Understanding 100 Years of the Evolution of Top Wealth Shares in the U.S.: What is the Role of Family Firms?

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The Rich are Different From You and Me ....

1. They have a lot of money

2. Lots of wealth mobility
   ▶ Many at the top got rich quickly

3. Top wealth shares have changed rapidly and by large amounts over last 100 years

4. Data on Innovations to top wealth
   ▶ Bloomberg and Forbes Billionaires
   ▶ Gomez 2021, Zheng 2021
   ▶ Bach, Calvet, Sodini 2020
   ▶ Fagareng et. al. 2019

This paper: Quantitative model to match these four facts based on Family Firms and their changing dynamics over the past 100 years
Empirical Challenge

Quantitative model of level and dynamics of top wealth shares

Simple random growth models: large top wealth shares imply slow dynamics for those top shares

▶ Luttmer (2016)
▶ Gabaix, Lasry, Lyons, and Moll (2016) Appendix E
▶ Hubmer, Krusell, and Smith (2020) Figure 8

also imply low wealth mobility from the bottom

▶ Luttmer (2011)
▶ Benhabib, Bisin, and Luo (2019)

Challenge: how to match facts 2 and 3 conditional on matching facts 1 and 4?
Family Firms and Dynamics of Top Wealth Shares

Family Firms: Striking Feature of Capitalist Economies

- Concentrated position even in large public firms
- Small minority overall but prevalent among very wealthy
- Families can remain undiversified for multiple generations
- Alessandra Peter (2020)

Family Firms and the Nouveau Riche

- Many of the very rich have recent fortunes
- Some of them came from very poor backgrounds
- Rapid mobility from the bottom
Family Firms and Dynamics of Top Wealth Shares

This paper: simple model of wealth dynamics

- Analytical link between dynamics of top wealth in response to shocks and wealth mobility from the bottom
  Facts 2 and 3 tied together in both a one-type and two-type model

- GLLM 2016 has slow dynamics of top wealth shares because it doesn’t have enough wealth mobility from the bottom

- Two-type model with “family firms” goes a long way to reconcile facts 1 - 4

- Difference in volatilities versus difference in means: Bach, Calvet, Sodini 20

- Hypothesis: changing dynamics of family firms can account for evolution of U.S. top wealth shares over the past century
Plan for the talk

Motivating Facts

Model: Champernowne (1953) with two types

Transitions: Gabaix, Lasry, Lions and Moll (2016) and Luttmer (2016)
  ▶ Top wealth dynamics and wealth mobility from the bottom

Calibration, drivers of wealth mobility

Transitions 1920-2020
Four Facts
The very rich have a lot of money

Forbes 400 have $3.2 Trillion in 2020

Equivalent to 2.9% of Household Net Worth

Bloomberg top 100 Billionaires worldwide have $3.5 Trillion

Pareto tail coefficient $\approx 1.5$
Wealth mobility: many get rich quickly

10 is truly bottom, 9 is working class, 8 is middle to upper middle class
8 of these self-made are under 40
(2 Snap, 2 Facebook, 3 Airbnb, 1 Nikola Motor)
70% of wealth of Bloomberg top 100 Billionaires is self-made
Proportion of self made has increased: was less than 1/2 in 1984
US Top Wealth Shares move a lot and quickly over 100 years

Figure 1: Wealth Concentration in the United States

A. Top 0.1% Share of Total Wealth

<table>
<thead>
<tr>
<th>Year</th>
<th>Equal Return, Individual (PSZ 2018)</th>
<th>Equal Return, Tax Unit (Saez Zucman 2016)</th>
<th>Our Preferred Estimate</th>
<th>Raw SCF</th>
<th>Raw SCF + Forbes 400</th>
</tr>
</thead>
<tbody>
<tr>
<td>1915</td>
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<td>1925</td>
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<td>1945</td>
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<td>2015</td>
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</tbody>
</table>

Notes: This figure plots the share of total household wealth for different wealth groups. Panel A graphs our preferred specification for the top 0.1% share of net household wealth, along with analogous series from Piketty, Saez and Zucman (2018), Saez and Zucman (2016), Kopczuk and Saez (2004) (retrieved from and updated in the appendix of Saez and Zucman (2016)), and the SCF. Panel B plots the share of aggregate household wealth in 2016 for different groups within the top decile that comes from taxable fixed income wealth, private business wealth, and public equity wealth. For example, private business wealth of the top 0.1% amounts to 8% of aggregate household wealth in the raw SCF series.
US Forbes 400 wealth share more than triples since 1980’s

Figure 2: Growth of the Forbes 400 and Top 1%, 0.1%, 0.01% Wealth Share

Notes. The figure plots the cumulative growth of top wealth shares for groups defined in the top Forbes percentile, which includes 400 households in 2017. Data for the top 10%, 1%, 0.1%, 0.01% is from Saez and Zucman (2016).

from Gomez 2021 and Zheng 2020
The very wealthy have very concentrated portfolios

Statistics for Top 100 Billionaires in Bloomberg Data

Total Net Worth in Billions: $3,547

Fraction Cash: 0.11
Fraction Private Assets: 0.21
Fraction Public Shares: 0.68

Fraction of Public Shares in top holding: 0.93
Fraction of Public Shares in top three holdings: 0.98

Fraction of Net Worth in Private Assets plus largest public holding: 0.84

Fraction of Net Worth Self Made: 0.70
Fraction of Net Worth Inherited: 0.30

from Bloomberg Billionaires. Exceptions Bill Gates and Ernesto Bertarelli Goldsmith: Also true for top wealthy families in 1930's
Model
Model Overview

- Discrete Time Random Growth Model: Champernowne (1953)
- Trinomial model with reflecting barrier at bottom
  - allows for type-dependent processes for wealth
  - Gabaix, Lasry, Lions, and Moll (2016)
  - Luttmer (2016)
  - Jones and Kim (2018)
- Family Types: Family Firm (F) and Diversified (D)
  - Switch $D \rightarrow F$: start a family firm
  - Cagetti and De Nardi (2009), Quadrini (2009)
  - Switch $F \rightarrow D$: diversify the family holdings
  - Bertrand and Schoar (2006), Peter (2019)
- Abstract from labor income: Benhabib, Bisin, Luo (2017)
  - The rich are different from you and me ...
Trinomial Implementation

Individual assets on a grid

\[ W(n) = \exp(n\Delta) \]

for \( n = 0, 1, 2, \ldots \).

probability up \( p_{uit} \) for type \( i = F, D \)

for \( n = 1, 2, \ldots \).

probability down \( p_{dit} \)

probability stay \( 1 - p_{uit} - p_{dit} \)

for \( n = 0 \).

probability stay \( 1 - p_{ui} \)

\( 1 - \phi_F \) probability transition \( F \rightarrow D \)

\( 1 - \phi_D \) probability transition \( D \rightarrow F \)

\( \nu_F, \nu_D \) stationary fractions of each type
Trinomial vs. Binomial Model

Moments of innovations:

Mean

\[(p_{u,j,t} - p_{d,j,t}) \Delta = \mu_{jt} \Delta_t\]

Uncentered second moment

\[(p_{u,j,t} + p_{d,j,t}) \Delta^2 = \sigma_{jt}^2 \Delta_t + \mu_{jt}^2 \Delta_t^2\]

Binomial Model: \(p_u + p_d = 1\)       Trinomial Model: \(0 \leq p_u + p_d \leq 1\)

In trinomial model, given grid step size \(\Delta\), flexibility in picking level of moments
Transitions of Top Wealth Shares and Wealth Mobility: Analytical Results
Steady State with one type

Second order difference equation for asset density $g_{ss}(n)$

1 stable eigenvalue $1 > \lambda > 0$

$$\lambda = \frac{p_u}{p_d}$$

Steady-state asset density

$$g_{ss} = \Lambda$$

$$\Lambda(n) = (1 - \lambda)\lambda^n$$

Asset tail coefficient

$$\zeta_{ss} = -\frac{1}{\Delta} \log(\lambda)$$

Can hit same tail coefficient with small or large asset innovation moments $\mu \Delta_t$ and $\sigma^2 \Delta_t$ with small or large $p_d$
Continuous time limit

Step Size

\[ \Delta = \sigma_{\text{max}} \sqrt{2\Delta t} \]

Mean

\[ (p_{u,j,t} - p_{d,j,t})\Delta = \mu \Delta t \]

Uncentered second moment

\[ (p_{u,j,t} + p_{d,j,t})\Delta^2 = \sigma^2 \Delta t + \mu^2 \Delta^2 t \]

Expected growth in the level of wealth

\[ g_{j,t} = \mu_{j,t} + \frac{\sigma^2_{j,t}}{2} \]

\[ \lim_{\Delta t \to 0} \zeta_{ss} = -\frac{2\mu}{\sigma^2} \]
GLLM (2016) transition experiment

Initial distribution of assets by type

\[ g_0 = \Lambda_0 \neq \Lambda_{ss} \]

\[ \Lambda_0(n) = (1 - \lambda_0)\lambda_0^n \]

Initial Tail Coefficient

\[ \zeta_0 = -\frac{1}{\Delta} \log(\lambda_0) \]

New Steady State Tail Coefficient

\[ \zeta_{ss} = -\frac{1}{\Delta} \log(\lambda_{ss}) \]

What does asset density at \( t \) look like?

\[ g_t = T^t(\Lambda_0) \]
GLLM (2016) transition experiment

Let \( 1 \) be a density that puts weight one on lowest node.

Let \( T^t(1) \) be the density after \( t \) periods for a cohort that started at the bottom.

**Proposition:**
The sequence \( g_t = T^t(\Lambda_0) \) satisfies

\[
g_{t+1} = A g_t + (1 - A) T^t(1)
\]

where \( A \) is a scalar given by

\[
A \equiv \left( p_d (1 - \lambda_0) \left( \frac{\lambda_{ss}}{\lambda_0} - 1 \right) + 1 \right)
\]

Alternatively

\[
g_t = T^t(\Lambda_0) = A^t \Lambda_0 + (1 - A) \sum_{k=0}^{t-1} A^{t-k-1} T^k(1)
\]
GLLM (2016) transition experiment

**Proposition:**
The sequence \( g_t = T^t(\Lambda_0) \) satisfies

\[
  g_{t+1} = Ag_t + (1 - A)T^t(1)
\]

where \( A \) is a scalar given by

\[
A \equiv (p_d(1 - \lambda_0)(\frac{\lambda_{ss}}{\lambda_0} - 1) + 1)
\]

**Proof.**
Direct calculation gives that

\[
T(\Lambda_0) = A\Lambda_0 + (1 - A)1.
\]

The operator \( T \) is linear. Repeated application of this operator to \( g_{t+1} = T(g_t) \) starting from \( g_0 = \Lambda_0 \) then gives the result. \( \square \)
Wealth mobility: A Transition starting from the bottom $\zeta_{ss} = 1.5$

Compare CCDF of $T^t(1)$ to steady-state CCDF at percentile $\alpha$:

$$G_t(n(\alpha))/\alpha$$

Wealth mobility high when asset innovation moments are large
Convergence of Tail Coefficient $\zeta_{ss} = 1.5$

Plot of tail coefficient $\zeta_t(n(\alpha))$ for percentiles $\alpha$

Rapid convergence of tail coefficient for high percentiles when asset innovation moments are large

Specifically, in our transition experiment, we start the economy with an initial distribution of assets $\tilde{\xi}_0$ with an initial tail coefficient of $\zeta = 2$. We compute the transition of this distribution to the new steady-state distribution $\tilde{\xi}_{ss}$ in which the steady-state tail coefficient is $\zeta = 1.5$. We display the evolution of the tail coefficient of wealth at top wealth percentiles over a 100 year period of this transition. When the distribution of assets has an exact Pareto tail, the slope of this graph is constant. However, during the transition, the asset distribution will not be exactly Pareto and hence the slope will depend on the wealth node at which it is computed. We therefore compute this wealth-level dependent slope, $\zeta_t(n(\alpha))$, in accordance with Equation 2 for nodes $n(\alpha)$ corresponding to top wealth percentiles $\alpha = 1\%$, $0.1\%$, $0.01\%$, $0.001\%$ and $0.0003\%$.

We plot the results of this computation in Figure 4.

(a) High $\sigma = 0.5$

(b) Low $\sigma = 0.25$
Summary of one-type model: option in the literature

1. The very rich have a lot of money ✓

2. Lots of wealth mobility
   - Many at the top got rich quickly ✗

3. Top wealth shares have changed rapidly and by large amounts over last 100 years ✗

4. Innovations to top wealth are volatile ✓

If you calibrate to the tail coefficient of wealth and the standard deviations of innovations to wealth with normal innovations to log wealth, then you miss wealth mobility and the dynamics of top wealth shares
Summary of one-type model: high volatility

1. The very rich have a lot of money ($\zeta_{ss} = 1.5$) ✓

2. Lots of wealth mobility
   - Many at the top got rich quickly ✓

3. Top wealth shares have changed rapidly and by large amounts over last 100 years ✓

4. Innovations to top wealth are volatile ✗

If you calibrate to the tail coefficient of wealth and wealth mobility, you get top share dynamics, but then the standard deviation of innovations to wealth with normal innovations to log wealth is too high.
Two Type Model
Steady State Two Type Model

One high variance type $F$ and one low variance type $D$

Two linked second order difference equations for densities $g_{j,ss}(n)$

2 stable eigenvalues $1 > \lambda_a > \lambda_b > 0$

Steady-state densities for $j = F, D$

$$g_{j,ss} = a_j \Lambda_a + b_j \Lambda_b$$

$$a_j + b_j = 1$$

$$\Lambda_i(n) = (1 - \lambda_i) \lambda_i^n \quad i = a, b$$

$$g_{ss}(n) = \sum_{i=1,2} \nu_i g_{i,ss}(n)$$

Limiting tail coefficient and fraction of family firms at the top

$$\lim_{n \to \infty} \zeta_{ss}(n) = -\frac{1}{\Delta} \log(\lambda_a) \quad \nu_F(n) \to \frac{\nu_F a_F}{\nu_F a_F + \nu_D a_D}$$
Calibrating Parameters and Moments

Eight parameters: $\Delta_t$, $\Delta$, $\nu_F$, $\phi_F$, $\rho_uF$, $\rho_dF$, $\rho_uD$, $\rho_dD$

1. Step size and time period

   $\Delta = \underbrace{\sigma_{max}}_{50\%} \sqrt{\frac{2}{\underbrace{\Delta_t}_{1/15000}}}$

2. Switching rates

   $F \rightarrow D$ 6.66% per year: persistence of family firms
   $D \rightarrow F$ unconditional fractions $\nu_F = 5\%$ and $\nu_D = 95\%$
   Bhandari and McGrattan (2020) Census data suggest $F \rightarrow D$ 10% per year

3. Two probabilities of innovations to wealth for each of two types

   limiting tail coefficient of wealth at the top $- \log(\lambda_a)/\Delta = 1.5$
   Bach et. al. moments
   gap in wealth growth rate top 10% and 0.01%: 3.43%
   $\sigma_{10\%} = 10.3\%$, and $\sigma_{0.01\%} = 35.79\%$
Upward wealth mobility with Family Firms

Still lots of upward mobility with just 5% Family Firms
Upward wealth mobility with Alternative Calibrations

Mobility from bottom into Forbes 400:
Is it differences in means or differences in volatilities across types

- No difference in volatility, $\sigma = 35\%$
- No difference in volatility, $\sigma = 25\%$
- Difference in mean growth rate doubled
- Difference in mean growth rate halved
Transitions 1920-2020
Evolution of idiosyncratic volatility of individual stocks

Panel B: Average Volatility

This common variation in idiosyncratic volatility cannot be explained by comovement among factor model residuals, for instance due to omitted common factors. Panel A of Figure 3 shows that raw returns share substantial common variation, with an average pairwise correlation of 13% over the 1926-2010 sample, and occasionally exceeding 40%. However, the principal components model captures nearly all of this common variation at the daily frequency, as average correlations among its residuals are typically less than 0.2%, and are never above 0.9% in a year. The same is true for the market and Fama-French models. Moving to a higher number of principal components, such as 10, has no quantitative impact on these results. Indeed, the Fama-French model and the five principal component model appear to absorb all of the comovement in returns, making omitted factors an unlikely explanation for the high degree of commonality in idiosyncratic volatilities.

Despite the absence of comovement among residual return realizations, Panel B of Figure 3 shows that average idiosyncratic volatility from various factor models is nearly the same as from Herskovic, Kelly, Lustig, van Nieuwerburgh (2014).
A Full Transition Experiment

100 years from 1920 to 2020

initial distribution with tail coefficient $\zeta_0 = 1.5$

hold $g_j, \sigma_D, \Delta, \Delta_t$ constant

For Family Firms $\sigma_{Ft}$
Model implied top tail coefficients 1920 - 2020

inequality bottoms out 20-40 years after bottom of equity volatility
Model implied top wealth shares 1920 - 2020

bottoms out 20-25 years after bottom of equity volatility $d = 0.9486$
Model implied very top wealth shares

Still a bit slow.
Model implied very top wealth shares

Timing is a bit off.
Less than 10% stay in Forbes 400 for whole 30 years (compare to Gomez)
1. The very rich have a lot of money ($\zeta_{ss} = 1.5$)✓

2. Lots of wealth mobility
   - Many at the top got rich quickly ✓

3. Top wealth shares have changed rapidly and by large amounts over last 100 years ✓

4. Innovations to top wealth are volatile ✓

Our top share dynamics are a little slow.
One might go to three or more types to refine model or consider jumps
Key is to get fast mobility from the bottom
Wealth Mobility: you don’t stay on top for long

List of Wealthy American Families 1924 (Lundberg 1937)

<table>
<thead>
<tr>
<th>FAMILY AND NUMBER OF TAX RETURNS</th>
<th>PRIMARY SOURCE OF WEALTH</th>
<th>AGGREGATE 1924 TAX</th>
<th>NET AGGREGATE INCOME TAXED</th>
<th>NET AGGREGATE FORTUNE TAXED</th>
<th>GROSS ADJUSTED FORTUNE AFTER MULTIPLYING BY 3</th>
<th>MAXIMUM ESTIMATED FORTUNE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 21 Rockefellers</td>
<td>Standard Oil</td>
<td>$7,309,989</td>
<td>$17,955,000</td>
<td>$359,100,000</td>
<td>$1,077,300,000</td>
<td>$2,500,000,000</td>
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<tr>
<td>2. 34 Morgan Inner Group</td>
<td>J. P. Morgan &amp; Co.</td>
<td>4,796,263</td>
<td>12,620,000</td>
<td>276,000,000$</td>
<td>728,000,000$</td>
<td>..................................................</td>
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<tr>
<td>(Including Morgan partners and families and eight leading Morgan corporation executives)</td>
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<tr>
<td>3. 2 Fords</td>
<td>Ford Motor Co.</td>
<td>4,766,863</td>
<td>11,000,000</td>
<td>220,000,000</td>
<td>660,000,000</td>
<td>1,000,000,000</td>
</tr>
<tr>
<td>4. 5 Harknesses</td>
<td>Standard Oil</td>
<td>2,776,735</td>
<td>7,550,000</td>
<td>150,200,000</td>
<td>450,600,000</td>
<td>800,000,000</td>
</tr>
<tr>
<td>5. 3 Mellons</td>
<td>Aluminum Company</td>
<td>3,237,876</td>
<td>7,500,000</td>
<td>150,000,000</td>
<td>450,000,000</td>
<td>1,000,000,000</td>
</tr>
<tr>
<td>6. 22 Vanderbilts</td>
<td>N. Y. Central R. R.</td>
<td>2,148,892</td>
<td>6,005,000</td>
<td>120,100,000</td>
<td>360,300,000</td>
<td>800,000,000</td>
</tr>
<tr>
<td>7. 4 Whitneys</td>
<td>Standard Oil</td>
<td>2,143,992</td>
<td>5,375,000</td>
<td>107,500,000</td>
<td>322,000,000</td>
<td>750,000,000</td>
</tr>
<tr>
<td>8. 28 Standard Oil Group</td>
<td>Standard Oil</td>
<td>1,737,857</td>
<td>5,435,000</td>
<td>118,700,000</td>
<td>356,000,000</td>
<td>..................................................</td>
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<td>(Including Archbolds, Rogerses, Bedfords, Cutlers, Flaglers, Pratts and Benjamins, but excepting others)</td>
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<td>9. 20 Du Ponts</td>
<td>E. I. du Pont de Nemours</td>
<td>1,294,651</td>
<td>3,925,000</td>
<td>79,500,000</td>
<td>238,500,000</td>
<td>1,000,000,000</td>
</tr>
<tr>
<td>10. 8 McCormicks</td>
<td>Int. Harvester and Chi. Tribune</td>
<td>1,332,517</td>
<td>3,520,000</td>
<td>70,400,000</td>
<td>211,200,000</td>
<td>..................................................</td>
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<tr>
<td>11. 2 Bakers</td>
<td>1st National Bank</td>
<td>1,575,482</td>
<td>3,500,000</td>
<td>70,000,000</td>
<td>210,000,000</td>
<td>500,000,000</td>
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<td>12. 5 Fishers</td>
<td>General Motors</td>
<td>1,424,583</td>
<td>3,225,000</td>
<td>64,500,000</td>
<td>193,500,000</td>
<td>500,000,000</td>
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<tr>
<td>13. 6 Guggenheim</td>
<td>Amer. Smelting &amp; Rfg. Co.</td>
<td>817,836</td>
<td>2,185,000</td>
<td>63,700,000</td>
<td>190,100,000</td>
<td>..................................................</td>
</tr>
<tr>
<td>14. 6 Fields</td>
<td>Marshall Field &amp; Co.</td>
<td>1,197,605</td>
<td>3,000,000</td>
<td>60,000,000</td>
<td>180,000,000</td>
<td>..................................................</td>
</tr>
<tr>
<td>15. 5 Curtiss-Boks</td>
<td>Curtis Pub. Co.</td>
<td>1,303,228</td>
<td>2,900,000</td>
<td>58,000,000</td>
<td>174,000,000</td>
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<td>16. 3 Dukes</td>
<td>Am. Tobacco Co.</td>
<td>1,045,544</td>
<td>2,600,000</td>
<td>52,000,000</td>
<td>156,000,000</td>
<td>..................................................</td>
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<tr>
<td>17. 3 Berwinds</td>
<td>Berwind-White Coal Co.</td>
<td>906,495</td>
<td>2,500,000</td>
<td>50,000,000</td>
<td>150,000,000</td>
<td>..................................................</td>
</tr>
<tr>
<td>18. 17 Lehmans</td>
<td>Lehman Brothers</td>
<td>672,897</td>
<td>2,150,000</td>
<td>43,000,000</td>
<td>129,000,000</td>
<td>300,000,000</td>
</tr>
<tr>
<td>19. 3 Widners</td>
<td>Am. Tob. &amp; Pub. Utilities</td>
<td>772,720</td>
<td>1,975,000</td>
<td>39,500,000</td>
<td>118,500,000</td>
<td>..................................................</td>
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<tr>
<td>20. 7 Reynolds</td>
<td>R. J. Reynolds Tobacco Co.</td>
<td>652,824</td>
<td>1,950,000</td>
<td>39,000,000</td>
<td>117,000,000</td>
<td>..................................................</td>
</tr>
<tr>
<td>21. 3 Astors</td>
<td>Real Estate</td>
<td>783,002</td>
<td>1,900,000</td>
<td>38,000,000</td>
<td>114,000,000</td>
<td>300,000,000</td>
</tr>
<tr>
<td>22. 6 Winthrops</td>
<td>Miscellaneous</td>
<td>651,188</td>
<td>1,735,000</td>
<td>34,700,000</td>
<td>104,100,000</td>
<td>..................................................</td>
</tr>
<tr>
<td>23. 3 Stillmans</td>
<td>National City Bank</td>
<td>623,014</td>
<td>1,700,000</td>
<td>34,000,000</td>
<td>102,000,000</td>
<td>500,000,000</td>
</tr>
<tr>
<td>24. 3 Timken's</td>
<td>Timken Roller Bearing Co.</td>
<td>781,435</td>
<td>1,850,000</td>
<td>37,000,000</td>
<td>111,000,000</td>
<td>..................................................</td>
</tr>
<tr>
<td>25. 4 Pitcairns</td>
<td>Pittsburgh Plate Glass Co.</td>
<td>752,545</td>
<td>1,660,000</td>
<td>33,200,000</td>
<td>99,600,000</td>
<td>..................................................</td>
</tr>
<tr>
<td>26. 8 Warburgs</td>
<td>Kuhn, Loeb &amp; Co.</td>
<td>598,246</td>
<td>1,620,000</td>
<td>32,400,000</td>
<td>97,200,000$</td>
<td>..................................................</td>
</tr>
<tr>
<td>27. 4 Metcalfs</td>
<td>Rhode Island textile mills</td>
<td>623,817</td>
<td>1,510,000</td>
<td>30,200,000</td>
<td>90,600,000</td>
<td>..................................................</td>
</tr>
<tr>
<td>Rank</td>
<td>Name</td>
<td>Net Worth</td>
<td>Origin of Wealth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------------------------</td>
<td>------------</td>
<td>---------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Walton family</td>
<td>$130 billion</td>
<td>Wal-Mart</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Koch family</td>
<td>$82 billion</td>
<td>diversified</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Mars family</td>
<td>$78 billion</td>
<td>candy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Cargill-MacMillan family</td>
<td>$49 billion</td>
<td>Cargill Inc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Cox family</td>
<td>$41 billion</td>
<td>media</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>S.C. Johnson family</td>
<td>$30 billion</td>
<td>cleaning products</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Pritzker family</td>
<td>$29 billion</td>
<td>hotels, investments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>(Edward) Johnson family</td>
<td>$28.5 billion</td>
<td>money management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Hearst family</td>
<td>$28 billion</td>
<td>Hearst Corp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Duncan family</td>
<td>$21.5 billion</td>
<td>pipelines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Newhouse family</td>
<td>$18.5 billion</td>
<td>magazines, cable TV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Lauder family</td>
<td>$17.9 billion</td>
<td>Estee Lauder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Dorrance family</td>
<td>$17.1 billion</td>
<td>Campbell Soup Co.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Ziff family</td>
<td>$14.4 billion</td>
<td>publishing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Du Pont family</td>
<td>$14.3 billion</td>
<td>DuPont (chemicals)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Hunt family</td>
<td>$13.7 billion</td>
<td>oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Goldman family</td>
<td>$13.7 billion</td>
<td>real estate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Busch family</td>
<td>$13.4 billion</td>
<td>Anheuser-Busch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Sackler family</td>
<td>$13 billion</td>
<td>pain medicines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Brown family</td>
<td>$12.3 billion</td>
<td>liquor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Marshall family</td>
<td>$12 billion</td>
<td>diversified</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Mellon family</td>
<td>$11.5 billion</td>
<td>banking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Butt family</td>
<td>$11 billion</td>
<td>supermarkets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Rockefeller family</td>
<td>$11 billion</td>
<td>oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Gallo family</td>
<td>$10.7 billion</td>
<td>wine, liquor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GLLM (2016) transition experiment

\[
\begin{bmatrix}
a_{F,t+1} \\ a_{D,t+1}
\end{bmatrix} =
\begin{bmatrix}
\phi_F A_F & (1 - \phi_F) A_D \\
(1 - \phi_D) A_F & \phi_D A_D
\end{bmatrix}
\begin{bmatrix}
a_{F,t} \\ a_{D,t}
\end{bmatrix}
\]

\[
\begin{bmatrix}
b_{F,t+1} \\ b_{D,t+1}
\end{bmatrix} =
\begin{bmatrix}
\phi_F B_F & (1 - \phi_F) B_D \\
(1 - \phi_D) B_F & \phi_D B_D
\end{bmatrix}
\begin{bmatrix}
b_{F,t} \\ b_{D,t}
\end{bmatrix}
\]

\[
A_j = \begin{bmatrix} 1 + p_{u,j} \frac{1 - \lambda_a}{\lambda_a} - p_{d,j}(1 - \lambda_a) \end{bmatrix}
\]

\[
B_j = \begin{bmatrix} 1 + p_{u,j} \frac{1 - \lambda_b}{\lambda_b} - p_{d,j}(1 - \lambda_b) \end{bmatrix}
\]

and \( c_{F,0} = c_{D,0} = 0 \) and

\[
c_{F,t+1} = \phi_F \left(a_{F,t} + b_{F,t}\right) + (1 - \phi_F) \left(a_{D,t} + b_{D,t}\right) - \left(a_{F,t+1} + b_{F,t+1}\right)
\]

\[
c_{D,t+1} = \phi_D \left(a_{D,t} + b_{D,t}\right) + (1 - \phi_D) \left(a_{F,t} + b_{F,t}\right) - \left(a_{D,t+1} + b_{D,t+1}\right)
\]
Some keep these concentrated portfolios for generations

Companies by Founding Year and Sector

from EY St Gallen Family Business Index follows family firms in 2nd generation or more
Census Data on Business Age

**Figure 1. Business Age Profile**

Notes. The U.S. estimates are based on the Survey of Business Owners microsample in 2007. The series is the fraction of owners reporting that they began operating their business in the current year, one year ago, two years ago, and so on. Individual information about how and when they acquired the businesses is included in the SBO for up to four owners. For acquisitions before 2004, the SBO uses intervals when reporting the data and we plot per-year averages. For the model, we compute the number of years in operation for all owners and record fractions separately for each year.

from Bhandari and McGrattan 2021