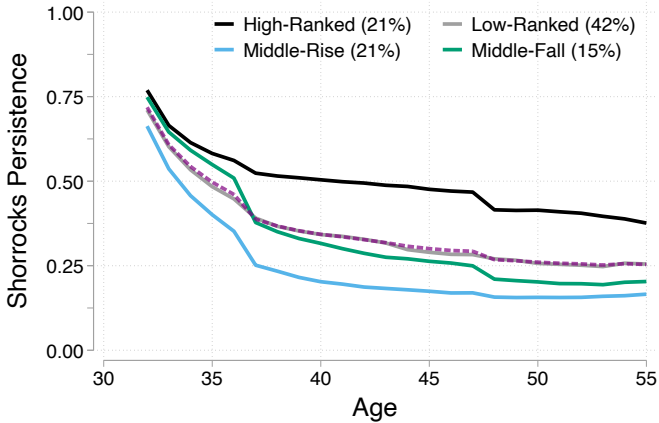
Trace of transition matrix: Divide individuals by quintiles.



- Declining intra-generational persistence $\longrightarrow$ Increased mobility
- Increasing inter-generational persistence $\longrightarrow$ Decreased mobility

Intra-Generational Shorrocks Mobility Index

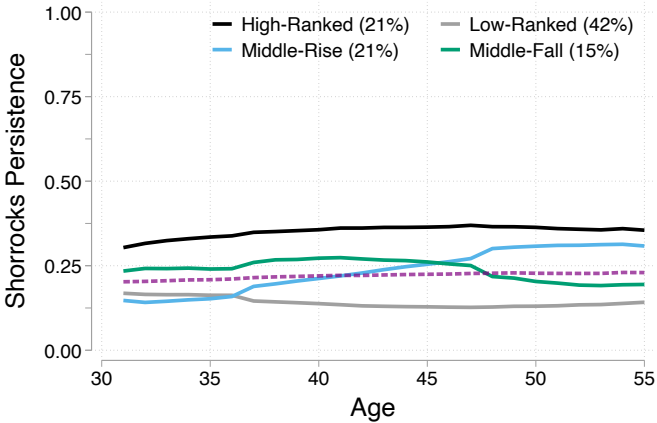
back



- 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

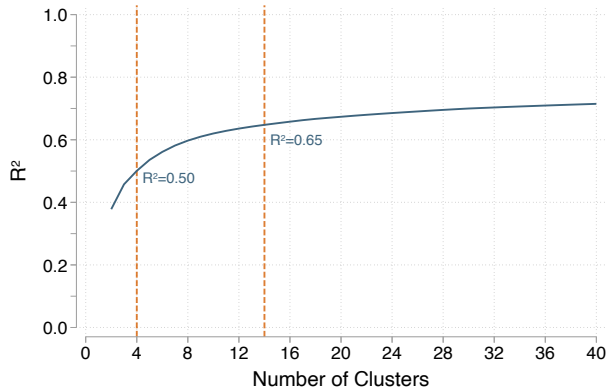
Characteristics of Main Clusters

Two Levels of Clustering

back

Clustering Tree

Variation Explained



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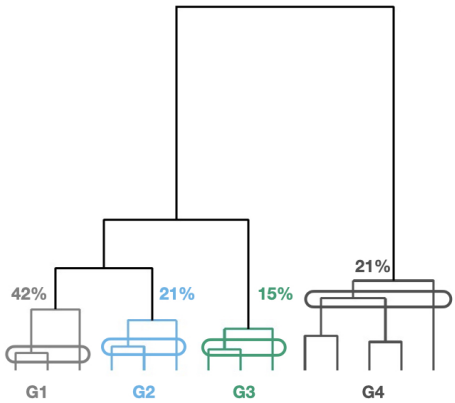

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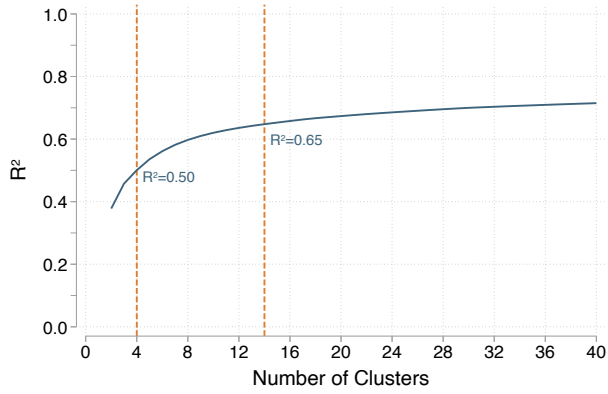

Alternative Clustering

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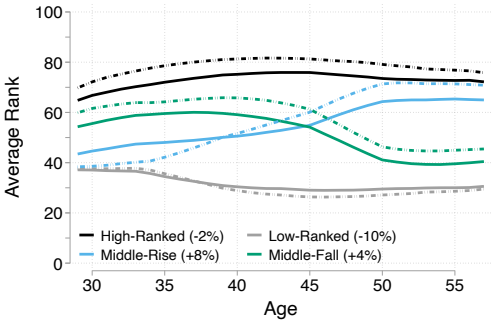
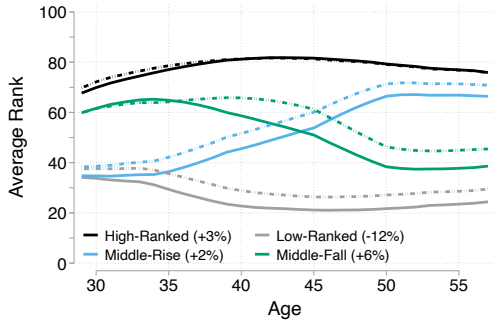
Household Cohort Ranks



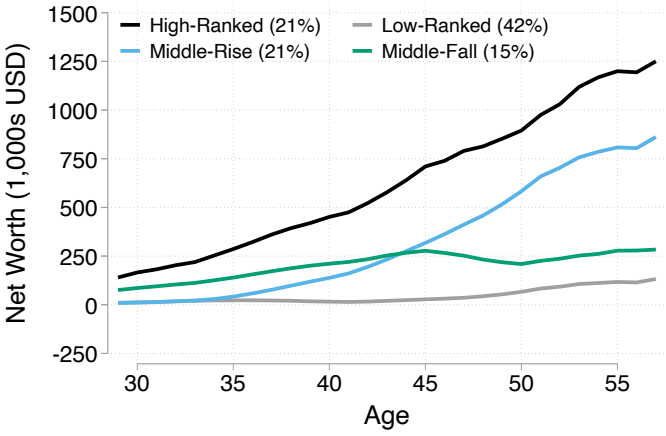
K Means on Ind. Cohort Ranks



Wealth Histories Across Segments of the Distribution

back

Net Worth ($1000s)



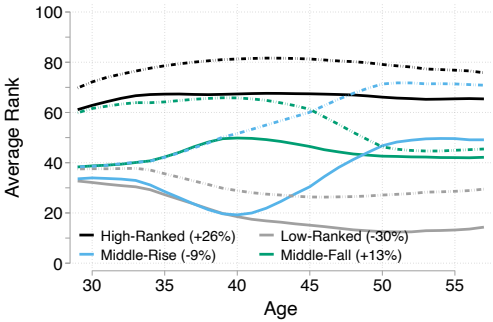
Significant diff. in wealth profiles

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

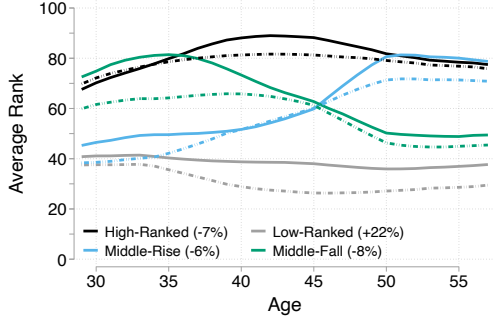
Absolute Mobility

Back

Log Net Worth



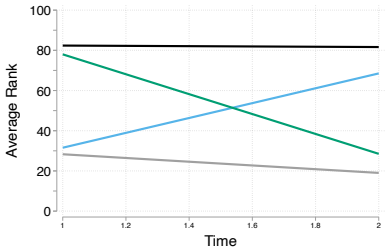
"Lorenz" Ordinates



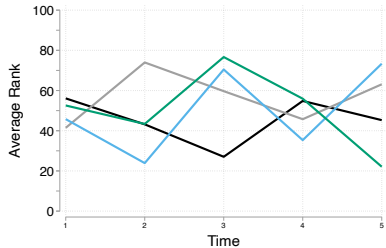
Clustering Random Ranks

Back

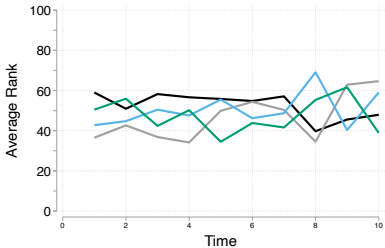
2 Periods



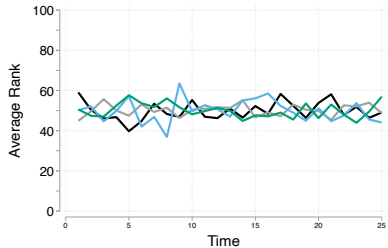
5 Periods



10 Periods



25 Periods



Household Income

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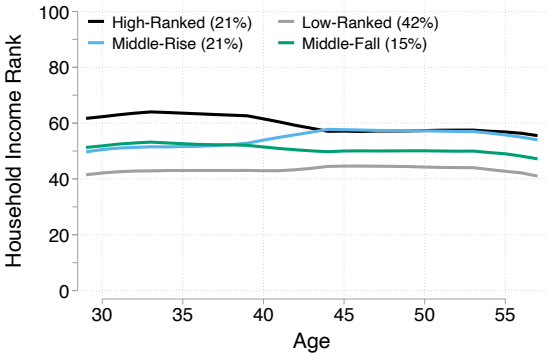
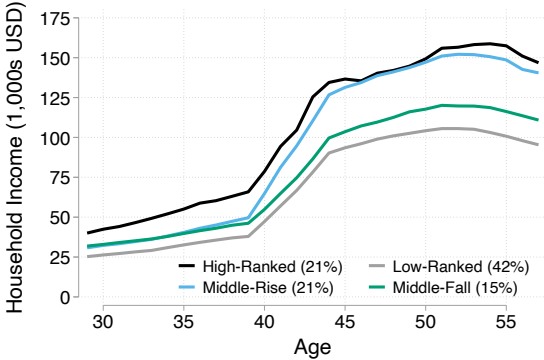
Household Income Cohort Ranks



Household Income ($1000s)



Median Income Histories

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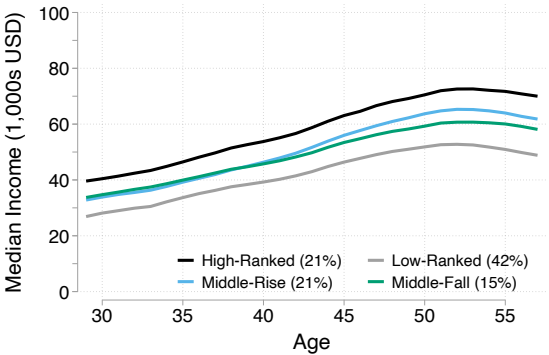
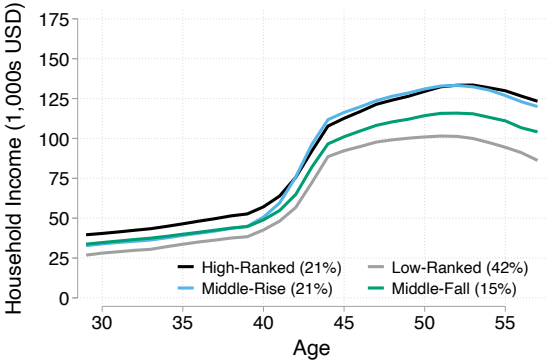
Median Income

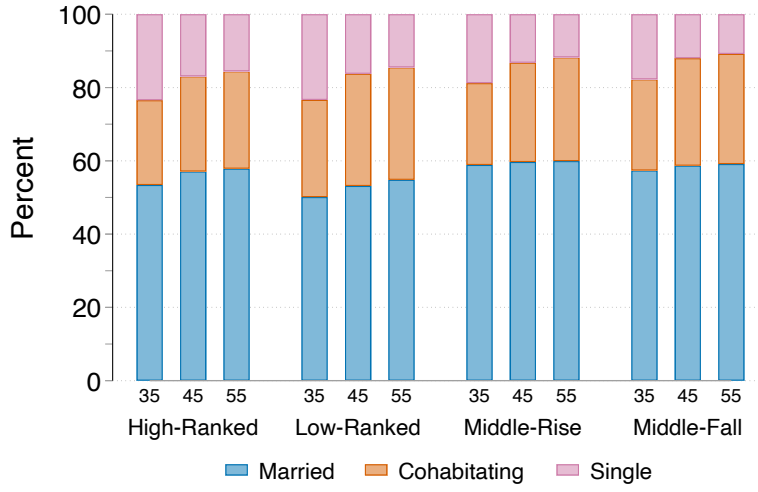


Household Median Income ($1000s)



Civil Status

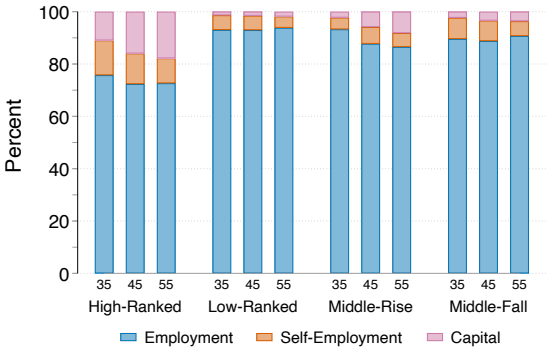
Back



Portfolio and Income Composition

Back

Income Sources



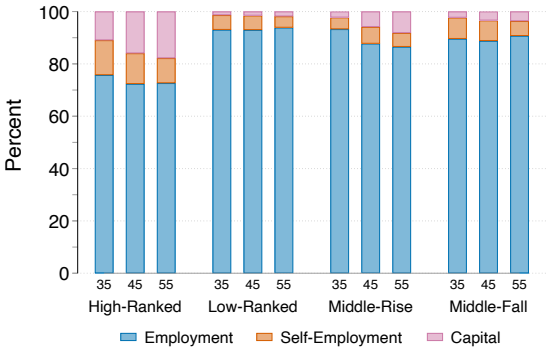
- Income differences in Self-Employment and Capital

SE Transfers Gifts

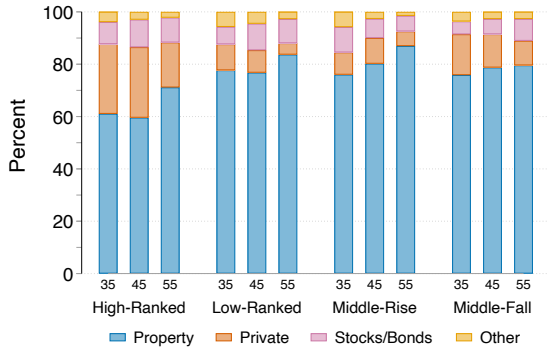
Portfolio and Income Composition

Back

Income Sources



Asset Portfolio



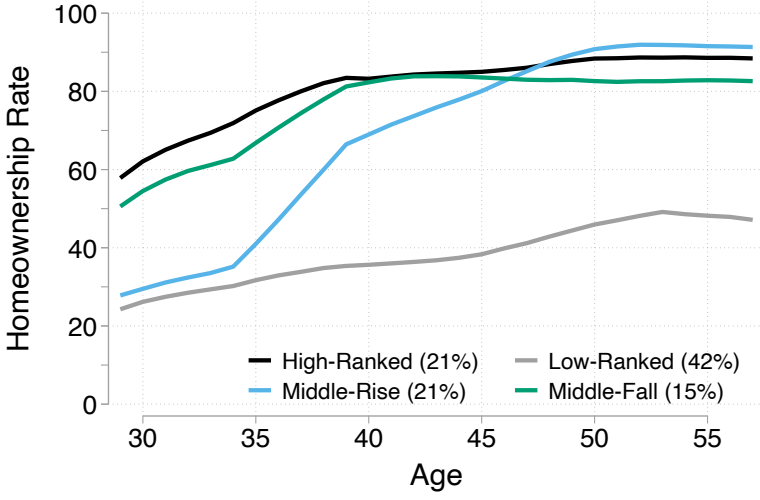
- Income differences in Self-Employment and Capital

SE Transfers Gifts

- Asset differences across clusters in Private Equity and Property

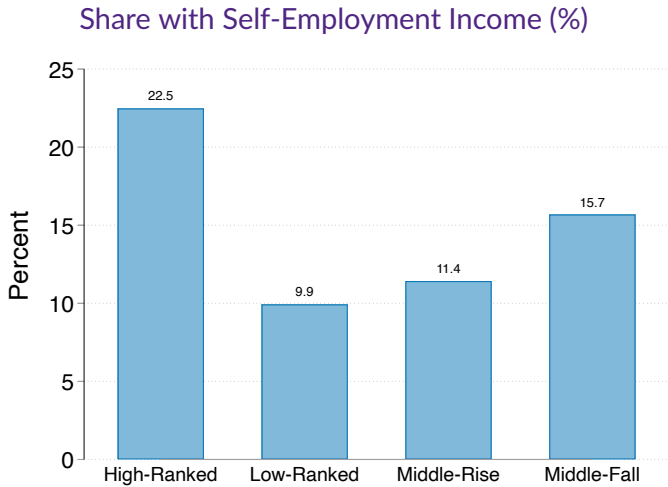
Home-ownership Rates by Cluster

Back



Self-Employment Rates, Age 45

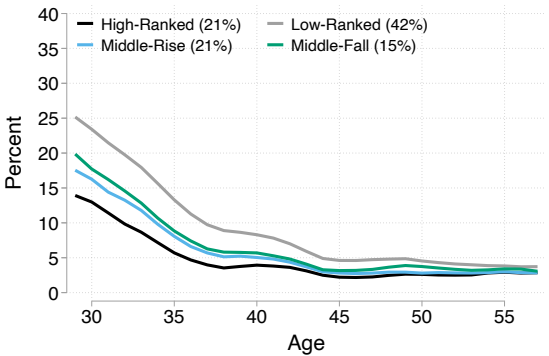
Back



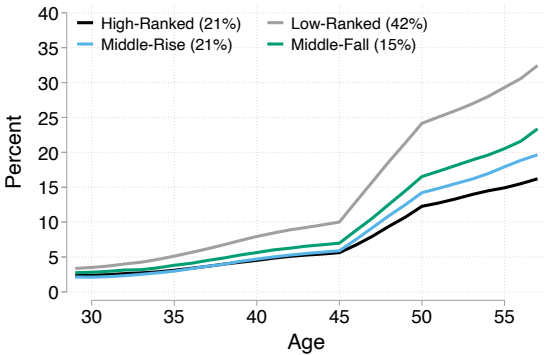
Transfers: Unemployment, Disability, Sick Leave, Nursing

Back

Share with Unemployment Benefits (%)

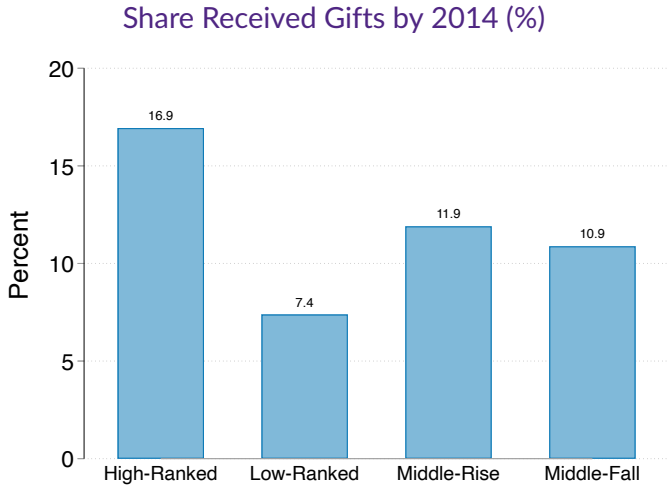


Share with Health-Related Transfers (%)



Lifetime Inheritances and Gifts

Back

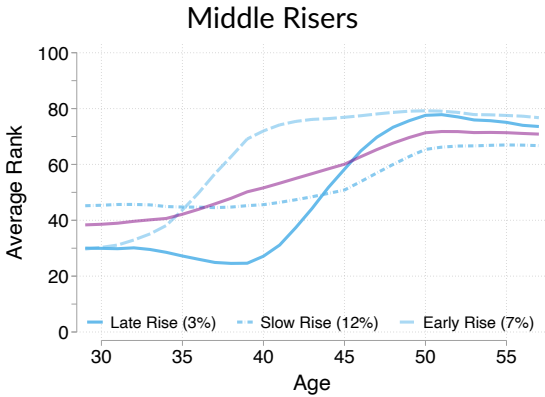


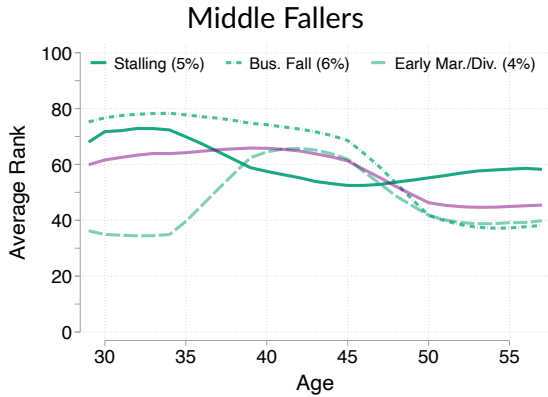
Notes: Total received $>$ NOK 470K ($\approx$ \$47K) before 2014

Characteristics of Sub-Clusters

Heterogeneity in Trajectories: Levels vs Timing

Back

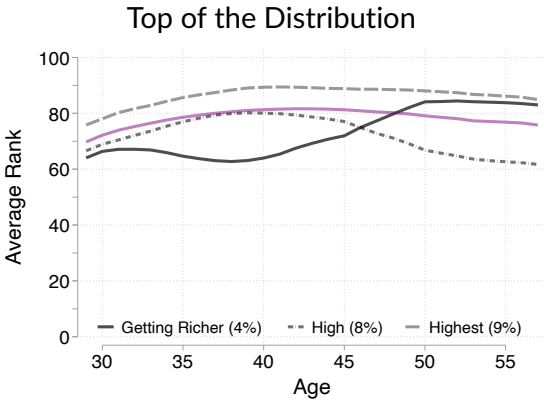


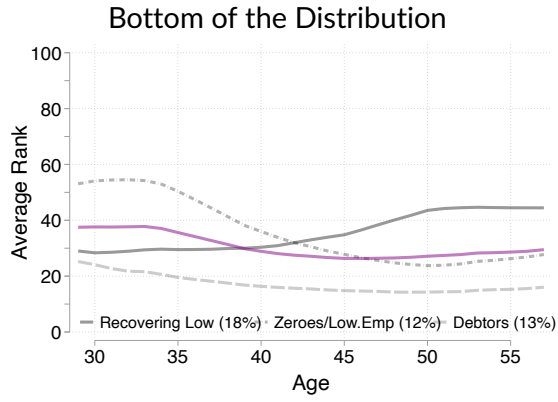


- Risers differ mainly in timing of changes (similar initial conditions)
- Fallers differ in initial conditions and timing of changes (similar final conditions)

Heterogeneity in Trajectories: Levels vs Timing

Back





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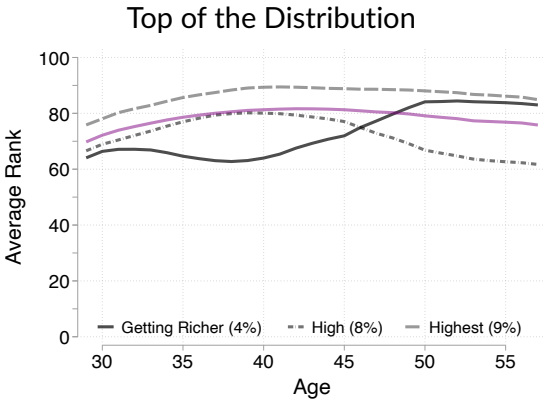
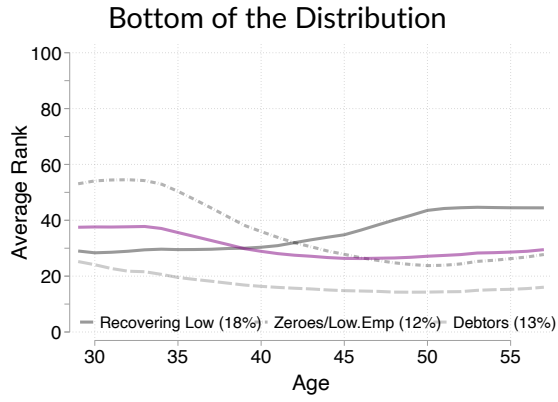
Heterogeneity in Trajectories: Levels vs Timing

Back





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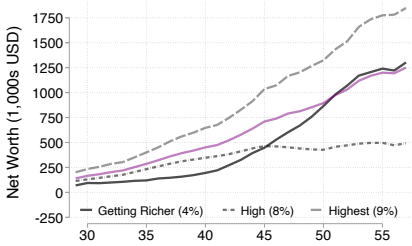
- Top and bottom groups differ mainly in avg. levels (with a rising sub-group in each)

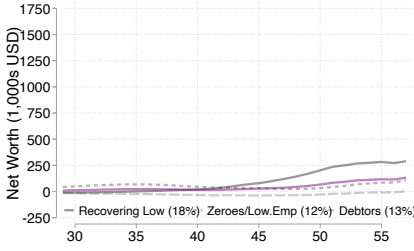
Sub-Clusters: Wealth Levels

Back

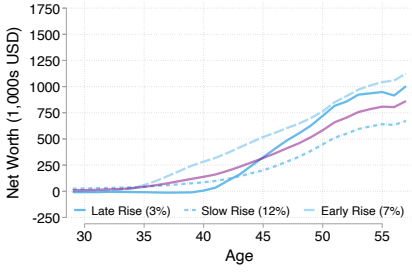
High Ranked



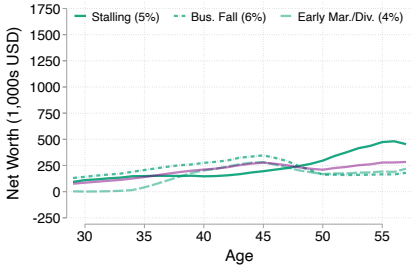
Low Ranked



Middle Risers



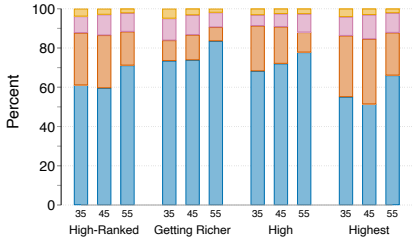
Middle Fallers



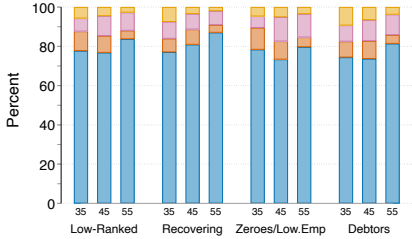
Sub-Clusters: Portfolio

Back

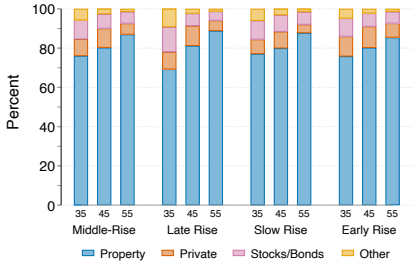
High Ranked



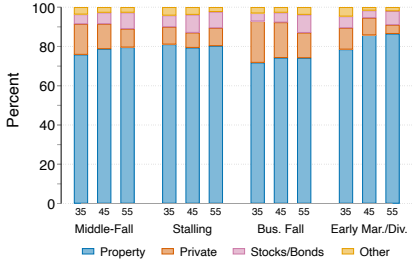
Low Ranked



Middle Risers



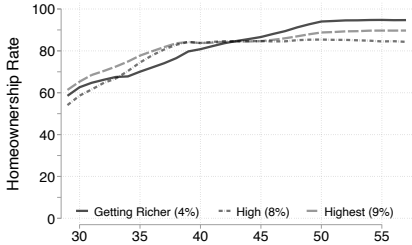
Middle Fallers



Sub-Clusters: Homeownership

Back

High Ranked



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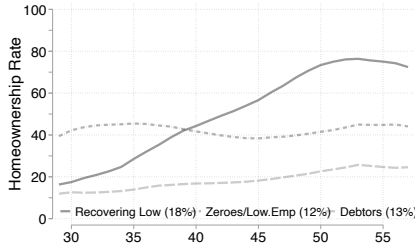
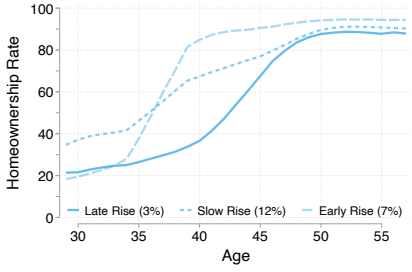
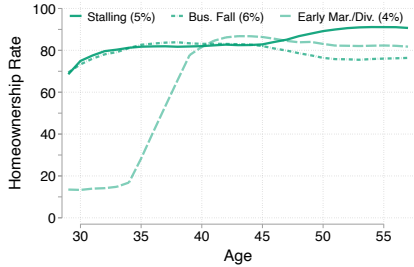


Middle Risers



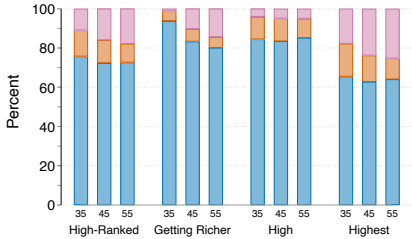
Middle Fallers



Sub-Clusters: Income Composition

Back

High Ranked



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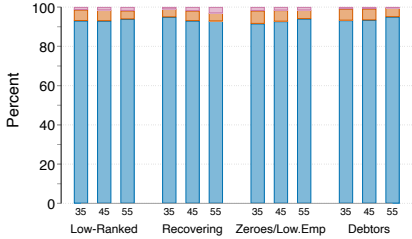
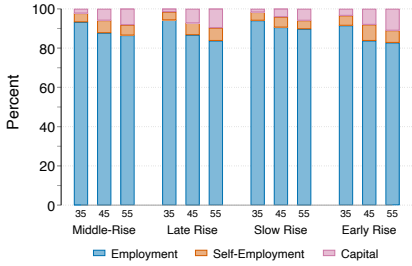
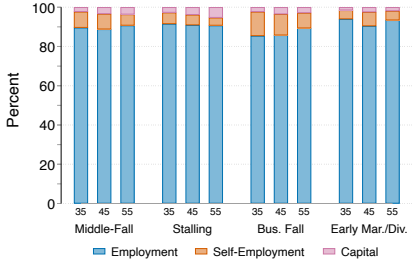


Middle Risers



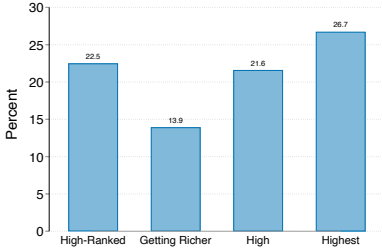
Middle Fallers



Sub-Clusters: Self-Employment

Back

High Ranked



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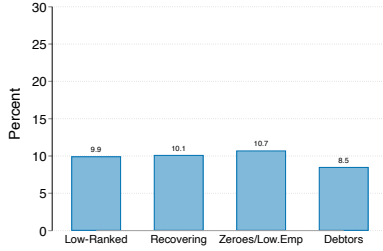

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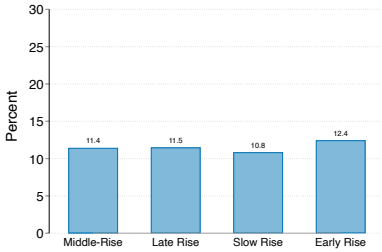
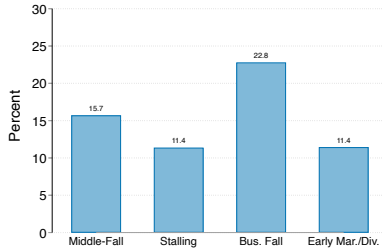


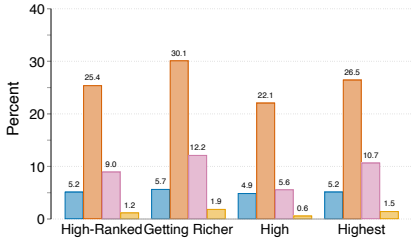
Middle Fallers



Sub-Clusters: Education

Back

High Ranked



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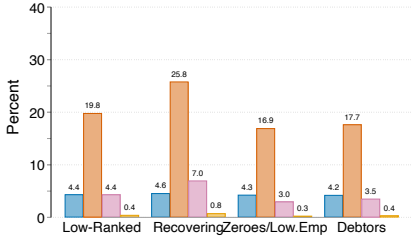
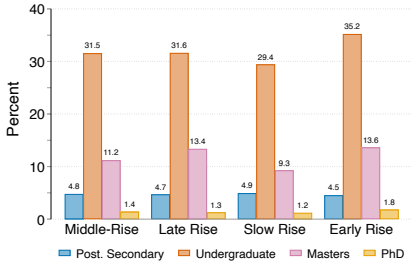
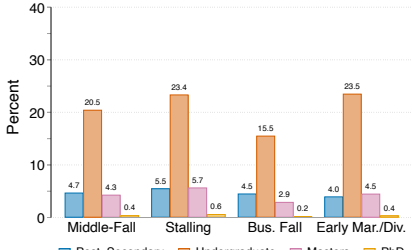


Middle Risers



Middle Fallers



Towards Determinants of Trajectories

Hereditary Advantage: Wealth vs Human Capital

back

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

Hereditary Advantage: Wealth vs Human Capital

back

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

$$Pr\left(g=j\right)=F\left(\alpha_0^j+\beta^j_{q(i)}+\gamma^j_{educ(i)}+\delta^j_{subj(i)}+\lambda^j_{male(i)}+\mu^j_{bcounty(i)}\right)$$

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

Hereditary Advantage: Wealth vs Human Capital

back

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

$$Pr(g = j) = F\left(\alpha_0^j + \beta^j_{q(i)} + \gamma^j_{educ(i)} + \delta^j_{subj(i)} + \lambda^j_{male(i)} + \mu^j_{bcounty(i)}\right)$$

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

- $\gamma^j_{educ(i)}$, $\delta^j_{subj(i)}$: Indicators for education level and subject (only for higher ed.)

Levels

Hereditary Advantage: Wealth vs Human Capital

back

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

back

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

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

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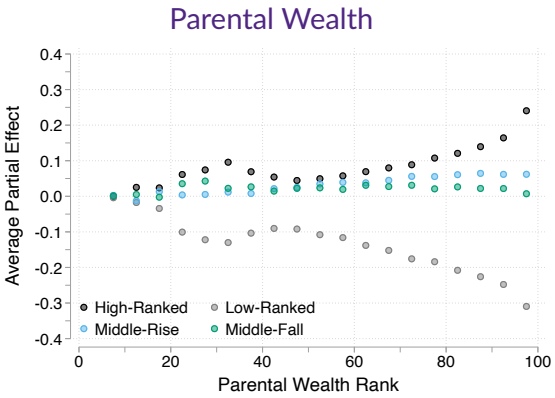
Predictors explain at most 6% of cross-group variation (same as rank-rank inter-gen reg) Results

Non-Linear Effects of Parental Wealth and Education

PW CIs | ED CIs | ED Field

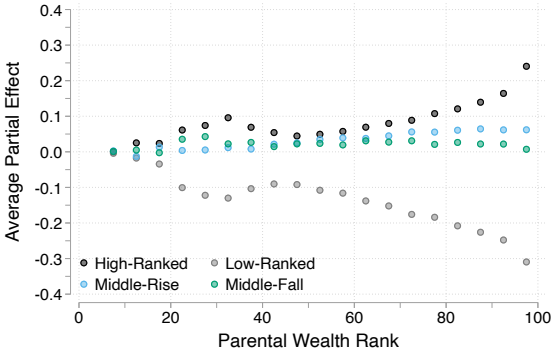


- Parental wealth's explanatory power: High for top/bottom, limited for middle groups

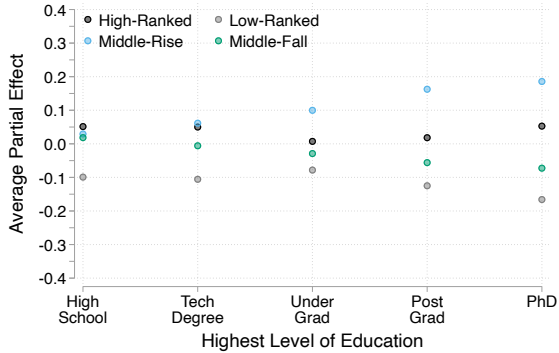
Non-Linear Effects of Parental Wealth and Education

PW CIs | ED CIs | ED Field

Parental Wealth



Education



- 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.

Shapley-Owen Decomposition

How Important Are Ex-Ante Explanations? Back

Two measures:

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

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

How Important Are Ex-Ante Explanations? Back

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

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

How Important Are Ex-Ante Explanations? Back

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

How Important Are Ex-Ante Explanations?

Back

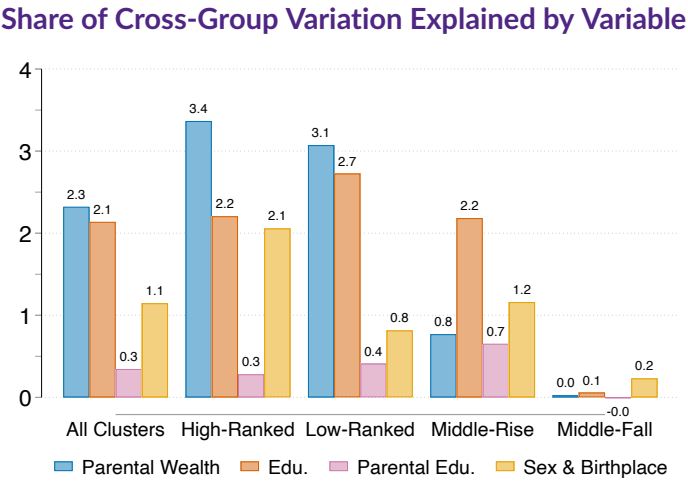
Total Contribution*	Partial Contribution			
	Parent	Education	Sex	Birth Place
Share of Distance Variation Explained by Variable (pp)				
5.9	2.4	2.3	0.8	0.4
Share of Individuals Correctly Classified (pp)				
3.1	1.1	1.3	0.6	1.2

*Contribution relative to random classification using population shares.

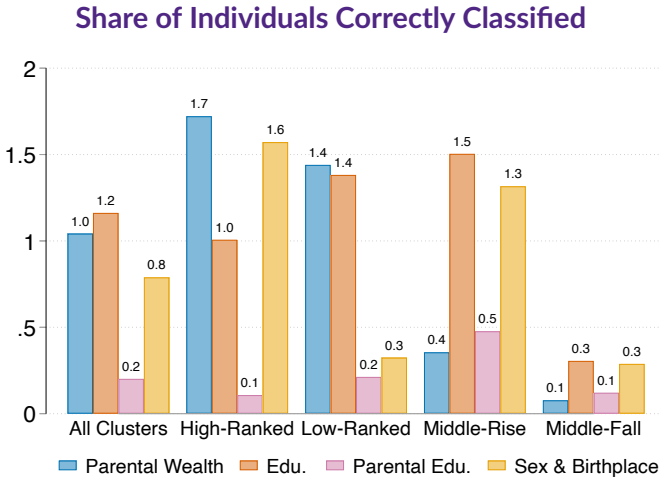
Share of individuals correctly classified by random classification 29.3% vs 32.5% with full model.

D by Cluster C by Cluster

How Important Are Ex-Ante Explanations? back



How Important Are Ex-Ante Explanations? back



*Contribution relative to random classification using population shares.

How Important Are Ex-Ante Explanations? Extra controls

Back

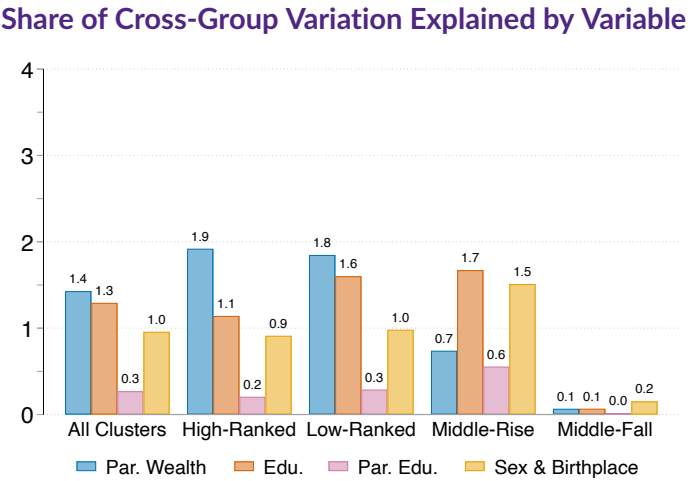
Total Contribution*	Partial Contribution					
	Parent	Education	Sex	Birth Place	Par. Bus.	Own State
Share of Distance Variation Explained by Variable (pp)						
20.0	1.6	2.0	0.6	0.3	0.6	15.0
Share of Individuals Correctly Classified (pp)						
10.6	0.8	1.1	0.4	0.2	0.3	7.9

*Contribution relative to random classification using population shares.

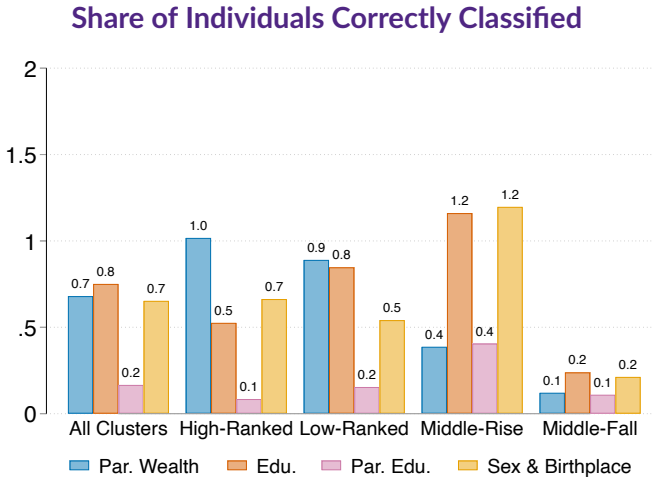
Share of individuals correctly classified by random classification 29.3% vs 40.0% with full model.

D by Cluster C by Cluster

How Important Are Ex-Ante Explanations? back



How Important Are Ex-Ante Explanations? back

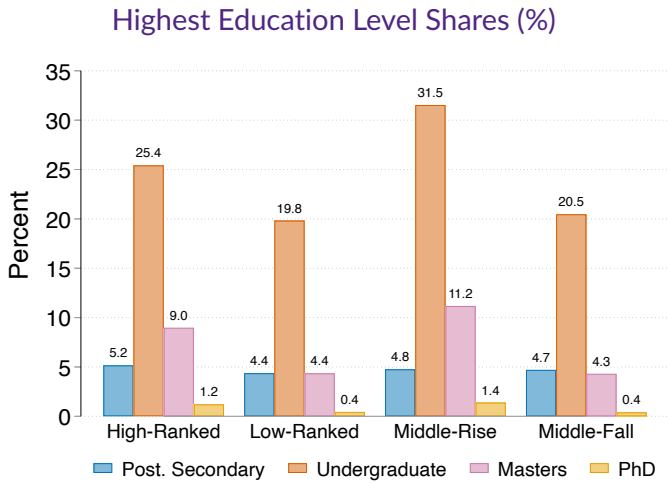


*Contribution relative to random classification using population shares.

Classification Results for Main Clusters

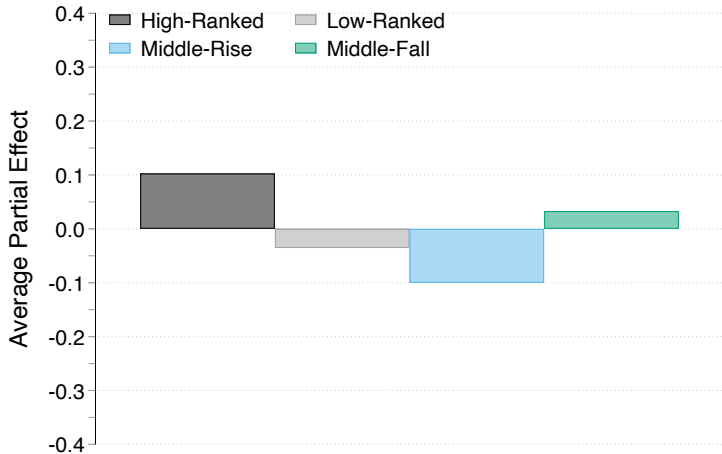
Education: Highest among risers

back



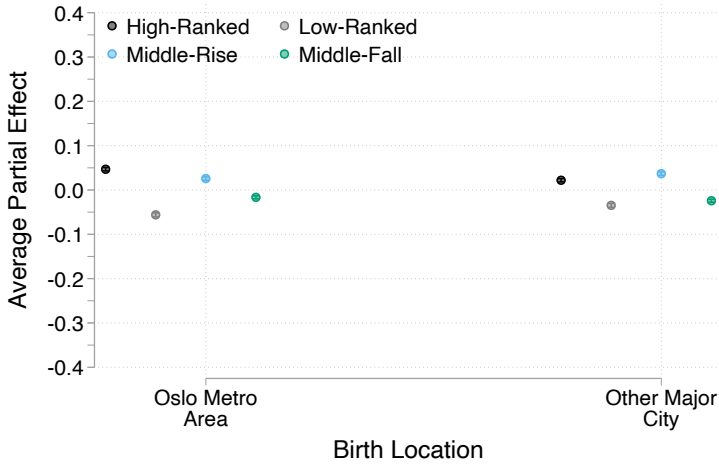
Sex Average Partial Effect

back



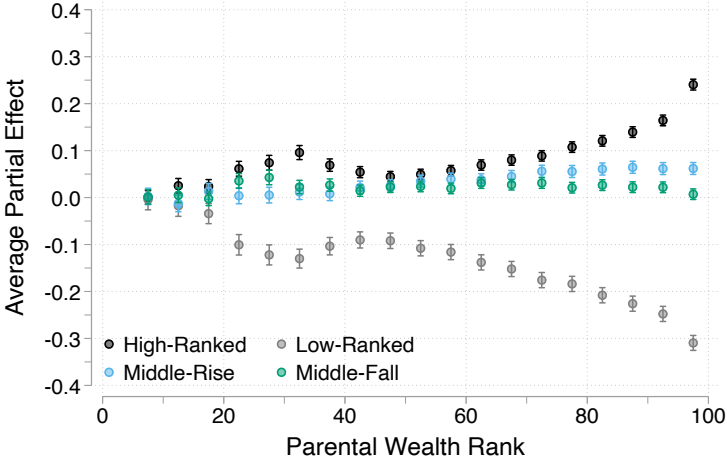
Where Is The Land of Opportunity? Norway

back



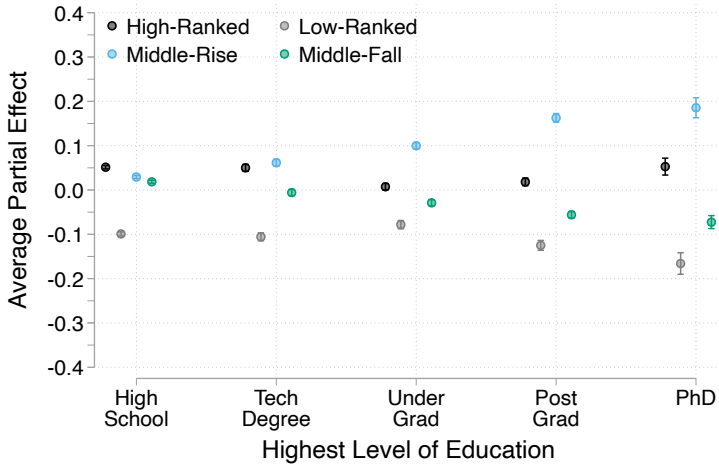
The Non-Linear Effect of Parental Wealth: CI

back



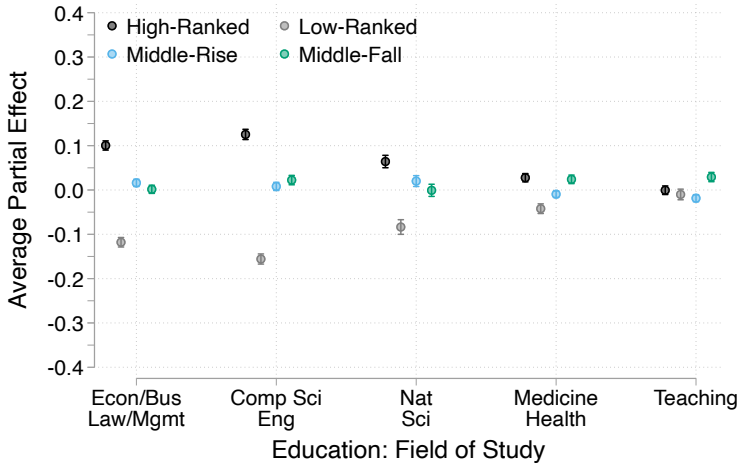
Learn & Rise?: CI

back



Education: Fields

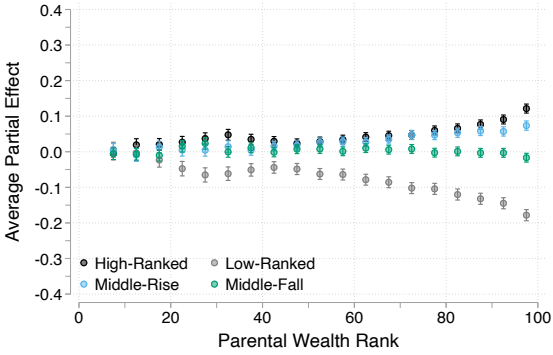
Back



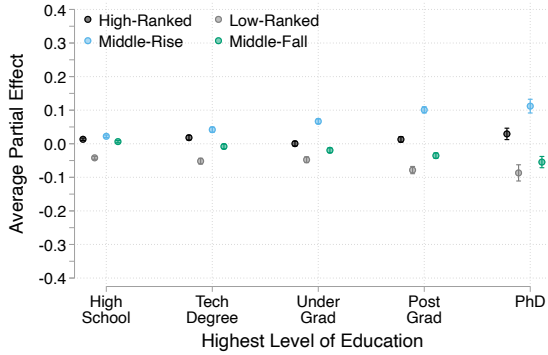
Patterns still present after conditioning on own initial wealth

Back

Parental Wealth



Education



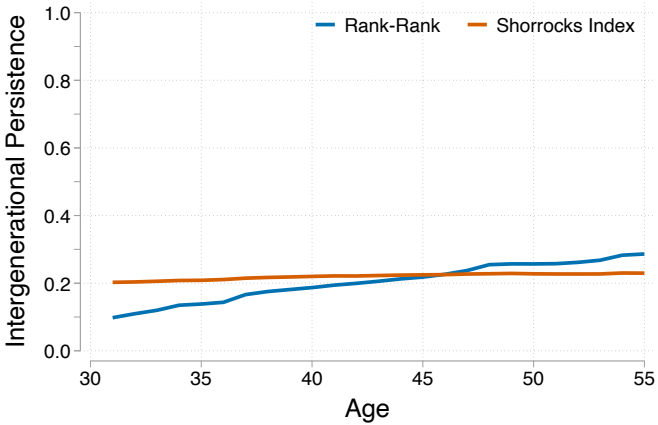
- Robust to controlling for individuals' initial wealth rank + parent portfolio (1993)
  - ↓ Effect sizes by 25-40% (+ explained variation)
  - ↑ Overall variation explained ($\times 4$)

Back to Intergenerational Mobility

Decreasing Inter-Generational Mobility

back

$$y^k_{i,t} = \alpha_t + \rho_t y^p_{i,0} + u_{i,t}$$

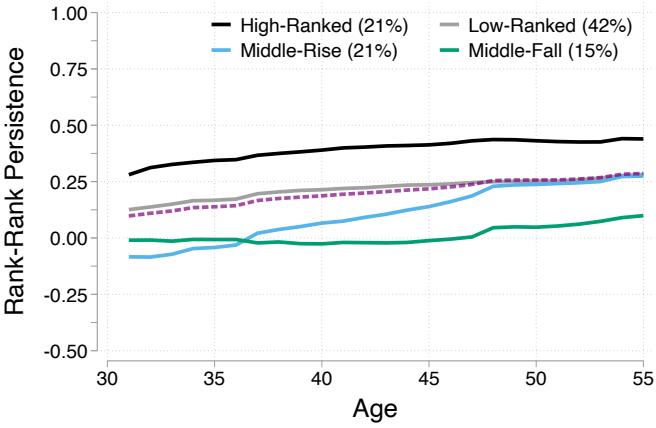


- Compute measure of mobility with respect to wealth of parents at age $\sim$ 55
- Mobility stable or rising over life-cycle
- People become more like their parents as they age

Decreasing Inter-Generational Mobility

back

$$y^k_{i,t} = \alpha_t + \rho_t^{g(i)} y^p_{i,0} + u_{i,t}$$

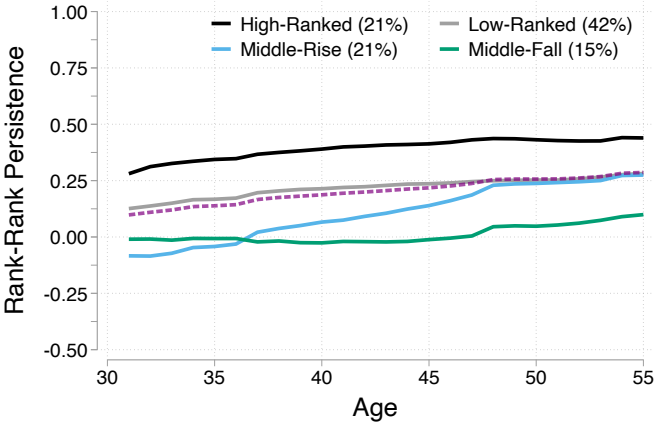


- Persistence rises for all groups
- Level differences look parallel

Decreasing Inter-Generational Mobility

back

$$y^k_{i,t} = \alpha_t + \rho^{g(i)}_t y^p_{i,0} + u_{i,t}$$



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

Shorrocks

- Clustering of trajectories captures persistent differences in mobility