Why Are the Wealthiest So Wealthy?*

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Abstract

We use administrative panel data from Norway between 1993 and 2015 on wealth and income to study lifecycle wealth dynamics. We investigate the past and the future asset accumulation patterns of different wealth groups. We find strong persistence at the top of the wealth distribution. On average, the wealthiest start their lives significantly richer than other households in the same cohort, invest mostly in private equity, earn higher returns, and derive most of their lifetime income from dividends and capital gains. Inheritances and inter vivos transfers constitute a small fraction of the lifetime resources for most households except for a few wealthy ones who, in general, receive these funds earlier in life and more in the form of private equity. We also document significant heterogeneity among the wealthiest: A large fraction starts with relatively little wealth but experiences rapid wealth growth early in life due to high rates of return from their equity investment. We then develop and estimate an overlapping generations model with rich heterogeneity. We find that the interaction between inheritance and rate of return heterogeneity is key for understanding wealth inequality in the cross-section and over the life cycle. Our counterfactual analysis suggests that a tax on inheritances reduces wealth inequality but has a detrimental effect on output and wages.

Keywords: Wealth inequality, life-cycle wealth dynamics, consumption and savings, rate of return heterogeneity, bequests

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1 Introduction

The large concentration of wealth is increasingly at the center of the academic and public discourse (see Piketty (2014)) prompting an active debate on whether and by how much the government should tax wealth (e.g., Scheuer and Slemrod (2021); Guvenen, Kambourov, Kuruscu, Ocampo-Diaz and Chen (2019); Boar and Midrigan (2022)). Most of the analysis and discussion is based on quantitative models and cross-sectional data. A thorough study of the wealth distribution and the potential effects of policy changes, however, requires not only cross-sectional evidence, but also an understanding of the dynamic determinants of wealth accumulation. In particular, one needs to know how the wealthiest accumulate their fortunes over their life cycle and across generations. Do they inherit their wealth from their parents? Or do they slowly build it up by consistently investing in higher-return assets (e.g., Fagereng, Guiso, Malacrino and Pistaferri (2020a)), by saving a higher portion of their income (Fagereng, Holm, Moll and Natvik (2019)), or by saving more due to their higher lifetime earnings? Or do they become wealthy in a short period of time from a single investment? In this paper, we aim to shed light on these questions by empirically and quantitatively investigating *household life-cycle wealth dynamics* using Norwegian administrative *panel* data on wealth and income between 1993 and 2015.

The empirical literature has largely analyzed wealth inequality using cross-sectional data, which does not allow for investigating the *dynamics* of wealth accumulation.[1] For example, in the United States, the main data source on wealth, the Survey of Consumer Finances (SCF), is a triennial cross sectional survey (e.g., Kopczuk (2015); Castañeda, Díaz-Giménez and Ríos-Rull (2003)). Although it accounts for households at the top of the wealth distribution, it does not allow to follow them over time. The Panel Study of Income Dynamics (PSID) also collects data on household wealth biennially since 1999 but does not sample top wealth owners—who own more than one third of the total wealth in the United States (Krueger, Mitman and Perri, 2016)—as the SCF does. Finally,

[1]The increasing availability of rich panel data on wealth holdings and income sources has allowed researchers to better analyze the dynamics of wealth and returns. For instance Fagereng *et al.* (2016, 2020a) and Bach, Calvet and Sodini (2016) study the heterogeneity on returns using administrative data from Norway and Sweden respectively; Black, Devereux, Landaud and Salvanes (2020) analyze the dynamics of income accumulation across the wealth distribution in Norway.;, Fagereng, Holm, Moll and Natvik (2019) investigate the saving behavior of households across the wealth distribution; Fagereng, Gomez, Gouin-Bonenfant, Holm, Moll and Natvik (2022a) study the redistributive impact of changes in asset prices; and Fagereng, Guiso and Pistaferri (2022b) analyze the impact of sorting of rich couples for wealth inequality.

Saez and Zucman (2016) back out the wealth distribution from administrative tax data by capitalizing incomes from different asset classes, but this method requires strong assumptions about asset returns (Smith, Zidar and Zwick, 2019).

In this paper, we use administrative panel data covering the entire Norwegian population between 1993 and 2015. Our data has several advantages which are crucial for the study of life-cycle wealth dynamics. First, its long panel dimension allows us to document households' long-term wealth accumulation patterns. Second, due to its administrative nature and third-party reporting, there is little or no measurement error or endogenous attrition. Third, the richness of our dataset allows us to jointly study the dynamics of financial and non financial wealth, labor income, capital income, taxes and transfers, as well as inheritances and inter vivos transfers. Finally, its large sample size allows us to obtain precise estimates for narrowly defined groups of households.

Our empirical analysis employs a fully nonparametric descriptive approach. We retrospectively investigate the evolution of wealth, portfolios, incomes, and rates of return following cohorts for 21 years conditional on *final* wealth quantile and age group. This "backward-looking" approach, of course, suffers from a "survival bias"; for example, we follow the households who actually reached the top and overlook those that did not. Therefore, we complement this analysis with a "forward-looking" investigation by documenting the same salient features of the wealth dynamics over the *subsequent* 21 years conditional on *initial* wealth quantile and age group. These two approaches jointly paint a thorough picture of life cycle wealth dynamics.

We start by comparing the evolution of net worth over the life cycle across wealth groups. We find strong persistence at the top of the distribution, which becomes stronger as cohorts age. For example, among households between 25 and 30 years old, more than half of the top 0.1% wealth owners in 1993 (2015) are still in the top 1% in 2015 (1993). Moreover, those at the top 0.1% own around 10 times more wealth than those in the next 0.9% and this difference remains almost unaltered over the life cycle. Overall within-cohort wealth concentration, however, declines substantially over the life cycle, especially between ages 25 and 35. For example, the wealthiest 1% of 25-years-old households own around 50% of the total wealth in their cohort. This number declines sharply to around 25% at age 35, after which wealth inequality declines at a slower pace.[2] This decline is

[2]This pattern is not specific to Norway but also visible in the US. In the SCF, the decline in inequality is less pronounced, going from a top 1% share of 60% a the age of 25 to around 30% at the age of 35. Notice also that the decline in within-cohort wealth inequality is in contrast with increasing wage or

mainly the result of the bottom half of the wealth distribution converging to the average wealth in the economy by accumulating wealth at a fast pace.

Second, wealthy household concentrate most of their wealth on risky assets over their entire life cycle. For instance, the share of risky assets (sum of private and public equity investment) in the portfolio for the wealthiest 0.1% among the 55-to-59 years old household increases from 80% at the age of 30 to about 90% at the age of 55, with the other 10% mostly invested in safe financial assets. In contrast, for households below the 90th percentile, and especially for those households below the 50th percentile of the wealth distribution, housing is the single most important asset in their portfolios, constituting around 80% of their gross wealth and showing very little change over the life cycle.

Third, we show that top wealth owners earn higher returns from their portfolios not only in the cross-section—as documented by Fagereng *et al.* (2020a)—but also over the life cycle. For instance, average life cycle returns for those who reach the top 1% of the wealth distribution—defined as the average returns within an age group over 21 years of data—ranges between 6% to 8% per year (depending on the age group), whereas those that stay below the 50th percentile earn, on average, an annual return between 2 and 5%. The higher life-cycle returns earned by those at the top 0.1% of the wealth distribution are explained by the higher share of private and public equity which, on average, exhibit a premia in excess of 10 pp. relative to other assets such as safe assets or real estate. Top 0.1% wealth owners, however, do not earn significantly higher (value-weighted) returns on equity relative to other households in the top 5% of the wealth distribution. For instance, for households who are between 55 and 59 years old, top 0.1% owners earn an average annual return of 25%, whereas households above the 95th percentile earn an annual lifetime average return on equity of 40%. These household, however, maintain a significantly lower portfolio share on equity over their entire life cycle, which precludes them to significant increase their wealth holdings.

Finally, for each wealth and age group, we document the sources of lifetime income (over 23 years), which include initial wealth in 1993, inheritances, inter vivos transfers, income from labor and safe assets, income and capital gains from equity and real estate, as well as taxes and transfers. Consistent with our results regarding returns, we find that the main source of lifetime income for 50-year-old top 0.1% wealth owners is income

earnings inequality over the life cycle (see Lagakos, Moll, Porzio, Qian and Schoellman (2018) for a cross-country comparison).

from equity, which constitutes more than half of the total lifetime resources. This is because top wealth owners are heavily invested in private equity, and they earn much higher returns from their investment relative to the rest of the population. This is in contrast with households in the bottom 90% of the wealth distribution, for whom labor income and net public transfers constitute roughly 80 to 90% of total lifetime resources. We also find that initial wealth, inheritances, and inter vivos transfers constitute a negligible fraction of lifetime incomes for most households. For a small fraction of rich households, however, inheritances and inter vivos transfers constitute a significant part of their lifetime resources.

The wealthiest also receive these funds earlier in the life cycle. For instance, for those in the top 0.1% of the wealth distribution, the probability of receiving some funds from parents in a given year is around 7% until age 50, after which this probability declines sharply. In contrast, for those below the 75th percentile, this probability follows a hump-shaped profile increasing from 2% to a 4% peak between ages 25 and 50. By exploiting the portfolios of households in the last year of their lives, we find that the wealthiest leave bequests mostly in the form of private equity whereas the rest of the households leave mainly real estate as bequests. These results suggest that the offsprings of wealthier families enjoy higher returns on their wealth starting earlier in their life.

We then zoom in on the top wealth owners (both top 1% and top 0.1%) and find significant within-group heterogeneity. Even though rich households, *on average,* start with much higher wealth, a large fraction actually starts relatively poor (with around 10% of the economy-wide average wealth), with little private equity in their portfolios. This group of households—which we label as "New Money" households—then experiences rapid wealth growth early in life and also much higher rates of return from their private equity investment relative to even those other top wealth owners ("Old-Money" households). As a consequence, they accumulate private equity at a very fast pace in a relatively short period of time.

The facts uncovered in the empirical analysis provide suggestive evidence on the determinants of wealth inequality in the cross-section and over the life cycle. They do not allow us, however, to fully quantify the importance of different factors, such as bequests and return heterogeneity, as they could interact with each other in ways that are difficult to disentangle descriptively. Hence, to quantify the importance of these different forces, we develop a structural overlapping generations incomplete markets model with heterogeneity in labor market efficiency, entrepreneurial ability, and bequests.

In the model, children inherit labor market efficiency and entrepreneurial ability from their parents imperfectly. Furthermore, children receive inheritances from their parents stochastically over the life cycle consistent with the data. We estimate the key parameters of this model by employing the method of simulated moments and targeting the moments documented in our descriptive analysis. The model is successful in matching salient features of the data such as the dynamic average wealth profiles, the life cycle evolution of within cohort wealth concentration, sources of lifetime income, and the rate of return heterogeneity observed in the data.

We then use our estimated model to quantify the importance of different economic forces for wealth inequality. First, we study wealth concentration under counterfactual parameterizations. When differences in the rate of return are shut down (i.e., all individuals earn the same exogenous return on their savings without a distinction between safe assets and equity), wealth concentration declines significantly, in the cross-section and at each age. For example, under our baseline estimates, those in the top 1% of the distribution own 25% of the aggregate wealth of the 25-year-old households. This figure declines to 17% in the absence of return heterogeneity. In the cross-section, there is a 1 percentage point (pp.) decline in the top 1% wealth share. Second, when we distribute bequests equally (by fully taxing them and issuing a lump sum transfer to each newborn), the share of wealth in the top 1% declines by around 2.4 pp. with a significantly larger decline in wealth inequality earlier in the life cycle. As cohorts age, within-age wealth inequality grows but stays below baseline inequality levels. These results indicate that return and bequest heterogeneity are necessary to generate substantial wealth inequality, especially earlier in life as wealth inequality declines sharply if either of them is absent. On the one hand, although persistent return heterogeneity can produce large cross-sectional dispersion of wealth, only a few households can accumulate large wealth holdings in one generation: bequest heterogeneity is necessary to perpetuate these large wealth holdings over time. On the other, if all households have access to the same rate of return, the wealth distribution does not spread even if households are allowed to leave bequests to their children.

Next, we use the model to investigate why the wealthiest are so wealthy. For this purpose, we follow those individuals who are in the top 0.1% and top 1% of the wealth distribution in the baseline calibration under counterfactual calibrations. When we shut down return heterogeneity, only 57% of 50-year-old top 0.1% wealth owners can still make it above the top 0.1% cut off from the baseline calibration; the rest of them fall

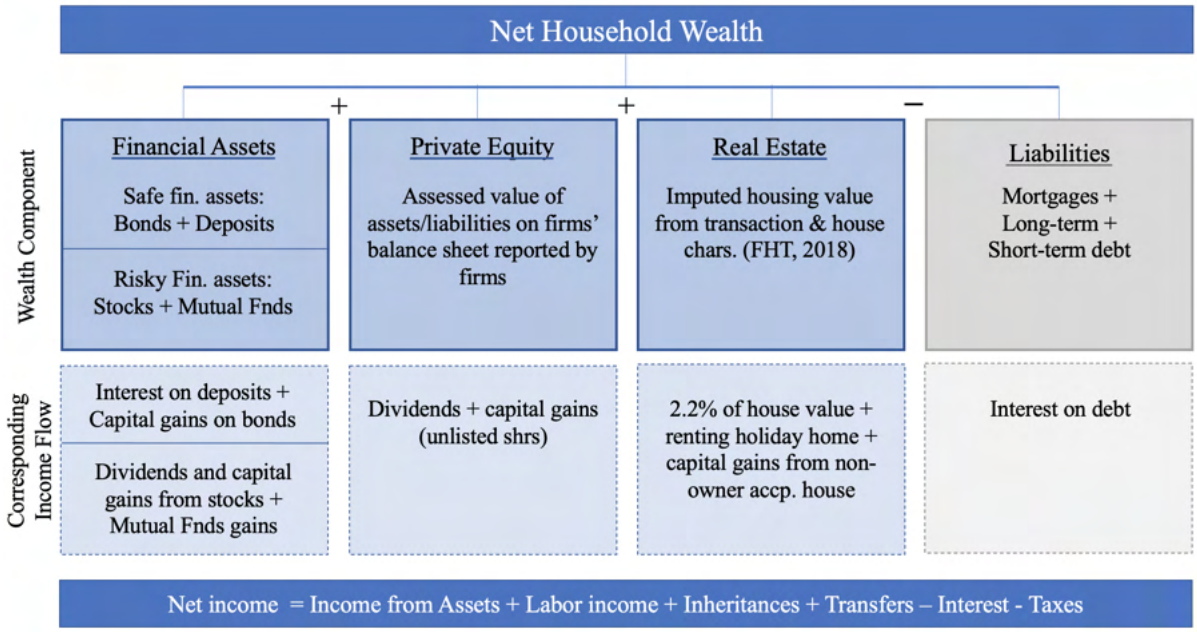
to the lower percentiles of the wealth distribution. As for the role of bequests, we find that only 53% of 50-year-old top 0.1% households can make it above the top 0.1% cutoff if they are counterfactually assigned the economy-wide average inheritance. The role of bequests is naturally smaller for older individuals: 64% of 70-years old individuals can still make it above the 99.9th percentile when receiving only the average inheritance. These results further highlight the importance of inheritance and return heterogeneity for understanding top wealth inequality.

Finally, we use our estimated model to assess the effects of the inheritance tax on output and welfare. Our estimated benchmark economy features a progressive inheritance tax with a top marginal tax rate of 15%, raising tax revenue on the order of 0.6% of GDP redistributed as a lump-sum payment. We find that removing the tax (and the corresponding lump-sum transfer) leads to a moderate increase in wealth inequality: for instance, the top 1% wealth share increases by 0.4 pp. The effect on aggregate output is ambiguous ex-ante: on the one hand, the lump-sum redistribution will help some low-wealth high-ability potential entrepreneurs by relaxing the collateral constraint earlier in life, which reduces misallocation in the economy. On the other hand, the children of wealthy parents are, on average, more capable entrepreneurs, which we infer from the inter-generational persistence in returns to wealth. As a consequence, taxing them potentially increases misallocation and reduces aggregate productivity. Quantitatively, we find that the second effect tends to dominate, such that completely eliminating the inheritance tax increases steady-state output and wages by 0.8%, which reflects the substantial inter-generational correlation in returns that we document empirically. Nevertheless, median consumption drops slightly in response to removing the inheritance tax and the corresponding transfer (and welfare even more so); consequently, the median household is in favor of the tax and transfer scheme. We also find that replacing the inheritance tax with higher wealth taxes improves both efficiency and equity. In contrast, replacing the inheritance tax with higher taxes on capital income is an inferior option.

2 Data and Definitions

Our analysis uses data derived from the Administrative Tax and Income Records, which contains a set of detailed income and tax variables for the entire Norwegian pop-

FIGURE 1 – SUMMARY OF VARIABLES



Notes: Figure 1 summarizes the variables used in our analysis. See Appendix A for additional definitions and details on the construction of each wealth and income variable.

ulation from 1993 to 2015.[3] In addition, this register contains information about age, gender, household composition, country of origin, and educational level. Most information is third-party reported to the tax authorities, and very little is self-reported. Employers, banks, brokers, insurance companies and other financial intermediaries are obliged to send information on payment of earnings, the value of the asset owned by the households as well as information on the income earned on these assets.

Our measure of household net wealth accounts for all financial wealth (e.g., stocks and bonds), non-financial wealth (e.g., imputed value of houses), and the value of private equity, net of the value of short- and long-term liabilities (e.g., credit card debt and mortgages). Fagereng *et al.* (2016) and Fagereng *et al.* (2019) use the same data to study return rate heterogeneity and saving behavior across the wealth distribution,

[3]Wealth and income are taxed in Norway. During our sample period, wealth was taxed at a flat rate of around 0.85% (0.7% at the Municipality level plus 0.15% at the National Level) above an exception threshold which has increased over time. By end of our sample, in 2015, this threshold increased to 2.4 million NOK (US$ 280,000) for a married couple and half of that for a single person (see https://www.skatteetaten.no/en/rates/wealth-tax/ for more information). This implies that the wealth tax applies to households starting around 55th percentile of the wealth distribution. Crucially, Norwegians are asked to provided information on their wealth holdings even if they do not meet the threshold. All assets and liabilities are measured by December 31st of each year so they represent an end-of-the period snap shot of individuals' wealth holdings.

respectively. Wage income in the tax records, includes wages and salaries from all jobs, including bonuses and other extraordinary payments. The data also contains information on business and self-employment income, which we use to construct a measure of total income at the individual and at the household level. Figure 1 summarizes the main variables used in our analysis.

Although the data is of high quality, it also has a few limitations. First, it excludes the value of private or public pensions. This tends to overstate the degree of wealth inequality. In Norway, more than 80% of all pensions are provided through a National Insurance program, a pay-as-you go scheme with a large degree of redistribution from the rich to the poor. Another 18% are covered by employer provided pension plans, and only 0.3% of total pension wealth is held as personal pension plans. Only this small fraction is reported on the tax return. Second, our data excludes any wealth hidden off shore which is not accounted for by the taxes authorities of Norway. This pulls in the other direction, as it tends to reduce the extent of wealth inequality in Norway. As shown by Alstadsæter, Johannesen and Zucman (2018), accounting for hidden wealth increases the share of the top 0.1% of households by 1 p.p. of total wealth. Third, our data excludes assets whose value is difficult to measure, such as art and jewelry. Fourth, although the data is third-party reported, the value of private business is self reported by business owners and it is highly correlated with the book value of the firm. The tax authorities of Norway regularly audit private firms to asses the value and compare it with the one reported in tax forms. Although not all firms are audited, medium and large firms (with a turnover above US$ 500,000) are also required to have their balance sheet audited by an approved auditing entity.

The key variable of interest in this analysis is net wealth, for which the natural decision-making unit is a household. Therefore, we measure variables at the household level, that is, for each individual, we assign this individual the household's net worth independently of the individual's personal wealth or whether the individual is the head of the household. We then drop all observations with a missing wealth variable and all individuals younger than 25 years old, reducing the sample size by about 11%. Importantly, to analyze the cross-sectional characteristics of the wealth distribution, we focus on households, but to characterize the life cycle evolution, we follow individuals over their own life cycle.

These minor restrictions leave us with a sample of around 51.3 million households and roughly 2.2 million observations per year. We convert all nominal values to 2018 prices

Table I – Basic Sample Statistics

Panel A: Population Shares					
	1995	2000	2005	2010	2015
Age 25/44	43.80%	43.00%	40.90%	39.20%	36.30%
Age 45/64	30.10%	32.90%	35.60%	36.30%	36.40%
Age 65+	26.00%	24.10%	23.50%	24.50%	27.30%
Male	63.20%	62.60%	62.50%	62.60%	62.10%

Panel B: Descriptive Statistics (US$ of 2018)							
	Mean	SD	P10	P50	P90	P99	P99.9
Safe Assets	42,869	204,242	345	12,001	102,886	408,838	1,474,710
Public Equity	7,899	303,496	0	0	11,036	118,260	642,274
Private Equity	35,205	2,312,932	0	0	490	409,833	4,425,962
Housing	285,608	300,826	0	222,809	638,730	1,384,161	2,192,636
Gross Wealth	371,581	2,551,564	2,778	259,693	749,967	1,922,639	6,978,503
Debt	92,417	114,888	0	45,135	250,202	464,635	678,678
Net wealth	279,164	2,546,067	-24,242	16,0147	637,285	1,731,470	6,750,314
Household Observations: 51.3 Million							

Notes: Table I show cross sectional statistics of the population of households in Norway. Panel A shows, population shares for head of household. Panel B shows household-level wealth statistics in real US$ of 2018 (1 USD = 8.14 NOK). To obtain these statistics, we first calculate cross sectional moments at the annual level and then we average the statistics across all years in the sample (1993 to 2015).

using the Norwegian Consumer Price Index. Table I shows basic sample statistics on the age and gender distributions (Panel A), as well as the wealth and income distributions (Panel B). Table II shows the degree of concentration of income and wealth in Norway. More details and variable definitions can be found in Appendix A.

Finally, to draw comparisons with the US, we consider a sample of households from the Survey of Consumer Finance (SCF). This survey contains information on income, wealth, and other household-level variables. Importantly, the SCF over samples rich households in order to get a better picture of the US wealth distribution. However, the SCF is not a panel, allowing only cross sectional comparisons between Norway and the US. As we will show, however, the available data obtained from the SCF compare well to those obtained from our data from Norway.[4]

[4]A second source of panel information on wealth in the Panel Study of Income Dynamics, PSID. Although the PSID has been collected since 1968, wealth data was only collected every five years before 1997, and after data, the survey because bi annual. Furthermore, the sample size is relatively smaller than the one in SCF and dos not provide much information about households at the top of the wealth distribution. These considerations leads us to use the SCF rather than the PSID as primary source of

Table II – Share of Total Wealth (%)

	Bottom 50	Top 10%	Top 5%	Top 1%	Top 0.1%	Top 0.01%
Income	8.77	32.33	19.19	5.69	3.41	1.1
Safe Assets	4.54	58.52	43.38	20.85	15.37	7.67
Public Equity	0	90.92	80.73	55.44	46.06	29.44
Private Equity	0	99.88	98.93	86.61	77.81	56.02
Housing	13.18	33.76	20.94	6.14	3.31	0.83
Gross Wealth	13.36	39.26	27.52	13.2	10.27	6.28
Debt	5.38	38.88	23.38	6.76	3.28	0.86
Net wealth	4.29	47.19	33.7	16.89	13.33	8.29

Notes: Table II show cross sectional concentration statistics at the household level. To calculate these statistics, we first calculate cross sectional moments at the annual level and then, we average across all years in the sample (1993 to 2015).

2.1 Wealth over the Life Cycle

We begin by characterizing the evolution of the distribution of wealth over the life cycle in Norway and compare it with the US using only cross sectional data. As shown in Figure 2a, average wealth in Norway displays a hum-shaped profile over the life cycle, increasing 9.5 times (225 log points) between ages 25 and 45 and another 1.6 times (50 long points) between ages of 45 and 65.[5] The rapid increase of the average wealth is explained by an even faster increase of the wealth of the median household, whose wealth increases 22 times (10 log points) between ages 25 and 35. In contrast, the wealth of households at the top 95th percentile of the distribution—who are already significantly richer than the average household of the same age—grows 2.7 times (1 log point) over the same period.[6]

This differential growth across the distributions results on a decline in wealth concentration—measured as the share of wealth owned by the 1% of the wealthiest households within each age group—over the life cycle as shown in Figure 2b. For example, at age 25, the top 1% of households own 35% of the total wealth of this age group. This number declines to around 18% at age 35. We find a similar pattern for the share of the top 0.1% of the distribution.[7]

information for the United States.

[5]This increase implies that 25 years old household, who own 0.1 times the average wealth in the economy (about 28 thousand US dollars), own 1.6 the average wealth in the economy at age 65.

[6]This is shown in Appendix Figure A.1 that shows different percentiles of the life-cycle wealth distribution.

[7]This is in contrast with the evolution of earnings inequality which typically increases over the life cycle (see Lagakos, Moll, Porzio, Qian and Schoellman (2018) for a cross-country comparison).

The significant increase of average wealth and the decline in wealth inequality over the life cycle is not specific to Norway but it is also observed in the US. Average wealth in the US increases around 320 log points between ages 25 and 65 and declines afterwards (dashed line in Figure 2a). Even though wealth concentration is significantly higher in the US compared to Norway—for instance, the top of households 1% hold about 35% of the total wealth in the US versus around 17% in Norway—wealth concentration declines over the life cycle in both countries, especially earlier in the working life.[8]

Cross sectional observations, however, cannot be used to disentangle the role of inheritances, returns, and life cycle wealth accumulation. For instance, two individuals at the age of 40 might appear at the top of the wealth distribution, one of them inherited a large fortune, whereas the other built a successful company. To disentangle these different paths, in the following sections we exploit the panel dimension of our data and look at the evolution of wealth, portfolio allocation, income sources, and returns following the same cohort over their life cycle and across the wealth distribution.

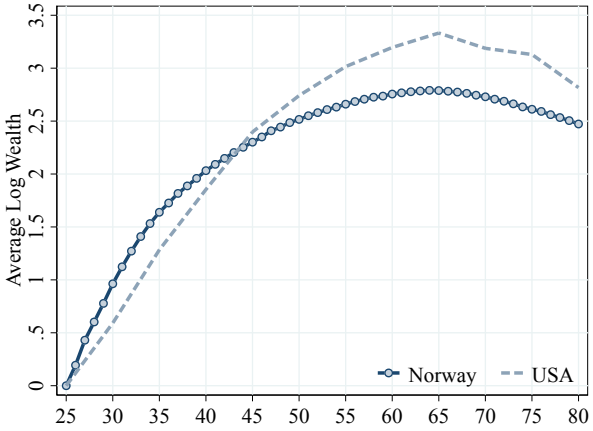
3 Life Cycle Wealth Dynamics

In this section, we document the salient features of the life-cycle wealth dynamics within a cohort. For this purpose, we follow two complementary approaches. First, we retrospectively investigate the evolution of net worth, portfolios, incomes sources, and rates of return in the *previous* 21 years conditional on age and wealth quantile at the end of the sample period. This *backward-looking* approach suffers from a "survival bias"; for example, by concentrating our attention on the characteristics of the households that made it to the top we might overlook important information about those households that did not. For this reason, we complement our retrospective approach with a *forward-looking* investigation and document the same moments of wealth dynamics over the *next* 21 years conditional on initial wealth quantile and age in the beginning of the sample period. Next, we discuss the details of our methodology.

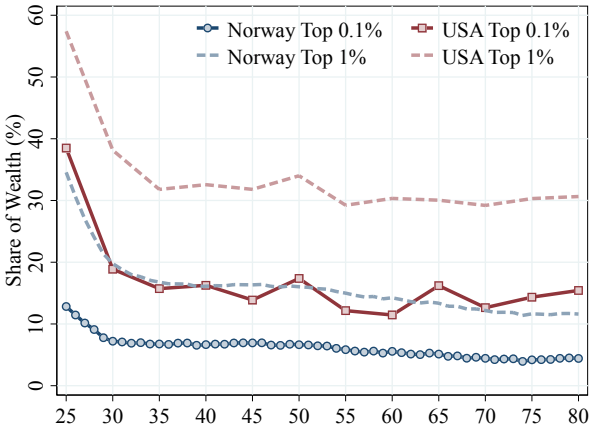
[8] We also compare the portfolio composition of wealth in Norway with that of the US (Appendix Figure A.4). In both Norway and the United States, housing is the largest component of household portfolios, but significantly more so for Norway, where the share of real estate is around 80% at the age of 25 and declines only to 70% in later years. This is mainly because US households own significantly more private and public equity than Norwegian households. We find similar differences across the wealth distribution (Appendix Figure A.5). In particular, the share of housing is significantly larger among households below the top 1% of the wealth distribution in Norway. In the top 1% of the distribution, the main difference is between private and public equity, with the latter representing a significantly larger fraction of the portfolios of rich households in the US.

FIGURE 2 – WEALTH LEVEL AND CONCENTRATION OVER THE LIFE CYCLE

(A) Average Wealth Profile



(B) Wealth Concentration



Notes: Figure 2 shows the evolution of log average wealth (Panel A) and wealth concentration over the cycle in Norway and in the United States. In both figures, we control for year fixed effects by employing Deaton-Paxson regression. Figure A.2 shows the results from a similar exercise when we controlling for cohort effects, which displays smaller increase in average wealth over the life cycle.

Retrospective (Backward-looking) Approach. In this case, we group households with similar observable characteristics in a given year and then investigate their history of wealth dynamics going back to 1993. To this end, we fix a year t in our sample (eg. year 2014) and we first group households into 5-year age bins according to the age of the head (i.e., the main earner) of the household. Since our aim is to investigate the wealth accumulation histories of households, we restrict our sample to households whose head is 45 years old or more so that we can follow them back to when they were about 25 years old. Then, within each age group, we rank households with respect to their average net wealth in t and $t+1$, $\bar{W}_{i,t} = (W_{i,t} + W_{i,t+1})/2$, where $W_{i,t}$ is the net worth of household i in year t. We use the average wealth to reduce the role of transitory changes in wealth in our ranking. We first group households who end up in year t with negative net wealth, $\overline{W}_{i,t} \in (-\infty, 0)$, and define another group of those who end up with very little but positive wealth, $\overline{W}_{i,t} \in \left\{\left[0, W_t^{\min}\right)\right\}$,where $W_t^{\min}$ is around 1,500 USD in 2018. We partition the remaining households into 6 bins according to their wealth, $\overline{W}_{i,t} \in \left\{\left[W_t^{\min}, P50\right), [P50, P75), [P75, P90), [P90, P95), [P95, P99), [P99, P99.9), \text{Top } 0.1\%\right\}$.

Then, by tracing back the wealth accumulation history of each such group, we document the properties of wealth dynamics that households within that group have experienced. To control for potential cohort effects, we repeat this analysis for each year $t \in \{2009, 2010, ..., 2014\}$ and then report the average across years.[9]

[9]In practice, we could repeat this analysis for each year available in our sample (i.e. 1993 to 2015).

Two additional details of our approach are worth mentioning. First, we follow individuals who are the heads of households in the conditioning year independently of their status in previous years. It is likely that these individuals may have belonged to different households in previous years (for example, because of marriages and divorces) or were not defined as the head of the household (for instance, if they were part of the paternal household). Second, even though we follow individuals, in each point in time, we register the wealth, income, and other variables of interest at the household level. Family formation might have important implications for wealth inequality (Fagereng, Guiso and Pistaferri, 2022b) and therefore, in a robustness analysis, we restrict our sample to those households that remained unchanged during our sample period. We find that our results are quantitatively and qualitatively similar in this more restrictive sample.

Forward-looking Approach. In this case, we group households by their age and wealth at the start of our sample and investigate the properties of wealth dynamics going forward. In particular, we group them into the same 5-year age bins in each year $t \in \{1994, 1995, ..., 2000\}$ between ages 25 and 80 years. Then, within each age group, we rank households with respect to their average net wealth in t and $t-1$, $\bar{W}_{i,t} = (W_{i,t} + W_{i,t-1})/2$ into the previously defined wealth groups. Conditional on these age and wealth groups, we study household's wealth dynamics, income and returns, over the following years until 2015. This approach allows us to uncover the heterogeneity in the wealth dynamics that different groups of households expect to face looking forward.

3.1 Dynamic Average Wealth Profiles

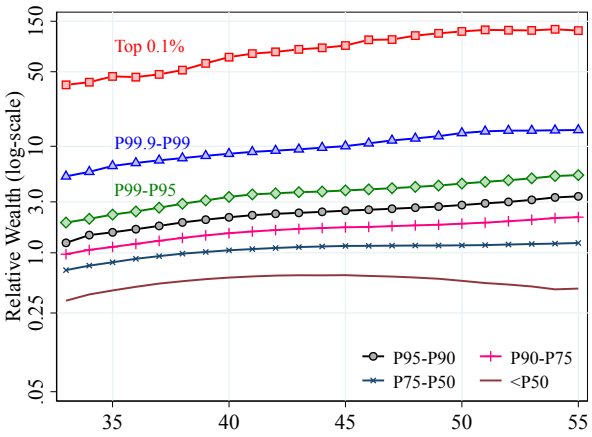
We start by documenting the evolution of households' net worth over the life cycle for different wealth groups retrospectively and going forward. Figure 3a shows the retrospective average net wealth profile (relative to average household7hose head is 55- to 59-years old at the end of our sample period. Similarly, Figure 3b shows the average wealth profile for several wealth groups over the next 21 years for 30- to 34-year old-head of households at the start of our sample period.[10] We find a significant degree of persistencein life cycle wealth dynamics within a cohort. On average, top wealth owners in 2014-2015

However, for each year we go backward, we reduce the number of years available for the panel analysis. By choosing 2009 as the first year, we ensure that we can observe individuals for at least 16 years.

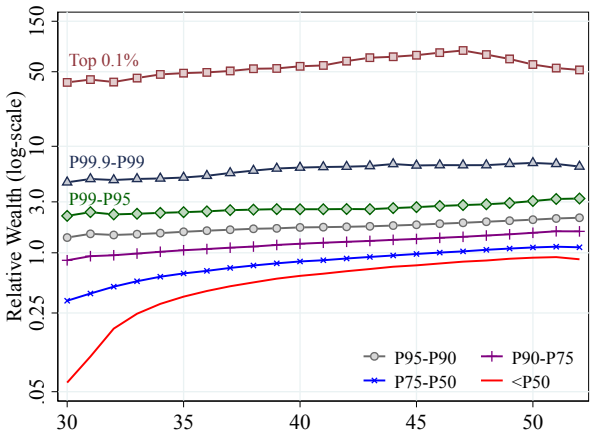
[10]Appendix Figure A.6 shows the evolution of wealth for households whose head is between 55 and 89 years old. Figure A.10 shows a more complete picture across the age distribution that combines different age groups in one plot. For instance, the top left panel shows the average wealth profile for those that end up in 2015 in the bottom 50 percent of the distribution for different age groups. Figure A.11 shows similar results conditional on wealth in 1993.

FIGURE 3 – AVERAGE WEALTH PROFILES BETWEEN AGES 30 AND 55

(A) Retrospective Wealth Profile



(B) Forward-Looking Wealth Profile



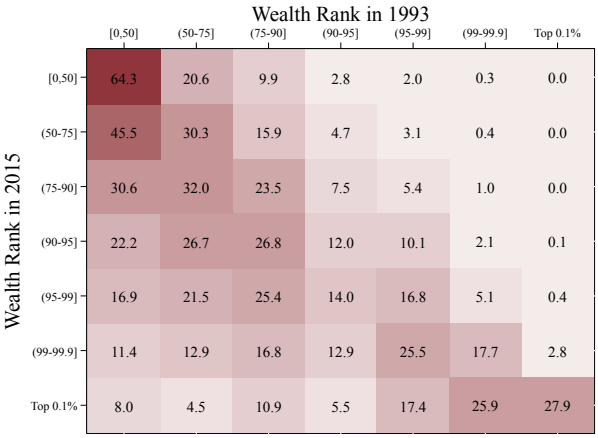
Notes: Figure 3a shows the evolution of average wealth for different wealth groups conditional on their wealth at the end of the sample period for household whose head is between 55 and 59 years old. We consider years 2009 to 2014 as end-of the sample period and we report within-age averages. Figure 3b shows the evolution of average household wealth conditional on their wealth at the start of the sample period for households whose head is between 30 and 34 years old. We consider years 1994 to 1999 as start-of-the-sample periods and we report within-age averages. We plot the log of the average wealth within the group relative to the average household wealth in the economy.

had much higher wealth initially in 1993-1994 (Figure 3a) relative to their peers. For instance, individuals in the top 0.1% of the within-age wealth distribution in 2014-2015 owned about 150 times the average wealth in economy (about US$280,000) whereas in 1993 they already owned 38 times the average wealth. Similarly, Figure 3b shows that the top 0.1% group in 1993-1994 among 30- to 34-year old individuals owned around 38 times the average wealth in the economy and increased their wealth holdings to more than 50 times the average wealth by 2015. This indicates that on average top wealth inequality remains mostly unchanged over the lifecycle: there is around 10-fold difference in net wealth between the top 0.1% and the next 0.9% in 2015, which is roughly the same difference as in 1993. These results suggest very strong persistence of wealth at the top of the distribution. We will further investigate the persistence of wealth concentration using long-term Markov transition matrices for net worth.

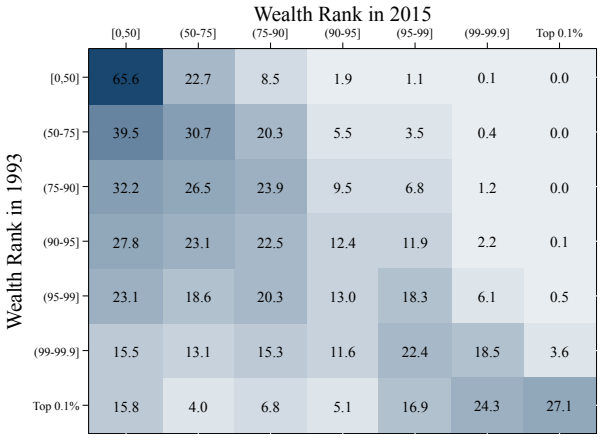
We only see a decline in wealth inequality in the bottom half of the distribution as households with little wealth in 1993 experience a much steeper wealth growth especially when they are between 30 and 40 years old. For instance, household who started below the 50th percentile of the wealth distribution experience a 20 times increase in their wealth from 0.05 to 1 average wealth (Figure 3b). Therefore, the decline in life cycle wealth inequality shown in Figure A.3 is mainly coming from the bottom half of the

FIGURE 4 – INTRAGENERATIONAL TRANSITION MATRIX

(A) Backward-Looking Transition



(B) Forward-Looking Transition



Note: Figure 4a shows the intragenerational persistence of net wealth. Figure 4a shows the results by first sorting household whose head is between 55 and 59 years old in 2014. We then go back 21 years and we sort them again in 1993. Each cell represent the fraction of household in different percentiles of the wealth distribution in 1993 (columns), conditional on their percentile of the wealth distribution in 2015 (rows). Each row sums to 100. Figure 4b shows similar results by first sorting head of households between 35 and 40 years old in 1993 (rows) and then again in 2014 when the households are between 50 and 55 years old.

distribution converging towards the middle of the distribution as low-wealth households enter the working life with very little wealth and accumulate assets as they age.

Long-term Markov Transition Matrix

To offer a more complete picture of the wealth transition dynamics, we investigate where individuals come from (retrospectively) in the wealth distribution in 1993, conditional on their average wealth percentile in 2014, by constructing long-term Markov transition matrices. To this end, we sort heads of households within an age group, say 55 to 59 years old in 2014, according to their average wealth in the end of the sample period as well as their initial average wealth. Figure 4a shows the probability that someone in the ith 2014-2015 average wealth group (rows of the matrix) was in the jth quantile of 1993-1994 average wealth distribution (columns of the matrix). The color intensity of each cell reflects the transition probability between the corresponding wealth groups with the darker the cells indicating a higher likelihood. Consistent with our previous results, around 70% of households who are in the top 0.1% of the within-age (average) wealth distribution in the end of the sample period (bottom row) were already in the top 5% of the initial wealth distribution in 1993 and 1994, and more than half were already in the top 1% of the distribution. This implies that households in the top 0.1% of the wealth distribution are 279 times and 259 times as likely to be in the 0.1% and next 0.9%

initially relative to the population average, respectively.[11] We refer to these households, who started their lives rich and have continued being rich, as "Old Money" households and investigate them in more detail below. Still, a significant fraction of individuals who reach the top 0.1% of the wealth distribution started below the 75th percentile (with wealth holdings of 0.8 the average wealth or less). For instance, 8% of those households that reach the top 0.1% of the distribution in 2014 where in the bottom half of the distribution in 1993 (bottom left quadrant cell of Figure 4a). Later, we refer to this group as "New Money" households and contrast their wealth accumulation patterns, portfolio composition, and returns with that of the Old Money households.

A second interesting aspect of Figure 4a is the lack of upward mobility. More than 84% of the households in the bottom half of the wealth distribution in 2014, started at or below the 75th percentile of the wealth distribution in 1994 (first row of Figure 4a). Moreover, the probability that a household who is at the bottom half of the distribution in 2015 had started at the top 1% of the distribution in 1993 is basically zero.

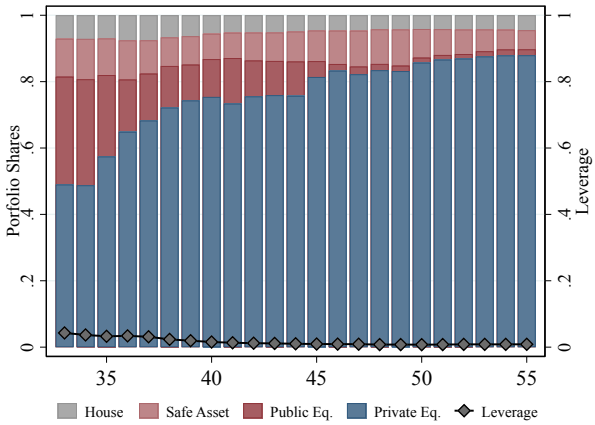
Figure 4b shows the corresponding results for *forward-looking* dynamics, that is, if we sort individuals in 1994 by their average wealth and we then ask in which percentile of the wealth distribution they end up in 2015. As in the backward-looking case, here we also find a significant degree of persistence at the top. For instance, around 70% of all households that were in the top 0.1% of the distribution in 1993, stayed within the top 5% of the distribution after 22 years, in 2015. Still, a significant fraction of them, around 15%, drop below the 50th percentile. At the bottom of the distribution we also find high persistence, with 65% of those households that started below the 50th percentile in 1993 staying in the bottom half after 22 years. Given the similarities between the forward and backward-looking transition matrices, and since our focus is on the characteristics of those individuals who reach the top ranks of the wealth distribution, in what follow we focus on the backward-looking profiles and discuss differences with respect of the forward-looking analysis when necessary.[12]

[11] Figure A.8a shows the normalized transition matrices where each probability is normalized by the cell size. For example, 64.3% of below-median wealth owners in 2015 were in the bottom 50% in 1993. Then, the likelihood of someone in the bottom 50% in 2015 being also in the bottom 50% wealth group in 1993 relative to the population average is $1.3 = \frac{64.3\%}{50\%}$—.

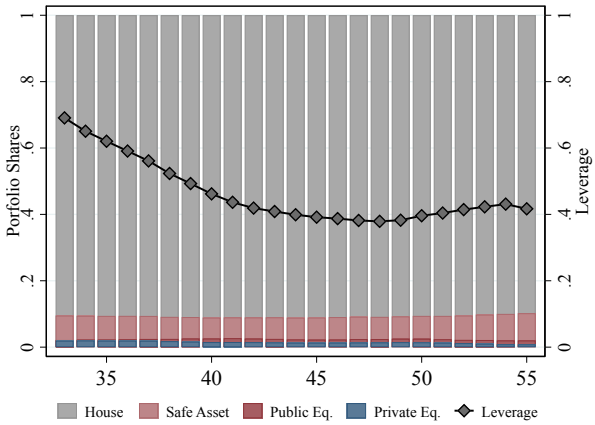
[12] The vast majority of individuals who reach the top 1% and top 0.1% of the wealth distribution, are entrepreneurs. For instance, if we define as entrepreneurs those individuals who directly own 20% of more of a company (either private or publicly traded), we find that more than 95% of those that reach the top 0.1% fall into this category between ages 45 and 55, as Appendix Figure A.12a shows. The share of entrepreneurs declines to around 75% if we focus on those who reach the next 0.9%.

FIGURE 5 – RETROSPECTIVE PORTFOLIO SHARES

(A) Households at top 0.1%



(B) Households between 0 and 50th percentile



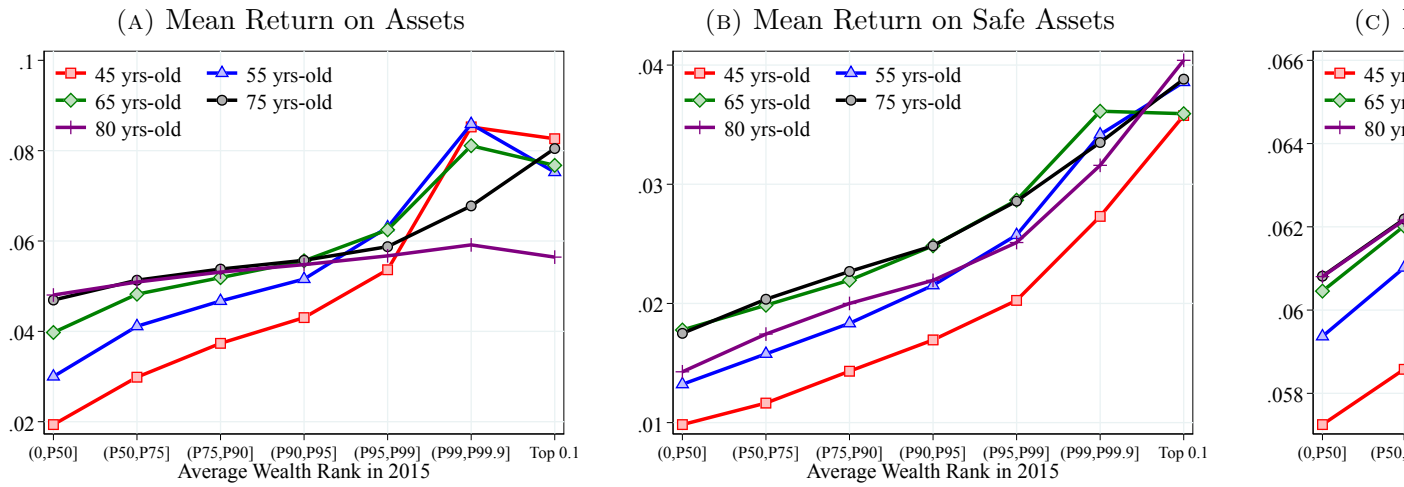
Notes: Figure 5 shows the evolution of the portfolio shares (left y-axis) and leverage (right y-axis) for households whose head is between 55 and 59 years old in 2015. Portfolio shares are calculated as the ratio between the the value of all assets in a particular category (eg. total value of safe assets) over the total value of gross wealth (ie. sum of wealth in housing, safe assets, public equity, and private equity) within an age group. Similarly, within-group leverage, is the ratio between the sum all debt (eg. mortgages, student debt, credit card debt) within a wealth rank and age group and the sum of all total assets within the same group.

3.2 Life-Cycle Portfolio Composition

Having studied the dynamics of wealth accumulation, we now analyze what different wealth groups invest in their portfolio over the life cycle. Figure 5 shows retrospective portfolio shares for households between 55 and 59 years old in 2015. To draw comparisons between middle- and high-wealth households, Figure 5a shows the life cycle portfolio composition of those that end up at the top 0.1% of the wealth distribution whereas Figure 5b shows the portfolio composition for those households in the bottom half of the wealth distribution (conditional on having positive net wealth). On average, households in the top 0.1% place a significant fraction of their portfolio in private equity at age 30. Over the life-cycle, their private equity portfolio share increases from 49% to around 87%. However, if we sum private and public equity, the share of the portfolio invested in risky assets is mostly constant over their life cycle staying above 80% across all years and raising up to 89% of the portfolio by age 55. Safe assets and housing represent a

This is substantially larger than the population share of entrepreneurs, that in Norway is about 8% of households. Furthermore, the share of entrepreneurs does not change much of we restrict our definition to household who own more than 20% of the firm and founded the firm they own Appendix Figure A.12b: in this case, the share of entrepreneurs among top 0.1% owners only declines to 80%. Further restricting our definition of entrepreneur—for instance, if we consider as entrepreneurs that own a employee firm (Appendix Figure A.12c) or own more than 50% of a company (Appendix Figure A.12d)—does not change our results significantly.

FIGURE 6 – LIFETIME RETURNS ON ASSETS ACROSS THE WEALTH DISTRIBUTION



Notes: Figure 6 shows the value-weighted lifetime average annual returns within age and wealth groups in 2015. The average lifetime return for each asset class is the 21 years average across all years available for each age-wealth group between 1994 and 2015. See Appendix A.2 for details on the calculation of returns.

much smaller fraction of their portfolio and remains more or less constant over time. Furthermore, top wealth owners maintain a very small amount of leverage over their entire life cycle (line with diamonds plotted on the right axis), never increasing above 10% of gross assets, even earlier in life.

In contrast, for households below the 50th percentile, housing is the single most important asset in their portfolios, constituting around 90% of their gross wealth. Low-wealth start their life with much higher leverage (around 70% of total assets) mostly coming from mortgages. As they progress in life, leverage declines, but not below 40% of total wealth. These large difference between high and low wealth household are similar across different age groups (Appendix Figure A.13).[13]

3.3 Life-Cycle Returns

High and persistent return heterogeneity has been argued to be key for explaining the large wealth concentration at the top of the distribution (Benhabib *et al.*, 2011; Benhabib and Bisin, 2018; Benhabib *et al.*, 2019). Consequently, one should expect that those individuals that reach the highest wealth ranks earn persistently higher returns

[13] Although less striking, there are significant differences in the portfolio composition between the top 0.1% and other rich households. As shown in Appendix Figure A.14, relative top 0.1% wealth owners, those in the next 0.9% place only 50% of their portfolio on risky assets, and this share declines to less that 20% among households between the 95 and 99 percentiles of the wealth distribution.

relative to rest of the population, not only in the cross section—as shown by Fagereng *et al.* (2016)—but also over the life cycle. To see if this is the case, we compute returns to wealth for each household in our sample and for each asset class.[14]

We follow closely Fagereng *et al.* (2019) in calculating rates of returns except for a few important differences regarding the treatment of capital gains and returns on housing (see Appendix A.2 for details of our methodology). Despite these differences, the distribution of returns from our calculations is similar to that of Fagereng *et al.* (2019) in terms of cross sectional moments (Appendix Table A.1) as well as in the correlation of returns with net wealth and its components.[15]

We start by documenting the (value-weighted) past average annual return between 1994 and 2015 for each wealth group in 2014-2015 (Figure 6). Similar to Fagereng *et al.* (2016), we find a large degree of return heterogeneity across the wealth distribution. The 20-year average annual return on net wealth increases monotonically from around 2 to 4% for the bottom 50% group to 6 to 8% for the rich households just below the top 0.1% (Figure 6a). These differences are more pronounced among the younger cohorts. For example, there is almost 9 percentage point difference between the highest- and lowest-return groups among 45-year olds versus only around 3.0 percentage point difference among the 75 year-old group.

Return heterogeneity across the wealth distribution can stem from differences sources. First, household might invest a different fractions of their portfolio in high-return assets. As shown in Figure 5, wealthier households invest a larger share of their portfolios in (public and private) equity which, on average, earn higher returns than other assets. For example, average annual return on equity is around 12% whereas the returns on real estate and safe assets do not exceed 3% per year (Table A.1). Therefore, portfolio

[14] Unless noted differently, all moments of the return distribution in this section are weighted by the value of the asset. The corresponding unweighted returns are shown in Appendix Figure A.16.

[15] Appendix Figure A.15 shows the annual average returns within deciles of the net worth distribution for four asset classes: net worth, safe assets, housing, and equity. We further divide the top decile in in 12 groups, including the top 0.1%. Similarly to Fagereng *et al.* (2019), we find a positive relation between wealth holdings and the (unweighted) average return on net worth (Appendix Figure A.15a) which varies from an average of -0.05 at the first decile of the net worth distribution to 0.1 among the top 0.1%. There is also a positive relation between returns and assets holdings for safe assets and housing. The returns on equity, however, show a sharp decline in average returns at the very top of the wealth distribution. In fact, as shown in Appendix Figure A.15b, average returns are low for household at the top 0.1% of the equity distribution than for those at the next 0.9%. This decline is even larger if we consider value-weighted average returns, which show a hump-shape profile at the top decile of the equity distribution: The average return for households at the top 0.1% is about 6% whereas for households with equity holdings between the 80 and the 90th percentiles, the average returns is about 15%.

composition is key for understanding why returns on assets are positively correlated with wealth.

Second, wealthier household might also earn higher returns within asset classes. To see if this is the case, Figure 6 shows retrospective average returns for each asset class for different wealth groups. Average return on safe assets increase significantly from 1.0% to 1.8% for the bottom 50% wealth group to 3.5% to 4% for the wealthiest households (Figure 6b). However, returns on housing display almost no significant heterogeneity between wealth groups (Figure 6c). As for the average returns on equity—which constitute most of the wealthiest portfolios and very little for the poor households—we find a hump-shaped profile over the wealth distribution (Figure 6d). Among 45-year olds, average equity returns increase from 23% for below-median households to around 41% for those between the 95th and 99th percentiles and then decline to 21% for the top 0.1% wealth group. In other words, households in the top 0.1% of the distribution have earned around 20% less from their equity investments than the next 0.9% wealth group.[16] However, recall that most households hold a much smaller fraction of their portfolio in equity relative to those at the top 0.1%, who invest around 80% of their portfolio on equity. Instead, those who are in the next 0.9% invest only 50% of their portfolio on equity whereas those between the 95th and 99th percentiles, have an average equity portfolio share of about 15% (Appendix Figure A.14). Hence, we conclude that top wealth owners earn higher returns mostly because they hold a larger fraction of their wealth in equity.

There are a few reasons why the equity returns are lower at the very top of the wealth distribution. First, it is possible that some of these high-rate-of-return investments are are not scalable (e.g., restaurants in which cooks have specific knowledge that it is difficult to replicate), therefore, the returns from them are not enough to help their owners to accumulate wealth to be in the top wealth groups. Second, it is possible that lower-wealth investors may face borrowing constraints that prevent them to invest more on theirs firms, which would lower the marginal average rate of returns. [17]

[16] At first glance, the fact that high wealth household do not earn higher returns on equity seems at odds with findings in Fagereng *et al.* (2016), which show a monotone increasing correlation between net wealth and returns. Recall that the distribution of *unweighted* returns from our calculations is similar to that of Fagereng *et al.* (2019) (Table A.1) as well as the correlation of returns with net wealth and its components (see Figures A.15). Therefore, differences between our results in this section (and those in Fagereng *et al.* (2019)) arise from the fact that we document weighted averages whereas Fagereng *et al.* (2019) show unweighted patterns. As show in Appendix Figure A.15c, cross sectional value-weighted returns on equity show the same decline at the top of the distribution we find for lifetime returns.

[17]

Finally, we find significant differences in higher moments of the rates of returns between wealth groups. Wealthier households face a more dispersed distribution of returns over the life cycle. For instance, among 45-year olds the standard deviation of the returns on total assets increases from around 5.5% for the bottom 50% of the households to around 11% for the top 0.1% (Appendix Figure A.17a). Dispersion of returns declines over the life cycle for all wealth groups but more so for the wealthiest. The more dispersed return distribution for the wealthier household is partly explained, in first place, by their larger share on equity investment which is much risker than housing and the safe assets (in our data, the cross sectional standard deviation of equity returns in 0.38 relative to 0.02 and 0.06 for safe assets and housing respectively). Second, wealthier households invest in higher risk projects than the rest of the population too: As we show in Appendix Figure A.17b, the standard deviation of the returns on equity increases from around 0.5 for the bottom 50% of the households who invest in equity to around 0.9 for top 0.1% wealth owners

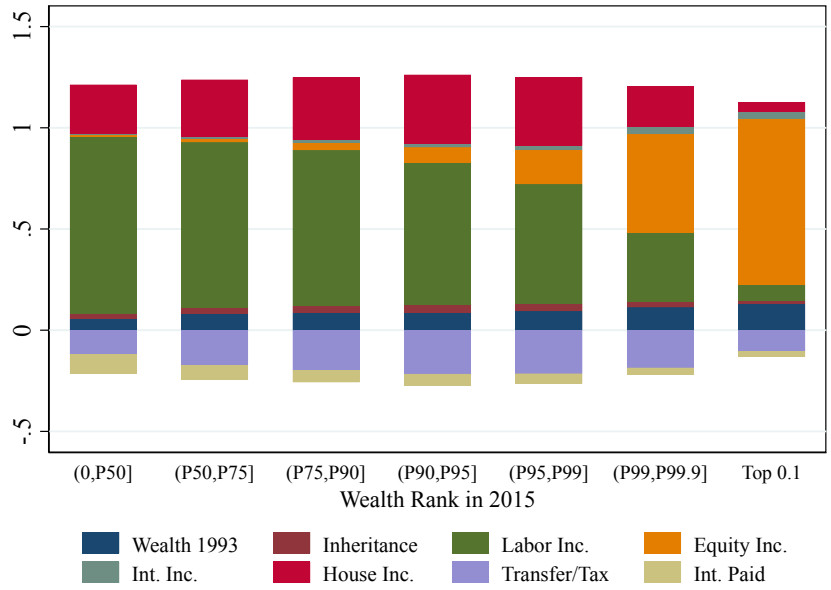
3.4 Sources of Lifetime Income

Next, for each wealth and age group, we document the sources of total lifetime resources, which include initial wealth, inheritances, income from labor and safe assets, dividends and capital gains from equity, real asset income and capital gains, as well as taxes and transfers (see also Black *et al.* (2020)). For doing that, we look at the budget constraint of each household in our sample, which, in 2015, is given by:

$$W_{i,2015} = \underbrace{W_{i,1993} + \sum_{t=1994}^{2015} L_{i,t} + \sum_{t=1994}^{2015} H_{i,t} + \sum_{t=1994}^{2015} RK_{i,t} + \sum_{t=1994}^{2015} CG_{i,t} + \sum_{t=1994}^{2015} T_{i,t} - \sum_{t=1994}^{2015} LB_{i,t}}_{\sum Y_{it}=\text{total lifetime resources}} - \sum_{t=1994}^{2015} C_{i,t},$$

This second channel is consistent with top 0.1% wealth owners having a significantly lower leverage relative to household in lower ranks of the wealth distribution. In fact, leverage among top wealth owners is about 5% at age 35 and declines to less than 1% over the life cycle. Instead, leverage for households between the 90 and 99.9th percentiles—who earn significantly higher returns on equity as shown in Figure 6d—represents about 30% of total assets at age 35 never declines below 20%m indicating, suggesting that these household are more financially constrained. This second channel is also consistent with our structural model, which we present in Section 4. In our setting, returns on investment decline on the amount of equity invested on the firm as richer entrepreneurs overcome their borrowing constraint and operate their firms at the optimal capacity. Hence, returns on equity tend to decrease with wealth. Our results are also consistent with Boar, Gorea and Midrigan (2022) that show that returns on equity decline with firms book value using a sample of firms from Spain.

FIGURE 7 – SOURCES OF TOTAL LIFETIME INCOME BY AGE 55



Note: Figure 7 shows the source of lifetime income for a sample of households whose head is between 55 and 59 years old in 2015 conditional on the wealth rank in the same year. All values expressed in 2018 NOK. Inheritances refers to the sum of bequests and inter vivos transfers. Equity Inc. refers to income obtained from investment in private and publicly traded firms in the form of dividends and capital gains.

where $W_{i,t}$ is net wealth of household i in $t \in \{1993, 2015\}$, $L_{i,t}$ is labor income of i in year t, $H_{i,t}$ is inheritances and inter vivos, RK_{it} is capital income (interest, dividends, housing, etc.), CG_{it} is capital gains from housing, public equity, and private equity, T_{it} is net taxes and transfers, LB_{it} is the interest paid for liabilities (e.g. mortgages, student loans, credit cards, etc.), and C_{it} is consumption. Then, for each household, we sum each component separately and we normalize it by total lifetime resources, $\sum Y_{it}$.

Figure 7 shows the share of each source of total lifetime resources for those households whose head is between 55 and 60 years old in 2015 and conditional on their wealth rank. The overwhelmingly main source of lifetime income for 55-year-old top 0.1% wealth owners is income from equity, which constitutes around half of total lifetime resources. This is because top wealth owners are heavily invested in private equity (see Figure 5a), and they earn much higher returns from their investment (see Figure 6d). This is in contrast to households in the bottom 90% of the wealth distribution, for whom labor income constitutes roughly 80% of total lifetime resources. Another important component of lifetime resources is the initial wealth in the end of 1993, which captures the total resources available for the household in the beginning of the sample period including labor income, net capital income, inheritances, inter vivos transfers, government transfers, net

of taxes and consumption. This component is less important for younger cohorts; see Figure ZZZZ. Surprisingly, inheritances and inter vivos transfers (after 1994) seem to be quite small in total resources even for the wealthiest group.

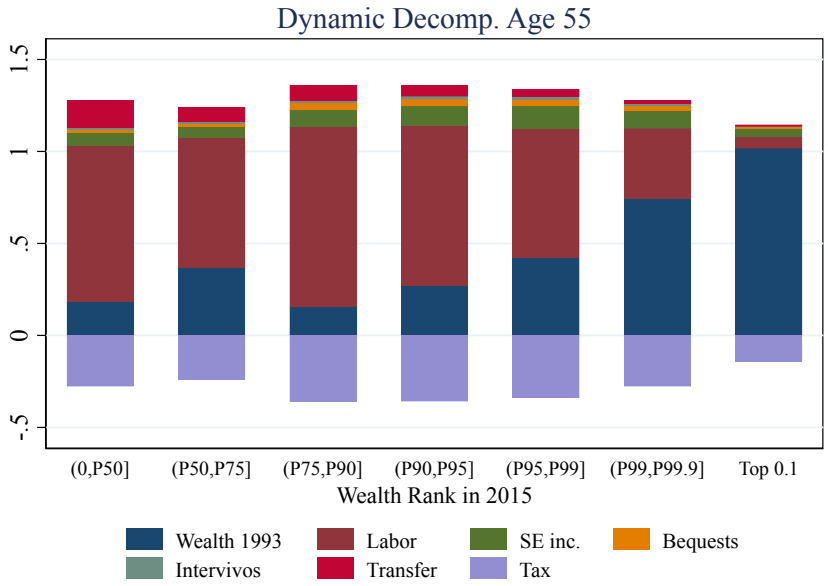
Fundemental Lifetime Resources In the above analysis, however, we ignore the capitalization of the stock of wealth, therefore, it is likely that we may be understating the importance of some of the stock variables for lifetime resources. For example, if a household inherits some amount of wealth from which she earns most of her capital income over the life cycle, the initial amount of inheritance can be misleading for understanding its importance for her total lifetime resources. To address this caveat, we perform another decomposition exercise in which we dynamically and iteratively distribute income from capital to (i) wealth in the end of 1993, (ii) inheritances and inter vivos transfers, (iii) labor income, and (iv) transfers from government.

Note that in our data we cannot distinguish the capital income from these four components separately. Therefore, in each year t we split the total capital income between them according to their share out of total wealth stock. In particular, household i starts 1994 with 1993 wealth (W_i^{93}) and then she earns labor income, receives inheritances and inter vivos transfers, and public transfers, and pay taxes ($L_{i,1994}, H_{i,1994}, T_{i,1994}$, respectively). Then, for the year 1994 the accumulated stocks of these components equal to their value in this year; i.e., $\hat{W}_i^{94} = W_i^{93}$, $\hat{L}_i^{94} = L_{i,1994}$, $\hat{H}_i^{94} = H_{i,1994}$, $\hat{T}_i^{94} = T_{i,1994}$. During the same year household i also earns net capital income $(RK_{i,1994} + CG_{i,1994} - LB_{i,1994})$. We then distribute the net capital income between these resources according to their share out of total resources $(RK_{i,1994} + CG_{i,1994} - LB_{i,1994}) \frac{\hat{X}_i^{94}}{\left(\hat{W}_i^{94}+\hat{L}_i^{94}+\hat{H}_i^{94}+\hat{T}_i^{94}\right)}$, where X denotes the resource type. Then, next year, in 1995, the stock value of wealth from 1993 will be equal to $\hat{W}_i^{95} = \hat{W}_i^{94} + (RK_{i,1994} + CG_{i,1994} - LB_{i,1994}) \frac{\hat{W}_i^{94}}{\left(\hat{W}_i^{94}+\hat{L}_i^{94}+\hat{H}_i^{94}+\hat{T}_i^{94}\right)}$. For other variables, we also add their corresponding flow values in 1995. For example, for labor income, $\hat{L}_i^{95} = \hat{L}_i^{94} + (RK_{i,1994} + CG_{i,1994} - LB_{i,1994}) \frac{\hat{L}_i^{94}}{\left(\hat{W}_i^{94}+\hat{L}_i^{94}+\hat{H}_i^{94}+\hat{T}_i^{94}\right)} + L_{i,1995}$. We repeat this calculation iteratively until 2015.[18]

Figure 8 shows the results from this exercise. For the wealthiest group the single most important component is the initial wealth in 1994, for which returns compound for more years than labor income or inheritances and inter vivos transfers. Because, the latter

[18]Note that Black *et al.* (2020) employs a similar strategy to uncover the components for "Deep Potential Wealth". However, they use the average rate of return in each year that vary by the net wealth decile of the individual in that year (with the top 1% as a separate category) to capitalize the stock variables.

FIGURE 8 – SOURCES OF TOTAL LIFETIME INCOME BY AGE 55



Note: Figure 8 shows the source of lifetime income for a sample of households whose head is between 55 and 59 years old in 2015 conditional on the wealth rank in the same year. All values expressed in 2018 NOK. Inheritances refers to the sum of bequests and inter vivos transfers. Equity Inc. refers to income obtained from investment in private and publicly traded firms in the form of dividends and capital gains.

components are received over time between 1994 and 2015. Even after accounting for capitalization, inheritances and inter vivos transfers are still a minuscule part of lifetime resources.

3.5 Inheritance and Intergenerational Wealth Persistence

As we discussed in the previous section, although inheritances (after 1994) are a small fraction of the total amount of resources received by the average household, few extremely rich individuals do receive large inheritances that put them to the top of the wealth distribution, even at early ages. To further investigate how inheritances play a role in the lifecycle wealth profile of households, we start by documenting the probability of a household receiving an inheritance or inter vivos transfers in a given year over the life cycle (Figure **??**). In contrast to the standard overlapping generations models with bequests (e.g., De Nardi and Fella (2017))—in which individuals typically receive their inheritances at the beginning of their life—our results indicate that for the average households this probability increases from below 2% at age 25 and peaks at 4%

age 50 and then declines to less than 1% at age 80.[19] Interestingly, there is significant heterogeneity in the timing of the inheritances and inter vivos transfers between wealth groups. Households that end up in the upper end of the 2014-2015 wealth distribution are more likely to have received inheritances or inter vivos and more likely to have received them earlier in the life cycle (Figure 9a). For example, this probability is highest between ages 25 and 50 around 8% per year for the wealthiest households, the top 0.1% group, after which it declines steeply, whereas for the bottom 50% this probability is much lower and follows a hump-shaped profile.

A second way in which rich households could differ in their inheritances relative to the rest of the population is in the portfolio composition that they leave to their offsprings. In Norway, individuals are only obliged to register the total amount of wealth they receive as inheritances or inter vivos transfers from their parents and relatives, but not its composition (whether it is in the form of safe assets, housing, private equity, etc.). We can gain some insight, however, by looking at the portfolio allocation of households in the last year of their lives.[20] Figure 9b shows the portfolio composition and leverage of households across the wealth distribution for households that do not survive to the next year and pass their wealth to their offsprings in the form of bequests.

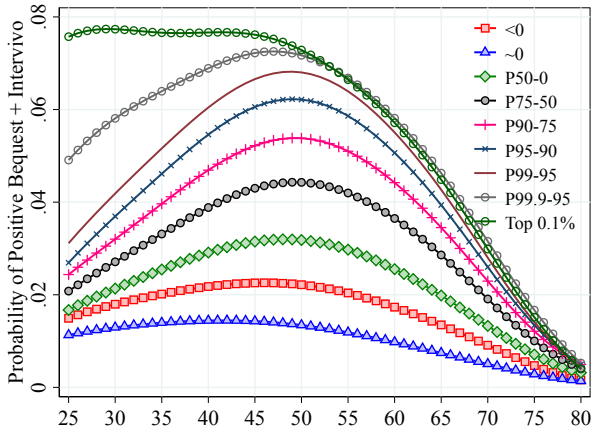
We find that the portfolio for households at the end of their life is remarkably similar to the portfolio composition across the entire population (see Figure **??**). Similarly to the rest of the population, those who do not survive but are at the top of the wealth distribution in their least year, show very little diversification and have most of their portfolio allocated in private equity; less rich households also show little diversification but have most of their wealth in housing. This has important implications for the type of inheritances individuals receive across the distribution: children of middle to low wealth families receive, if anything, inheritances that mostly consist of real estate (e.g., children receiving the house in which their parents lived when they were alive). In contrast, children of rich families, which receive larger inheritances and with a higher probability, inherit a portfolio that is highly skewed toward private equity. This helps explain, for instance, why individuals who start at the top of the wealth distribution tend to also

[19] Our data indicates that most individuals receive inheritances (bequests or inter vivos) only once in their life cycle.

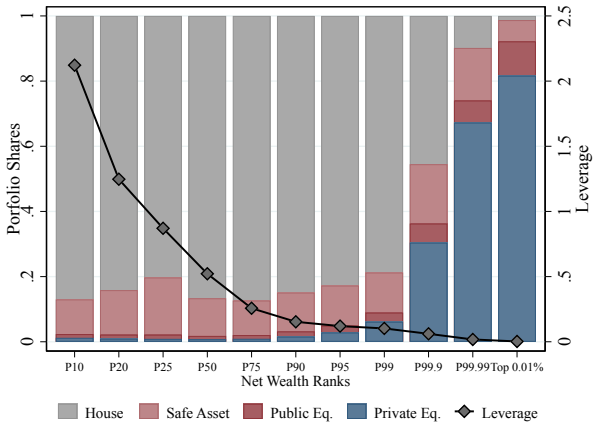
[20] Since we are looking at household-level data, we consider the last year in which a household is alive as the year in which both spouses within a household tax unit pass away. Notice also that, if the household passes away in period $t-1$, the last year in which we observe tax data is in year t, which corresponds to the wealth accumulated until year $t-1$.

FIGURE 9 – PROBABILITY OF RECEIVING INHERITANCE AND PORTFOLIO COMPOSITION

(A) Conditional on Wealth



(B) Not surviving Households

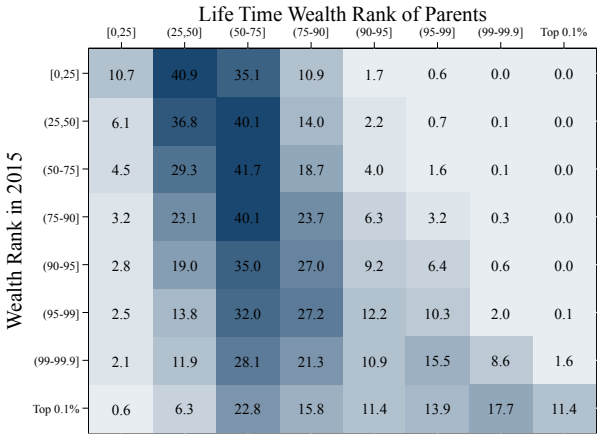


Note: Figure 9a shows the probability that a household receives an inheritances in a given age, conditional on the percentiles of the wealth distribution. To construct this figure, we first rank individuals with respect to their average wealth in 2014/2015 within five-year age groups and calculate the the probability of receiving an inheritance in each year between 1993 and 2014 (backward-looking approach). Conditional on this age-wealth group, we define the probability of receiving an inheritance at each age prior 2014. We then average across ages and smooth out the probability using a lowess estimator. Inheritances are defined as the sum of intervivos transfers and bequests. Figure 9b shows the portfolio composition of households who are alive in period t but are dead in period $t-1$. We define dead households as those where both spouses pass away.

have portfolios concentrated in private equity, as we show in the next section.

Given these results, one wonders how large is the intergenerational persistence of wealth, in particular at the top of the wealth distribution. To answer this question, we match those household that we observe at the end of the sample (2015) to their parental household. We sort parental household according to their rank in the average lifetime wealth distribution, which is defined as the mean wealth across all years we observe the parental household adjusted for year-and-age specific means. Figure 10 displays the transition matrix between those household who are between 55 and 59 years old in 2015 (y axis) and their parents (x axis). The results indicate a significant degree of persistence across generations, specially at the top. For instance, 29% of the household who end up at the top 0.1% of the wealth distribution in 2015 (bottom row) had parents with wealth at the top 1%, whereas 54% of them had parents at the top 5% of the lifetime wealth distribution. A significant part of rich households, however, came from middle-high wealth families (those with wealth between the 50th and the 90th percentiles) whereas as smaller fraction came from lower ranks of the wealth distribution. As we show in the following sections, rich households coming from low wealth families (new money

FIGURE 10 – INTERGENERATIONAL TRANSITION MATRIX



Notes: Figure 10 shows a intergenerational transition matrix between households wealth in 2015 and their parental household wealth for households who in 2015 are between 55 and 59 years old.

households) differ significantly in terms of their initial wealth and portfolio allocation earlier in life relative to those households whose parents were relatively rich (old money households).

3.6 Dissecting the top 1%: New versus Old Money

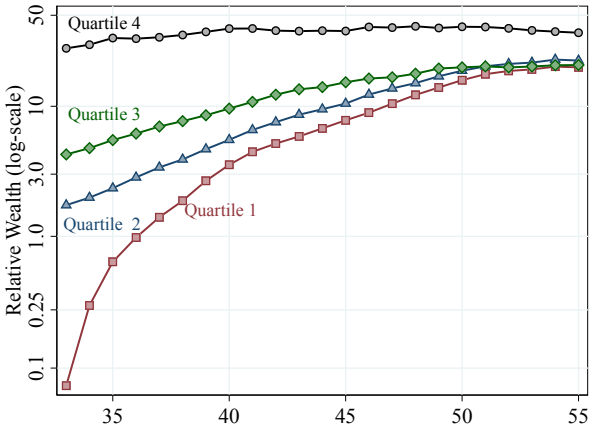
In figure 3 we have shown that the wealthiest in the end of the sample period were already very rich 21 years ago. However, figure 4a reveals that almost a quarter of them had initially relatively modest wealth. Now, we study this within group heterogeneity among the wealthiest. For this purpose, we rank those households in the top 1% of the within-age $\bar{W}_{i,2015}$ distribution also according to their $\bar{W}_{i,1994}$ into 4 quartiles.[21] We then compare these quartiles according to average their wealth profile, portfolio composition, and rate of returns returns over the lifecycle as well as the components of their lifetime incomes.

Figure 11a shows the average wealth profiles of the 55 and 59 years old top 1% wealth owners in 2015. Three points are worth noting. First, as we have also shown in Figure 4a, there is significant heterogeneity in the starting wealth—in 1993, when these households are around 30 to 34 years old. In particular, those that start at the top quartile in 1994—the "Old-Money" households—have, on average, wealth holdings of around 30 times the average wealth in the economy and their wealth holdings remain more or less stable (black dots). In contrast, those that start at the bottom quartile—the

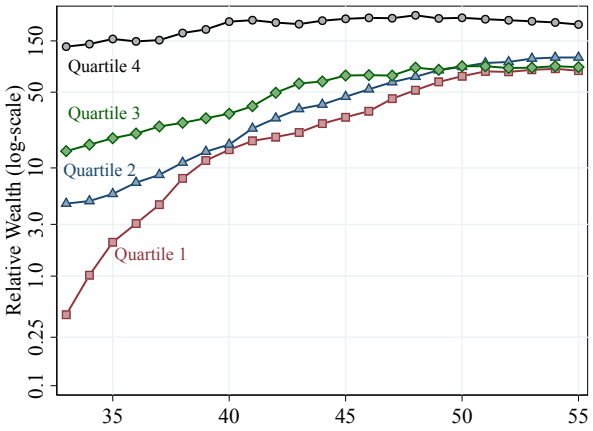
[21] We also do the same exercise for the top 0.1% wealth group, for whom sample size becomes

FIGURE 11 – AVERAGE WEALTH PROFILE: OLD MONEY AND NEW MONEY

(A) Top 1% in 2015



(B) Top 0.1% in 2015



Notes: Figure 11 shows the average wealth profile for household whose head is between 55 and 60 years old in 2015 and belong to the top 1% (Panel A) and top 0.1% (Panel B) in that year. Each line is the average wealth for individuals in different quartiles of the wealth distribution in 1993.

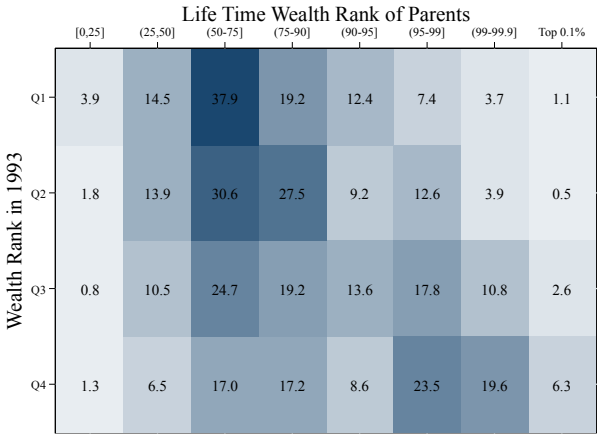
"New-Money" households—hold wealth that is, on average, less than 10% of the average wealth in the economy (red line with squares).

Second, New-Money households experience significant wealth growth during their lifetime: on average, their wealth increases around 150 times in a 20 years span. Part of this increase is, of course, by construction, as we are conditioning on their wealth in 2015. Third, most of this rapid growth occurs early in life between ages 32 and 40. After that period, the growth rate of wealth is similar to the growth rate of those who started in the middle of the wealth distribution (lines with triangles and diamonds). We find similar results when we focus on those individuals reaching the top 0.1% of the wealth distribution (Figure 11b) or when we look at other age groups (as shown by Figure A.21 in the Appendix).

Do "new money" households come from modest backgrounds? To investigate this question, Figure shows average income percentiles of parents for four quartiles of top wealth group. "Old-money" households are much more likely to have parents in the top 5% (almost 50%), whereas only around 10% of "new-money" households' parents in the top 5% of the wealth distribution and 75% of them are below 90%. This result suggest that most "new money" households are self-made and come from modest backgrounds.

We then analyze the determinants of wealth accumulation for Old- and New-Money households using the same statistics we discussed in the previous sections. We start by

FIGURE 12 – INTERGENERATIONAL TRANSITION MATRIX

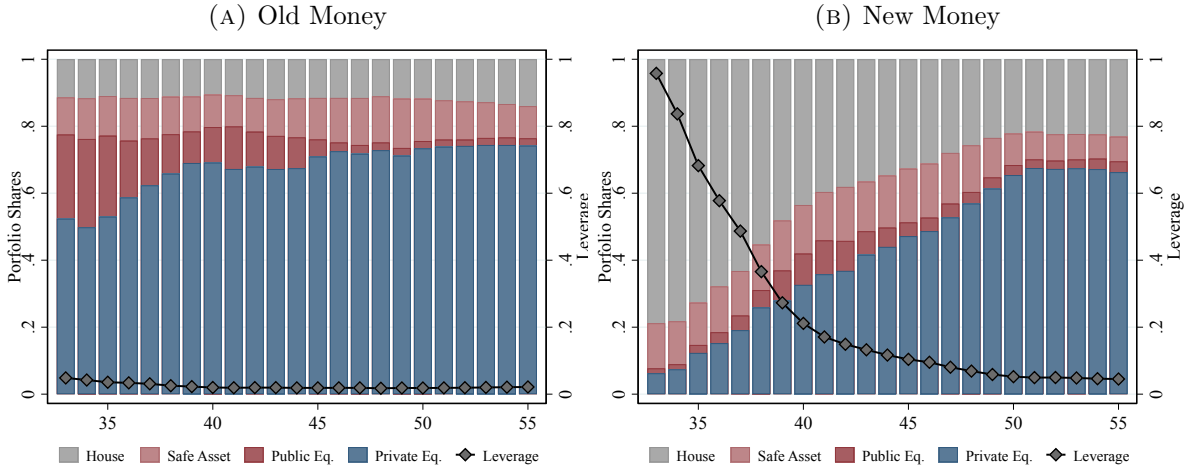


Notes: Figure 12 shows a intergenerational transition matrix between households wealth in 2015 and their parental household wealth for households who in 2015 are between 55 and 59 years old.

focusing on their portfolio composition. Figures 13a and 13b show the share of different types of assets over the life cycle for Old- and New-Money households, respectively. Starting from 13a—which shows the portfolio composition for those in Quartile 4 (Old Money) in Figure 11—we find the same pattern found at the aggregate level: Old Money households hold a large fraction of their wealth in private equity; in this case, around 55% even at the start of their life, when they are around 30 years old. Leverage (depicted by the line with diamonds) is close to 0 for this group throughout. In contrast, New Money households—Figure 13b or Quarter 1 in Figure 11—start their life with an average portfolio share of equity of around 5% which they increase rapidly over the next 20 years to reach almost the same share of private equity held by those households who start rich. Leverage among these households starts quite high and declines fast especially between the ages of 30 and 40, which coincides with the period of rapid expansion of their wealth. Figure A.24 in the Appendix shows similar results for other age groups.

Heterogeneity in labor earnings does not seem to be the main source of the different patterns between New and Old-Money households. We would expect such a pattern if, for instance, New Money households were successful medical doctors or lawyers who accumulate wealth by saving a large fraction of a high labor income. In fact, as we show in Figure A.22 in the appendix, New- and Old-Money Household earn, on average, between 3 to 4 times the level of labor income received by the average worker in Norway. New-Money households experience a larger increase in labor income during their lifecycle, earning by age 55 around 4.5 times the average the economy-wide average level. In

FIGURE 13 – PORTFOLIO SHARES: OLD MONEY AND NEW MONEY



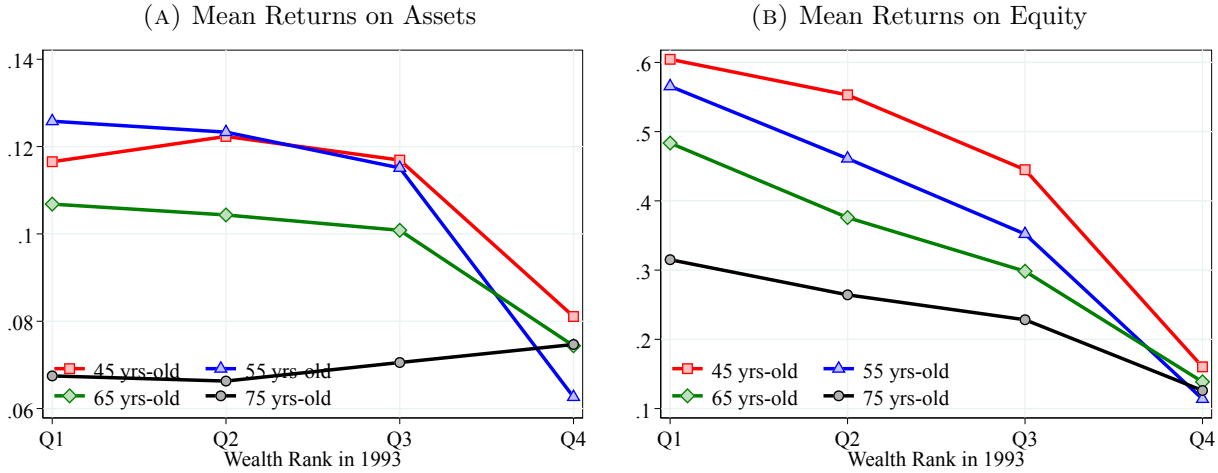
Notes: Figure 13 shows the portfolio composition and leverage for households whose head is between 55 and 59 years old in 2015 and who belong to the top 1% in that year. Old Money households (Panel B) are those households that were in the fourth quartile (Quarter 4) of the wealth distribution in 1993. New Money households (Panel A) are those households that were in the first quartile (Quarter 1) of the wealth distribution in 1993.

contrast, the labor earnings for Old-Money households remains relatively stable at around 2.5 times the average level. The larger increase in labor income among New-Money household, however, is negligible relative to the 100-times increase in wealth depicted in Figure 11.[22]

Finally, we study the rates of return on wealth earned by each of these groups over their lifetime. For doing that, we calculate (value-weighted) returns for each asset class and we average across time and within each quartile of the 1993 wealth distribution. Figure 14a shows the average return for net wealth and Figure 14b shows the average return on equity. In this figure, the x-axis is a quartile of the wealth distribution at the start of our sample (in 1993) and the y-axis is the corresponding lifetime average return within quartile for a given age group. Figure 14a shows that Old Money households (those who start at the top quartile of the wealth distribution in 1993) earn a significantly lower return than other households that at lower ranks of the wealth distribution, in particular those who start at the first quartile or New Money households. Most of this differences is accounted for by coming from significant heterogeneity in the lifetime return on equity, depicted in Figure 14b: Across the age distribution, those that start with little

[22] We do not find significant differences in the education level of the head of the household between New- and Old-Money. As Figure A.23 in appendix show, most households have a High School degree or less, with a significant fraction reaching Law or Medical degrees. Old and New money households do not differ much in the within-group shares across different education categories.

FIGURE 14 – LIFETIME RETURNS: OLD MONEY AND NEW MONEY



Notes: Figure 14 shows the value-weighted median lifetime returns for households who are at the top 1% of the wealth distribution at the end of the sample period (2015) and were in different quarterlies of the wealth distribution at the start of the sample period (1993) identified as Quartile 1 (Q1) to Quartile 4 (Q4).

wealth earn significantly larger returns (eg. a 50% average annual return for those of 55 years old) relative to those that start rich (eg. 20% for those of 55 years old).[23] This large difference in rate of returns, and the corresponding increase in the portfolio share of private equity among New money households explain the convergence of wealth accumulation displayed in Figure 11.

4 Lifecycle Model

The empirical analysis presented in the previous sections reveals interesting patterns of wealth accumulation over the life cycle. These patterns can be the result of different forces, such as inheritances, intergenerational transmission of abilities, return heterogeneity, and other forces that have been identified in the literature (De Nardi and Fella, 2017). To further disentangle these forces, in this section we develop a life-cycle, incomplete market, heterogeneous agents model, whose main parameters are disciplined by the empirical findings of the previous sections. We also use the model to analyze the effects of taxes on wealth, capital income, and bequests in the aggregate and across the distribution.

[23] We do not find significant differences in the returns on housing (Appendix Figure A.25a) or safe assets (Appendix Figure A.25b). Un weighted rates of return—displayed in Appendix Figure A.26—show similar qualitative patters.

4.1 Model Setup

We consider a general equilibrium small open economy setting with fixed interest rate r. The economy is populated by overlapping generations of finitely lived households. Time is discrete, and the model is solved at annual frequency. Individuals face mortality risk and can live up to a maximum of H years. We denote ϕ_h as the unconditional probability of survival up to age h, where $\phi_1 = 1$, and $\psi_h \equiv \phi_h/\phi_{h-1}$ is the conditional probability of surviving from age $h-1$ to h, with $\psi_{H+1} = 0$. Households are replaced by offsprings that inherit parental wealth and abilities imperfectly.

Household preferences are time-separable. Households derive utility from consumption, $u(c) = c^{1-\gamma_c}/(1-\gamma_c)$, and from leaving a bequest, $v(a) = \chi a^{1-\gamma_b}/(1-\gamma_b)$. Households discount the future with a common discount factor β. Thus, they maximize

$$\mathbb{E}_0 \left(\sum_{h=1}^{H} \beta^{h-1} \phi_h \left(u\left(c_h\right) + \left(1 - \psi_{h+1}\right) v\left(a\right) \right) \right).$$

Each household supplies one unit of labor in the labor market and potentially produces a differentiated intermediate good, financing the capital k used for production using their own wealth, a, as well as external funds, denoted by k^{rent}. They also have the option to invest (part of) their wealth in a risk-free bond denoted by a^{bond}. At any given age h, households indexed by i differ in their labor market efficiency e_{ih}, entrepreneurial ability z_{ih}, and wealth a_{ih}.

Labor Income Heterogeneity

A household's efficiency units of labor supply e_{ih} evolve according to

$$\ln e_{ih} = \underbrace{\kappa_h}_{\text{lifecycle}} + \underbrace{\bar{e}_i}_{\text{permanent}} + \underbrace{\eta_{ih}}_{\text{persistent stochastic}} + \underbrace{\xi_{ih}}_{\text{transitory stochastic}},$$

where κ_h is a life-cycle component—which is common for all households—and $\bar{e}_i$ denotes a household's fixed labor efficiency type, which is inherited imperfectly across generations:

$$\bar{e}_{child} = \rho_e \bar{e}_{parent} + \varepsilon^e_{child},$$

where the parameter ρ_e captures the inter-generational correlation of labor efficiency and $\varepsilon^e \sim N(0, \sigma_e)$ is an i.i.d. shock. The stochastic component of labor efficiency comprises a persistent component, denoted by η_{ih}, and a transitory component, denoted by ξ_{ih}. The

persistent component is modeled as an first-order autoregressive process with innovations drawn from a mixture of normally distributed random variables:

$$\eta_{ih} = \rho_\eta \eta_{i,h-1} + \varepsilon^\eta_{ih}, \text{ where}$$
$$\varepsilon^\eta_{ih} = \begin{cases} N(\mu_{\eta,1}, \sigma_{\eta,1}) \text{ with probability } p^\eta, \\ N(\mu_{\eta,2}, \sigma_{\eta,2}) \text{ with probability } 1 - p^\eta. \end{cases}$$

The transitory component is also modeled as a mixture or normals:

$$\xi_{ih} = \begin{cases} N(\mu_{\xi,1}, \sigma_{\xi,1}) \text{ with probability } p^\xi, \\ N(\mu_{\xi,2}, \sigma_{\xi,2}) \text{ with probability } 1 - p^\xi. \end{cases}$$

The mixture of Normal distributions is crucial to match the negative skewness and excess kurtosis that characterizes the typical earnings process (Guvenen *et al.*, 2018).

Return Heterogeneity

Household i owns the product line i and may choose to produce x_{ih} units of the intermediate good according to $x_{ih} = z_{ih} k_{ih}$, where z_{ih} is i's entrepreneurial ability at age h and k_{ih} denotes the capital employed. Production entails an operating fixed cost ψ. The key source of heterogeneity is in entrepreneurial ability, z_{ih}, that evolves according to

$$\log z_{ih} = \underbrace{\overline{z}_i}_{\text{permanent}} + \underbrace{\zeta_{ih}}_{\text{stochastic}}.$$

Here $\overline{z}_i$ denotes a household's fixed entrepreneurial ability, which is inherited imperfectly across generations such that,

$$\overline{z}_{child} = \rho_z \overline{z}_{parent} + \varepsilon^z_{child},$$

where ρ_z is the inter-generational correlation of entrepreneurial ability and $\varepsilon^z \sim N(\mu_z, \sigma_z)$ is an i.i.d. shock. The stochastic component of entrepreneurial ability is modeled as an first-order autoregressive process defined by

$$\zeta_{ih} = \rho_\zeta \zeta_{i,h-1} + \varepsilon^\zeta_{ih},$$

with persistence parameter ρ_ζ and i.i.d. shock $\varepsilon^\zeta \sim N(0, \sigma^\zeta)$.

Final and Intermediate Good Markets

A representative final good producer combines the intermediate goods, x_i, and labor to produce the final good Y according to $Y = X^{\alpha}L^{1-\alpha}$, where L is the aggregate labor supply and X is an intermediate goods aggregator, which is characterized by a constant elasticity of substitution across varieties:

$$X = \left(\int_i x_i^{\mu} di \right)^{1/\mu}, \quad \text{with} \quad 0 < \mu < 1.$$

The profit maximization problem of the final good producer can be written as

$$\max_{\{x_i\},L} \left(\int_i x_i^{\mu} di \right)^{\alpha/\mu} L^{1-\alpha} - \int_i p_i x_i di - wL,$$

where p_i is the price of intermediate good i and w is the wage rate. Taking first order conditions, we obtain the inverse demand function for intermediate good i,

$$p_i = p\left(x_i\right) = \alpha x_i^{\mu-1} X^{\alpha-\mu} L^{1-\alpha},$$

and the wage rate

$$w = (1-\alpha) X^{\alpha} L^{-\alpha}.$$

It follows that an entrepreneur that employs productive capital k and has entrepreneurial ability z earns a profit of

$$\hat{\pi}(k,z) = p(kz)kz - \delta k - \theta = \alpha (kz)^{\mu} X^{\alpha-\mu} L^{1-\alpha} - \delta k - \psi,$$

where δ denote the depreciation rate of capital. Defining $P = \alpha X^{\alpha-\mu} L^{1-\alpha}$, we obtain

$$\hat{\pi}(k,z) = P(kz)^{\mu} - \delta k - \psi.$$

Returns on Capital and Asset Structure

Consider a household that starts a given period with a units of wealth, and that is endowed with entrepreneurial ability z. The household can decide whether and how much productive capital k to employ in its own firm, subject to a borrowing constraint $k \leq \lambda a$. Let $k^*(z)$ denote the optimal amount of productive capital in the absence of a

constraint. Then, optimality implies that

$$k^*(z) = \arg\max_{k\geq 0} \left\{ P\left(zk\right)^{\mu} - \delta k - r\left(k-a\right) = \left(\frac{\mu P z^{\mu}}{r+\delta}\right)^{1/(1-\mu)} \right\}.$$

Define the unconstrained net entrepreneurial profit (in excess of the market return) as

$$\begin{aligned}
\pi^*(z) &= \hat{\pi}(k^*(z),z) - rk^*(z) = Pz^{\mu}\left(\frac{\mu P z^{\mu}}{r+\delta}\right)^{\mu/(1-\mu)} - (r+\delta)\left(\frac{\mu P z^{\mu}}{r+\delta}\right)^{1/(1-\mu)} - \psi, \\
&= \left(\frac{\mu P z^{\mu}}{r+\delta}\right)^{1/(1-\mu)}\left(\frac{r+\delta}{\mu} - (r+\delta)\right) - \psi, \\
&= \frac{1-\mu}{\mu}\left(\mu P z^{\mu}\right)^{1/(1-\mu)}(r+\delta)^{-\mu/(1-\mu)} - \psi.
\end{aligned}$$

Thus, for unconstrained households with sufficiently high z such that variable profits exceed the fixed cost of production ψ, entrepreneurial activity nets an extra profit that is independent of their wealth level and a function of z only. In this case, total capital income is given by

$$\pi(a,z) = ra + \max\{\pi^*(z), 0\}.$$

Constrained households are such that $\nu a < k^{\star}(z)$. For these households, capital income is given by

$$\pi(a,z) = ra + \max\{P\left(z\lambda a\right)^{\mu} - (r+\delta)\lambda a - \psi, 0\}.$$

Conditional on operating a business, entrepreneur's capital demand can be written as $k^d(a,z) = \min\{k^*(z), \nu a\}$. The decision to become an entrepreneur $I^{ent}(a,z) \in \{0,1\}$ is characterized by $I^{ent} = 1$ if $\hat{\pi}(k^d(a,z),z) \geq rk^d(a,z)$, which implies that wealthier and more productive households are more likely to enter into entrepreneurship.

Inheritances

Following the evidence presented in Figure 9, that indicates that the probability of receiving an inheritance or an inter vivos transfer is hump shaped over the life cycle and varies across the wealth distribution, we allow for bequests to arrive stochastically over the life-cycle. In particular, at any given age h, a household of type $\theta = (\bar{e}, \bar{z})$ draws from an type-specific inheritance distribution, Γ_{θ}, with age- and type-specific

probability $p_{h,\theta}$. The inheritance distribution, Γ_θ, is an equilibrium object, corresponding to the distribution of parental bequests (which equals the distribution of wealth at death, integrating over parental types θ' conditional on child type θ). Note that if $p_{1,\theta} = 1$ and $p_{h,\theta} = 0$ for all $h \geq 2$ and for all θ, then this setup reduces to the standard model of inheritances, where offsprings receive a deterministic bequest in the first period.

Taxes and Transfer

We model taxes and transfers following the Norwegian system. A household i retires in period R. Throughout retirement, they receive retirement benefits given by $s\left(\bar{e}_i, \eta_{i,R-1}\right)$. For tractability, the retirement payments depend on the permanent component of labor ability, $\bar{e}_i$, and the value of the persistent stochastic component in the period preceding retirement, $\eta_{i,R-1}$. The labor income and retirement process is estimated as after-tax and -transfers. In addition, there are tax schedules on bequests $\tau^b(\cdot)$, on wealth $\tau^a(\cdot)$, as well as a linear tax on capital income τ^k. Let $\tilde{\tau}^b(b) = b - \tau^b(b)$ and $\tilde{\tau}^a(a) = a - \tau^a(a)$ denote the respective net-of-tax schedules. The proceeds from the bequest tax are redistributed in lump-sum fashion at $h = 1$, whereas the proceeds from capital income taxes and wealth taxes are implicitly used by the government (together with implicit taxes on labor income) to finance the transfers implicit in the after tax and transfers retirement benefit and labor income process.[24]

Household Value Functions

Retirement. Denoting the vector of exogenous household state variables by $\mathbf{S} = (\bar{e}, \eta, \xi, \bar{z}, \zeta)$, the household's problem for at age h such that $R \leq h \leq H$ is given by

$$V_h(a, \mathbf{S}) = \max_{c,a'} \left\{ u\left(c\right) + \beta\psi_{h+1} E\left[V_{h+1}(a', \mathbf{S}') \mid \mathbf{S}\right] + (1 - \psi_{h+1}) v(\tilde{\tau}^b(a')) \right\},$$

with the convention $V_{H+1} = 0$, and subject to

$$c + a' = \tilde{\tau}^a(a) + (1 - \tau^k)\pi(a, z) + s\left(\bar{e}, \eta\right),$$

$$a' \geq 0.$$

Working Period. A household of age $1 \leq h < R$ inelastically supplies $e_h(\bar{e}, \eta, \xi)$ efficiency units of labor. At the beginning of each period, with probability $p_{\theta,h}$ they draw a bequest b from the bequest distribution Γ_θ. Denote by I^b a random variable which is

[24] In policy counterfactuals, we hold net tax revenue constant.

equal to one if they draw a bequest (and zero else). Their dynamic problem is given by

$$V_h(a, \mathbf{S}) = \max_{c,a'} \left\{ u(c) + \beta\psi_{h+1} E\left[V_{h+1}(a' + I^b b), \mathbf{S}') \mid \mathbf{S}\right] + (1 - \psi_{h+1}) v(\tilde{\tau}^b(a')) \right\},$$

subject to

$$c + a' = \tilde{\tau}^a(a) + (1 - \tau^k)\pi(a, z) + we_h(\bar{e}, \eta, \xi),$$

$$a' \geq 0.$$

Equilibrium

Given the fixed interest rate r, equilibrium is characterized by a wage rate w such that

1. households solve their dynamic problem taking as given the wage rate w, the intermediate good pricing function $p(x_i)$, as well as the inheritance distribution Γ_θ, resulting in optimal entrepreneurial decisions I^{ent}, intermediate good supply x_{ih}, and bequests b_i,
2. the value of the intermediate good aggregator X results from household choices x_i,
3. the wage rate w equals the marginal product of labor given X and the normalization $L = 1$,
4. the pricing function $p(x_i)$ results from the optimality condition of the final good producer,
5. and for every type θ, the inheritance distribution Γ_θ is consistent with the ergodic distribution of bequests b_i.

4.2 Estimation

Ex-ante Parameter Inputs. We feed the after-tax-and-transfers labor income process, the retirement replacement rate, and the survival probability profile into the model, all based on Norwegian data.[25] We fix the leverage constraint, $\lambda = 3$, which corresponds

[25] Our income process consists of a normally distributed individual fixed effect, an AR(1) persistent component, and an iid transitory component. The innovations to the persistent component and the transitory shocks are drawn from a mixture of normals, which allows for non-Gaussian features. Furthermore, we allow the probability of normal mixture to change by age to capture the life-cycle variation in income dynamics (similar to Guvenen *et al.* (2018)). We estimate this income process by targeting cross-sectional moments of 1-year and 5-year household after-tax after-transfer income growth, average and variance of log income as well as the share of aggregate income owned by top 0.1%, 1% and 5%.

Table III – Targeted Moments in Data and Model

Moment	*Data*	*Model*
Life-cycle profile of mean wealth	Figure A.28a	
Life-cycle profile of top 1% wealth share	Figure A.28b	
Mean wealth at death (normalized)	0.800	0.781
Annual return, standard deviation (%)	10.180	9.388
Difference mean return P99+ vs. P50-75 by wealth (%)	6.190	5.636
Return fixed effect, standard deviation (%)	4.210	4.532
Return fixed effect, inter-generational persistence	0.094	0.095
Fraction business owners	0.072	0.073
Wealth-labor income ratio	6.368	5.793

Notes: Table III displays the moments used for the model estimation.

to the 95th percentile of the leverage distribution in the data. Finally, we set the risk-free interest rate to $r = 1.87\%$, and we use standard values for the capital share parameter $\alpha = 0.4$, the depreciation rate of capital $\delta = 0.05$, and the curvature of consumption utility $\gamma_c = 4$.[26]

Estimated Parameters. We jointly estimate a total of 9 parameters relating to preferences $\{\beta, \chi, \gamma_b\}$, entrepreneurial ability $\{\rho_z, \sigma_z, \sigma_\zeta\}$, technology $\{\mu, \psi\}$, and the inheritance life-cycle $\{\omega\}$ to match a set of 33 data moments. The data moments consist of the life-cycle profile of mean wealth and wealth concentration (13 moments each), mean bequest, return heterogeneity (4 moments), the fraction of business owners, and the wealth-to-labor income ratio. While all parameters are jointly estimated, we provide some intuition on how our estimates are informed by the data. First, the discount factor β is disciplined by the wealth-to-labor income ratio. The weight on bequest utility, χ in the utility function, is informative about mean wealth towards the end of the life-cycle and the average bequest, while the bequest utility curvature, γ_b, affects primarily the life-cycle profile of wealth concentration. Although we observe the life-cycle profile of inheritances for offsprings in the data $(\tilde{p}_{h,\theta})_{h=1}^{H}$, we choose to estimate the probability of receiving an inheritance in the first model period. We do this because the first period we observe an individual in the model corresponds to age 24 in the data, and we do not have information on the cumulative probability of an individual aged 24 of having

[26] We compute r as the unweighted average household return on safe financial assets and housing in the data.

TABLE IV – ESTIMATED PARAMETERS

Parameter		*Value*
Discount factor	β	0.874
Fixed entrepreneurial ability, inter-generational persistence	ρ_z	0.624
Fixed entrepreneurial ability, standard deviation	σ_z	0.383
Stochastic entrepreneurial ability, standard deviation	σ_ζ	0.772
Decreasing returns to scale	μ	0.853
Fixed cost of operating business	ψ	3.463
Bequest utility weight	χ	86.702
Bequest utility curvature	γ_b	4.329
Scalar bequest period one	ω	12.304

Notes: Table IV displays the implied parameters estimated targeting the moments shown in Table III.

received inheritances or inter vivos earlier in life. Thus, we set $p_{1\theta} = \omega\tilde{p}_{1\theta}$ and $p_{h,\theta} = \tilde{p}_{h\theta}$ for all $h \geq 2$; then, we normalize such that $\sum_{h=1}^{H} p_{h\theta} = 1$.

Second, we target a number of moments related to the return process and entrepreneurial technology. The model generates an overall return per household and year, incorporating returns to entrepreneurship, that we relate to the overall return on net wealth in the data. We also compute for each household a return fixed effect, as in the data using an eleven-year panel regression, and match the corresponding dispersion and inter-generational persistence . The two parameters that are most informative on these are the persistence ρ_z and dispersion σ_z of the fixed entrepreneurial ability type of a household $\bar{z}_i$. Given that the return residual, conditional on the estimated fixed effect, exhibits near zero auto-correlation in the data (see Fagereng *et al.* (2016)) , we set the persistence of the stochastic entrepreneurial ability term ζ_{ih} to zero ($\rho_\zeta = 0$) and choose its dispersion σ_ζ to match the unconditional dispersion of annual household returns. We then normalize mean entrepreneurial ability μ_z such that z_i has mean zero. Finally, the fixed cost of operating a business, ψ, relates closely to the fraction of business owners; and the returns to scale parameter μ affects the difference in mean returns across the wealth distribution.

Table III displays targeted moments in model and data whereas Table IV shows the parameters estimated jointly with the equilibrium of the model. Since the number of targeted moments exceeds the number of estimated parameters, the model is over-identified. As Table III reveals, the model is capable of replicating the targeted moments

very well. In particular, the model generates enough overall wealth inequality when simultaneously matching the observed degree of return heterogeneity (given the observed labor income process).

Model Fit. The estimation strategy described above does not target any of the dynamic profiles described in the empirical section. The model, however, does a good job in matching the salient features of the data. For instance, the retrospective profiles implied by the model, depicted by solid lines in Figure 15a, match those observed in the data (lines with markers), both in terms of levels and lifecycle growth. Similarly, the model accounts for the difference between Old Money and New Money households as shown in Figure 15b. Figure 15c shows that the mean portfolio return is monotonically increasing in household wealth both in the data and in the model. On average, households in the richest percentile earn a return that is more than 7 percentage points higher than the return of households in the bottom half of the wealth distribution.

4.3 Quantitative Results

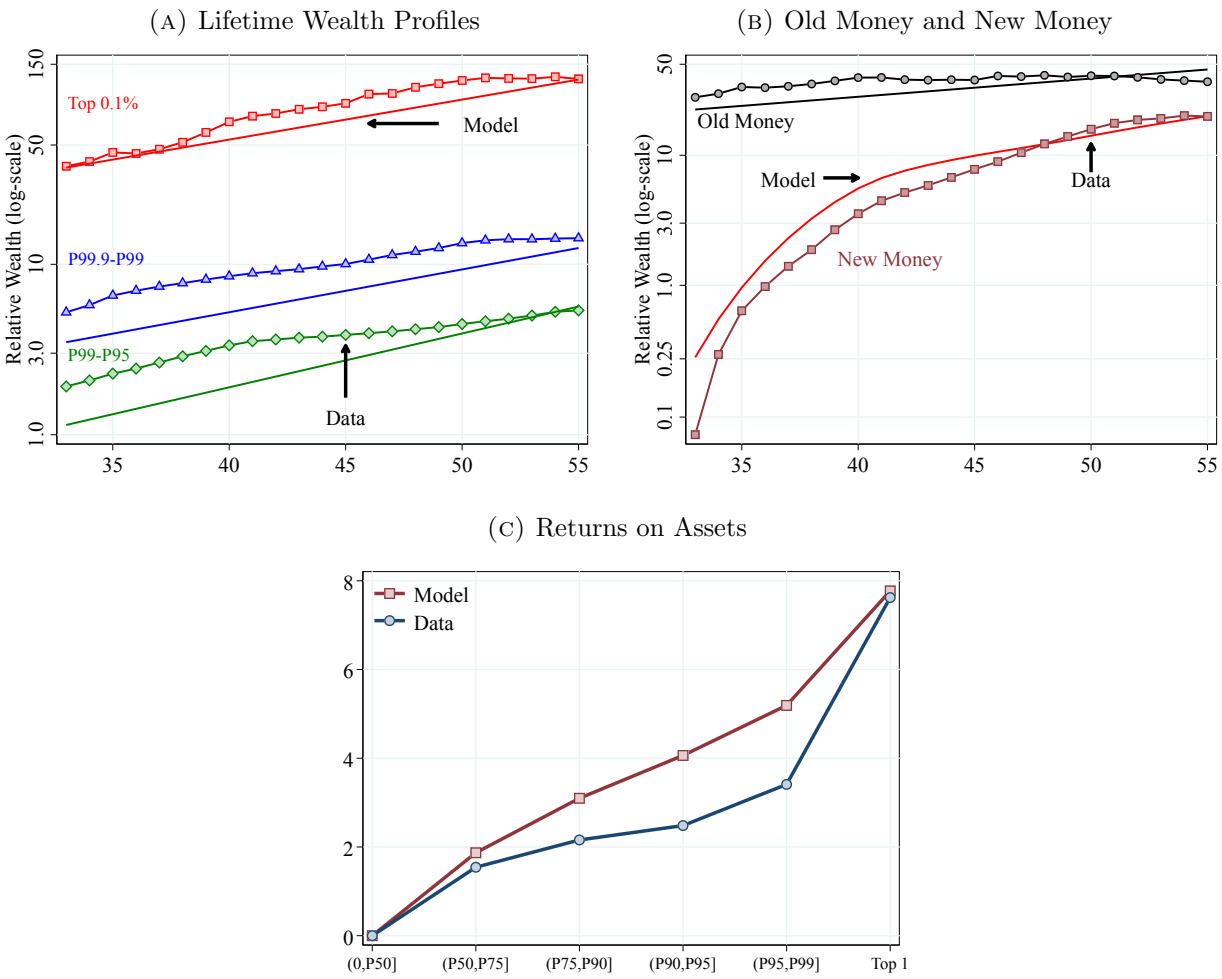
In this section, we use our estimated model to quantitatively evaluate why the wealthy are so wealthy. We start by quantifying the importance of return and bequest heterogeneity for wealth inequality over the life-cycle via counterfactual analysis. Then, we analyze the aggregate and distributional effects of the inheritance tax and compare it to taxes on wealth and capital income taxes.

4.3.1 The Importance of Return and Bequest Heterogeneity

We compare the baseline model to two alternative parameterizations: (i) eliminating all return heterogeneity, instead assigning to all households the unweighted average return in the economy (3.6%); (ii) eliminating bequest heterogeneity, instead assigning to all households the average bequest in the economy. We quantify the importance of each channel for wealth inequality in two ways.

First, Figure 16 shows the top 1% wealth share over the life-cycle for the baseline model and the counterfactual parameterizations. When differences in rates of return are shut down (line with diamonds), wealth concentration at each age declines significantly. For example, in the baseline calibration, those in the top 1% of the distribution own around 24% of aggregate wealth of 25-year olds. This number declines to 17% in the absence of return heterogeneity. The importance of return heterogeneity declines slightly over the life cycle. Moreover, when we distribute bequests equally (line with triangles), that is,

FIGURE 15 – MODEL AND DATA COMPARISON: LIFE TIME WEALTH PROFILES

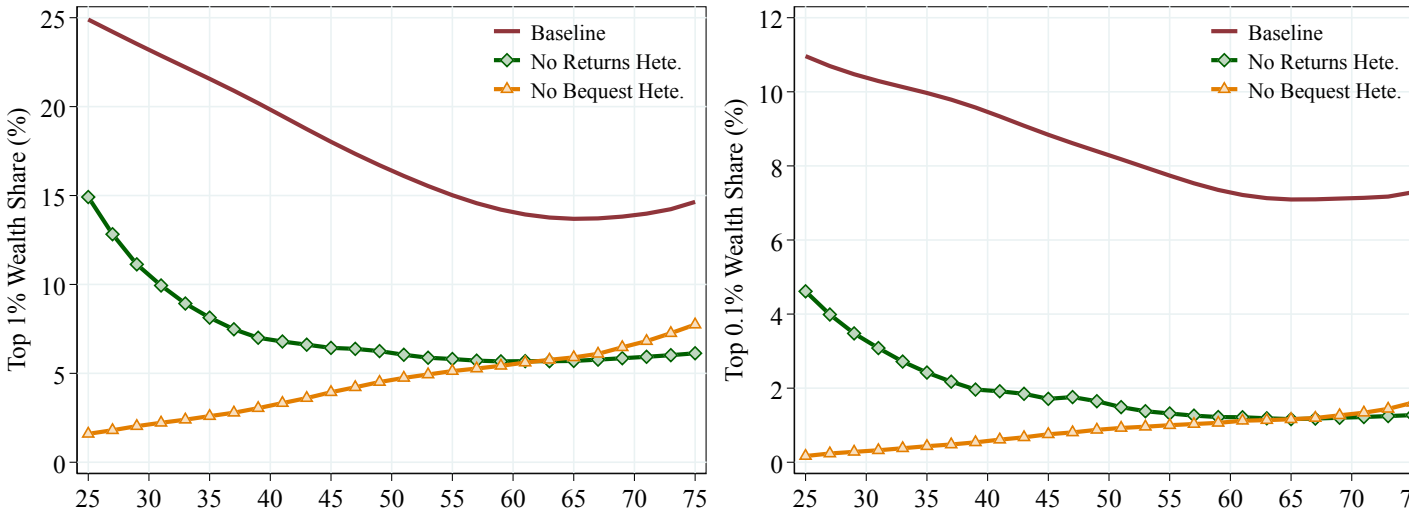


Notes: The top panels display the backward-looking profiles in the model (solid lines) and in the data (lines with markers) for a sample of households who are between 55 and 59 years old when ranked. The top left panel displays the wealth of selected ranking groups (relative to average wealth in the economy); the top right panel zooms into the new and old money households within the top 1%. Panel (c) displays the average portfolio return in the cross-section of households ranked by wealth, in percentage points, and normalizing the return of the bottom half of the wealth distribution to zero.

by fully taxing them and issuing a lump-sum transfer to each newborn, by construction we find a much larger decline in wealth inequality earlier in the life cycle. As cohorts age, within-age wealth inequality grows but stays below baseline inequality levels. This indicates that return heterogeneity alone cannot explain the large within-age concentration of wealth that we observe in the data.

We then compute the fraction of rich households that remain at the top of the distribution without return or bequest heterogeneity. Specifically, we follow those individuals who are at the top of the wealth distribution in the baseline under counterfactual cali-

FIGURE 16 – CROSS SECTIONAL DECOMPOSITION OF WEALTH INEQUALITY



Notes: Figure 16 shows the share of the top 1% of wealth within age groups for the data and for the model under different parameterizations. In the Baseline case, the wealth share of the top 1% of households is 20%, in the case without returns heterogeneity is 14.5%,in the case without bequest heterogeneity is 14.0%, and without either of them, 14.0%.

brations. The results are reported in Tables Va and Vb respectively. For example, when we shut down return heterogeneity (Table Va), we find that, depending on the age group, around 53-58% of those households that are above the top 0.1% cutoff in the baseline calibration would still be above the same cutoff level of wealth if they would earn the average return in the economy on their wealth. As for the role of bequests (Table Vb), we find that by age 50 only 46% of the top 0.1% richest households in the baseline still make it above the top 0.1% wealth cutoff if they are counterfactually assigned the economy-wide average inheritance. The significance of bequest heterogeneity naturally declines over the life-cycle: by age 70, this number increases to 64%.

4.3.2 The Impact of an Inheritance Tax

We use our estimated model in an open economy general equilibrium setting to assess the effects of the inheritance tax on output and welfare. Our estimated benchmark economy features a progressive inheritance tax with a top marginal tax rate of 15% and an exemption level corresponding to around 13% of average net wealth, raising tax revenue on the order of 0.6% of GDP. Inheritance tax revenues are re-distributed in a lump sum fashion to households. We conduct equilibrium counterfactuals, where we eliminate the inheritance tax, financed by either (i) cutting the lumpsum transfer, (ii) raising the wealth tax in a revenue-neutral way (such that the transfer is fixed), and (iii) raising the capital income tax in a revenue-neutral way. The results are summarized

TABLE V – DYNAMIC DECOMPOSITION OF WEALTH INEQUALITY

(A) No Return Heterogeneity

	Age 50				Age 70			
	Top 0.1%	99-99.9	95-99	<95	Top 0.1%	99-99.9	95-99	<95
Top 0.1%	53.3%	25.0%	6.5%	15.2%	57.6%	18.8%	3.5%	20.0%
P99-P99.9	0.7%	52.1%	25.4%	21.8%	0.7%	47.1%	24.1%	28.2%
P95-P99	0.0%	0.9%	59.2%	39.9%	0.0%	0.9%	48.7%	50.4%

(B) No Bequest Heterogeneity

	Age 50				Age 70			
	Top 0.1%	99-99.9	95-99	<95	Top 0.1%	99-99.9	95-99	<95
Top 0.1%	45.7%	6.5%	6.5%	41.3%	63.5%	16.5%	3.5%	16.5%
P99-P99.9	0.1%	53.7%	7.5%	38.7%	0.5%	65.5%	11.1%	22.9%
P95-P99	0.0%	0.7%	61.5%	37.8%	0.0%	0.7%	69.4%	29.9%

Notes: Table V shows the share of individuals that belong to different percentiles of the wealth distribution implied by the model under different different parameterizations. The wealth cut offs are those implied by the baseline calibration.

in Table 17. Our results indicate that eliminating both the inheritance tax and the transfer increases output by 0.8% in the long run (column 2), while generating a moderate increase in the top 1% wealth share (+0.4pp). The effect of the tax and transfer scheme on aggregate output is ambiguous ex ante: on the one hand, the lump sum redistribution will help some low-wealth high-ability potential entrepreneurs by relaxing the collateral constraint earlier in life, which reduces misallocation in the economy. On the other hand, the children of wealthy parents are, on average, more capable entrepreneurs, which we infer from the inter-generational persistence in returns to wealth. As a consequence, taxing them potentially reduces aggregate productivity. Moreover, the inheritance tax also reduces saving incentives. Quantitatively, we find that the latter two effects dominate in the aggregate. Yet, the typical household does not favor such a tax reform due to its adverse distributional consequences: median consumption drops slightly by 0.01%, and only 49.3% of households experience an increase in consumption.[27] Columns (3) and (4) of Table 17 contrast the inheritance tax to taxes on wealth and capital income.

[27]The fraction of households that experiences a positive welfare change is even smaller, since the tax and transfer scheme provides insurance. The precise value depends on the amount of risk aversion; in our calibration, expected utility as of the initial period declines for over 90%.

FIGURE 17 – QUANTITATIVE IMPACT OF WEALTH AND INHERITANCE TAXES

	Benchmark	Eliminate inheritance tax and...		
		cut transfer	wealth tax ↑	cap. inc. tax ↑
	(1)	(2)	(3)	(4)
Bequest tax (average)	12.2%	0.0%	0.0%	0.0%
Wealth tax	0.2%	0.2%	0.4%	0.2%
Capital income tax	28.0%	28.0%	28.0%	30.5%
Lumpsum transfer	yes	no	yes	yes
Output change		0.81%	0.61%	0.12%
Top 1% Wealth	16.1%	16.5%	16.5%	16.2%
Mean consumption (% change)		0.85%	0.80%	0.20%
Median consumption (% change)		-0.01%	0.47%	0.03%
Fraction >0 consumption change		49.30%	84.20%	59.12%

Notes: Table 17 compares different model-implied macroeconomic aggregates under different parameterizations of the model based on the general equilibrium steady state of the model.

We find that while eliminating the inheritance tax and cutting the transfer maximizes aggregate output, eliminating the inheritance tax and increasing the wealth tax in a revenue-neutral way such that the transfer is unchanged is the option that maximizes median consumption, and the fraction of the population with positive consumption (and welfare) changes. Finally, raising instead the capital tax is inferior to raising the wealth tax along all metrics, as in Guvenen *et al.* (2019).

5 Conclusions

In this paper, we study the lifecycle dynamics of wealth accumulation using a rich administrative data set from Norway covering 23 years of data. We provide a fuller picture of the evolution of wealth, portfolio composition, sources of income, and returns across the wealth distribution, in particular for those households that reach the very top of the distribution. Although we find a significant degree of persistence at the top, we also find that a large fraction of those households that become rich do so starting significantly poorer than the average household. Our results shed light on the mechanisms through which households become rich: some receive large inheritances, some others found a new private business generating significant returns. When we put these mechanisms in play in a heterogeneous agents model we find an important role for inheritance heterogeneity, returns heterogeneity, and the interaction between them in accounting for the aggregate

and life-cycle concentration of wealth.

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Supplemental Online Appendix

NOT FOR PUBLICATION

A Data Sources and Variable Definitions

A.1 Tax returns (TR)

The main data source is tax returns for all persons in Norway 1993-2015. The tax system is residence based so Norwegians living abroad are not included. The basic income tax unit is an individual, but wealth is jointly taxed for married couples. Cohabitant couples (with or without children) are taxed separately even though they may own assets jointly. The division of assets jointly owned follows the formal ownership shares in the case of housing (see Section A.1.7 for additional details) but can be chosen freely for mortgages. For most households, the division of assets on the tax returns has little consequence as only a small fraction of households actually pay wealth taxes (due to an exception level). All values are measured at December 31st of each year.

A.1.1 Income variables - with corresponding tax returns (TR) code

- **Labor income:** Measures of labor income is comprehensive and includes wages and salaries, bonuses and other irregular payments.All third party reported by employers.
- **Business income**: Labor income from self-employment. Norway has a dual-income tax system where tax on capital is proportional and tax on labor is progressive. To avoid income shifting and achieve neutrality in the tax treatment of wage earners and entrepreneurs, the Norwegian dual-income tax splits the income from self-employment and from small companies into an imputed return to capital, taxable as capital income, and a residual income subject to labor income tax.
- **Transfers**: Transfers include unemployment benefits, sickness benefits, paid parental leave, remuneration for participation in various government activity programs, disability benefits, public pensions, and other social welfare payments.
- **Interest income**: Interest income on bank deposits in Norway (TR 3.1.1), other interest income (TR 3.1.2), interest on loans to companies (TR 3.1.3), yield and disbursements from endowment insurance (TR 3.1.4), interest income on bank deposits abroad (TR 3.1.11). In addition, we do as Fagereng *et al.* (2020b) and impute interest on outstanding claims and private loans using the average rate charged by Norwegian banks on corporate loans and capital gains on bond funds.
- **Interest paid**: Interest payments on debt home and abroad (TR 3.3.1 + TR 3.3.2).
- **Dividend income**: Taxable dividends received from stocks and shares registered in the Norwegian Central Securities Depository VPS (TR 3.1.5), from mutual funds (TR 3.1.6), and from private equity/Norwegian and foreign shares or unit trusts not registered with the VPS (TR 3.1.7). For an alternative value for dividends received from non-listed companies see variables from Firm Balance sheet below.
- **Realized capital gains**: Realized capital gains and losses on transactions of registered stocks (TR 3.1.3- TR 3.3.8), mutual funds (TR 3.1.9 – TR 3.3.9), non-registered stocks (TR 3.1.10 – TR 3.3.10) and housing (TR 2.8.4 – TR 3.3.6). Gains and losses from housing are only taxed if it the house has not been (sufficiently) owner-occupied (i.e. when it is likely to be due to speculation).

- **Income from real assets**: Income from ownership of real assets; taxable income from renting out holiday home (TR 2.8.3) or property abroad (TR 2.8.5).

- **Tax**: Total taxes paid on labor income, capital income and wealth. It is possible to observe the wealth tax separately (see more about the wealth tax below). Separating tax on labor income from tax on capital income is more cumbersome. In order to calculate labor income after tax we therefore make the simplifying assumption that tax on labor (T^l) can approximated as follows:

$$T_t^l = \left[1 - \tau_t^c \left(\frac{Y_t^c}{Y_t^c + Y_t^l}\right)\right] * (T_t - T_t^w)$$

  where $Y^l$and $Y^c$are labor and capital income, respectively, $T$is total taxes, $T^w$is wealth tax, and $\tau^c$the flat tax rate on capital income, which was 28 percent until 2014. From 2014 to 2019 the tax rate on capital was gradually reduced downwards to 22 percent.

- **Wealth tax**: In 2021, wealth above NOK 1.5 million is taxed at a rate of 0.85 percent, with some important valuation discounts, for example for primary housing. The tax revenue from wealth taxation is modest, only approximately 15 billion NOK per year, which corresponds to around 1.1 percent of the total tax revenue and 0.4 percent of GDP. During our sample period, wealth taxation has become more lenient, both through reduced rates and through specific valuation concessions. The highest rate was 1.5 percent under the two-tier wealth tax in the beginning of our sample period, it went down to 1.1 percent in 1998, and has been 0.85 percent since 2015. During the sam period, the exception level has been increased, from NOK 120,000 in 1993 to NOK 1.5 million in 2021.

A.1.2 Wealth variables –with corresponding tax returns (TR) code:

- **Deposits**: Bank deposits in Norwegian banks (TR 4.1.1) + cash (TR 4.1.3) + deposits in foreign banks (TR 4.1.9)

- **Bonds**: Bond funds and money market funds (TR 4.1.5) + bonds (TR 4.1.7.2)

- **Other financial assets**: Outstanding claims/loans to friends and family (TR 4.1.6)

- **Mutual funds**: Mutual funds/stock market funds (TR 4.1.4)

- **Stocks, listed**: Shares/stocks and shares listed in the Norwegian Central Securities Depository (VPS) (https://www.euronextvps.no/) – (TR 4.1.7)

- **Stocks, non-listed**: Non-listed shares/private equity, Norwegian and foreign shares or unit trusts not registered with the VPS, stock market options (TR 4.1.8). For an alternative value, see Shareholder registry (SR) below.

- **Other real assets**: Cars, caravans and other motor vehicles at tax values (TR 4.2.5 and TR 4.2.6), boats at tax values (TR 4.2.4), other real estate except housing (primary and secondary) and holiday homes, in other words, mostly farms.

- **Housing, tax value**: Owner-occupied and secondary housing at tax value (TR 4.3.2). Since 2010 this value has been imputed using hedonic price regressions. Since values are used as basis for wealth taxation it is possible to complain to tax authorities and get the value adjusted down.

- **Liabilities**: Total debt, i.e. the sum of mortgages, student loans and consumer debt.

A.1.3 Computing capital gains and net saving using information from tax records

- **Capital gains, mutual funds**: From tax records we observe the market value of mutual funds owned as of December 31st of year $t-1$, w_{it-1}^{mf}. We assume as (Fagereng *et al.*, 2019) that mutual funds investors own a composite index fund representative of the Oslo Stock Exchange (OSE) market (80%) and the MSCI World (20%) with price q_{t-1}^{mf} as measured December 31st of year $t-1$, which we take from the OSE price database. We estimate the shares of mutual fund owned at the end of $t-1$ as $s_{it-1}^{mf} = w_{it-1}^{mf}/q_{t-1}^{mf}$. Subsequently, yields on mutual funds is calculated as $y_{it}^{mf} = (q_t^{mf} - q_{t-1}^{mf})s_{it-1}^{mf} + ((q_t^{mf} - \bar{q}_t^{mf})(s_{it}^{mf} - s_{it-1}^{mf}))$ if $s_{it-1}^{mf} \neq s_{it}^{mf}$, where $\bar{q}_t^{mf}$ is the geometric average of the composite index fund price in year t.

- **Saving, mutual funds**: The overall change in the market value of mutual funds minus capital gains as calculated above.

- **Capital gains on and net saving in public equity** - same as for mutual funds/stock marked funds

A.1.4 Missing assets/underreporting/possibilities for evasion

What's missing? Offshore wealth and pension wealth. According to Alstadsæter *et al.* (2019), the richest Scandinavians keep a substantial part of their wealth in offshore tax havens. The wealth of the top 0.01 of Norwegian households increases by about 25 percent if offshore wealth is included. On the other hand, Norwegian tax authorities offer tax amnesty for voluntary disclosure of foreign wealth.[28] Since 2007, an extra NOK 1.5 billion of taxable wealth and income has been disclosed because of this program.

The omission of pension wealth pulls in the opposite direction. More than 80 percent of all pension wealth in Norway is provided through a National Insurance scheme, a pay-as-you go (PAYG) scheme, with a large degree of redistribution from rich to poor. Another 18 percent are covered by employer provided pension plans, and finally 0.3 percent of total pension wealth is held as personal pension plans. Only this tiny fraction of 0.3 percent is reported on the tax return.

Furthermore, tax returns underestimate the value of certain assets, in particular housing prior to 2010, holiday homes and private businesses. Supplementary data sources are therefore used to adjust for this undervaluation.

[28] https://www.skatteetaten.no/en/person/taxes/get-the-taxes-right/abroad/income-and-wealth-abroad/undeclared-income-andor-wealth-abroad/

Issues of the valuation of assets also arise with private businesses. A private business is a company that is not listed on a stock exchange and owned by a small number of shareholders. Control of the firm is therefore limited to a few persons. These firms are typically small to medium sized businesses or holding companies. In 2006, Norway introduced a dividend tax at the personal level as part of a major tax reform. One response to this reform was that the number of holding companies increased, as owners would retain their earnings in firms to avoid paying dividend tax. These holding companies are therefore common, especially at the top of the wealth distribution. It is important to account for indirect ownership so that we are able to allocate capital gains onto the ultimate owner. To do this, we rely in the Shareholder registry which we describe below. The approach is similar to other papers using Norwegian data (Alstadsæter *et al.* (2018), Fagereng *et al.* (2019)).

Most of the information in personal tax records is third-party reported by employers or financial intermediaries such as banks, brokers, insurance companies or the Norwegian Central Securities Depository (VPS). Components of income and wealth not provided by third parties (e.g. foreign income or dividends not registered in the VPS) are added by the individual and checked by the tax authority. In addition, tax authorities have control routines that flag tax returns with extreme movements in either income or wealth, and these are checked extra carefully.

Tax authorities also have routines to identify underreporting of assessed values of private businesses (see below for firm taxation). In addition, medium- and lager-sized firms (with turnover above about USD 500,000) are required to have their balance sheet audited by an approved auditing entity.

A.1.5 Shareholder registry (SR)

All private limited companies in Norway must submit information about shareholders and the number of shares each person owns to the Norwegian Tax Administration's Shareholder Register. The register is open and searchable for the years 2014-2020 (https://www.aksjeeiere.no/). Thus, the shareholder registry contains information on individuals' and firms' ownership of stocks in all companies in Norway. Some companies are held directly. In this case, the ownership share is the fraction of total shares owned by the individual. However, many companies are owned by other firms. If an individual owns shares in company A and company A owns shares in company B, the individuals ownership share in company B is equal to that individual's ownership share in company A multiplied with A's ownership share in company B. We compute indirect ownership up to 7 layers.

- Number of shares in each company at the beginning (01.01) and end (31.12) of each year
- Price of shares at the beginning (01.01) and end (31.12) of each year
- No of companies an individual owns shares in though direct and indirect ownership

A.1.6 Firm balance sheet and tax return

For equity in unlisted firms we must rely on the assessed value that private businesses report to the tax authorities. This assessed value is derived from firm balance sheets and

book values. Balance sheets contain information about total equity (total assets minus total debt), accumulated retained earnings, total revenue, and profits before and after tax. Using this information, we calculate the following objects

- **Stocks, non-listed:** Using the fraction of an unlisted company (k) that an individual (i) owns (as measured in the Shareholder registry, and including indirect ownership), s_{it}^k, and multiplying with assessed value of an unlisted company (V_t^k), gives us an alternative measure of the overall value of unlisted shares owned as $\sum_k s_{it}^k V_t^k$.
- **Dividends**: Using the fraction of an unlisted company (k) that an individual (i) owns (as measured in the Shareholder registry, and including indirect ownership), s_{it}^k, and multiplying with dividends from an unlisted company (D_t^k), gives us an alternative measure of dividend income as $\sum_k s_{it}^k D_t^k$.
- **Retained earnings**: Retained earnings in year t is the part of profits after tax that are not paid out as dividends. Using the fraction of an unlisted company (k) that an individual (i) owns (as measured in the Shareholder registry), s_{it}^k, we allocate these earnings to ultimate owners.
- **Saving, private equity**: Net saving is derived as in Fagereng et al (2021), i.e. by using observable information about the number of shares in each company (q) and its price (p) at the beginning and end of the year: $0.5(p_t - p_{t-1})(q_t - q_{t-1})$
- **Capital gain, private equity**: Capital gains is defined as the change in private equity (i.e. retained earnings) not counted for by net saving. If there is no change in number of shares (no transactions) then capital gains are equal to retained earnings.

There is no clear-cut market value for equity in unlisted firms. Since assessed values are derived from book values they may still underreport actual business wealth, especially at the very top of the wealth distribution. It can be shown that if we replaced the wealthiest 400 persons when sorting by net wealth as measured in tax returns with the top 400 persons on Norway's Forbes list equivalent ("Kapital 400"), then wealth shares of the top 1 percent would increase from 20 to 25 percent, and from 4.2 to 14 percent in the top 0.1 group.

A.1.7 Housing wealth database

Construction of housing wealth is described in detail in Fagereng, Holm and Torstensen (2018).

- **Housing wealth**: Housing wealth is imputed using ensemble machine learning method on housing transaction data. The imputation includes not only owner-occupied housing, but secondary housing and cabins (holiday homes) as well. Housing wealth is allocated to individuals according to ownership shares.
- **Saving, housing**: Net saving is calculated based on net transactions at market value in a given year.

- **Capital gains, housing**: Capital gains in housing is then the change in housing wealth minus net transactions when net transactions are non-zero. For households without housing transactions, net saving in housing is zero and all changes in housing wealth are due to capital gains.
- **Imputed income, housing**: Imputed rent from housing using the rental equivalence approach, and calculated as the aggregate value of owner-occupied housing services from the National Accounts relative to the aggregate value of housing wealth in our sample, which implies a rent-to-value ratio of 2.23 percent.
- **Total income, housing**: Imputed income plus income from ownership of real asset (as measured in the tax returns, see above).

A.1.8 Central population registry and Norwegian educational database

Based on a combination of spousal ID and marital status, a household ID number is created. A change in marital status (marriage/divorce) will generate a new household ID. The household ID is used to aggregate up from individual level data to household level data.

A.1.9 Inheritance database

Information about inheritances and inter vivos gifts as derived from Inheritance tax records. The inheritance tax in Norway was abolished in 2014. Before the abolition, the inheritance and gift tax had a zero rate for taxable amounts up to NOK 470,000 from each donor (around 52,000 USD dollars in 2022). From this level, the rates ranged from 6% to 15% depending on the status of the beneficiary and the size of the taxable amount. The Norwegian inheritance taxation was recipient based, meaning that the total gift and inheritance received by one individual from one donor constituted the tax base (a child inheriting his or her last surviving parent would therefore usually inherit from both parents and thus face an exception level of NOK 940,000).

In comparison, under estate taxation it is the total estate left by the deceased that makes up the tax base. Inter-vivos given to lineal descendants of the donor or donor's spouse/spousal equivalent and receivers mentioned in the written will at the time of transfer were also subject to taxation. Gifts to lineal descendants or spouse/spousal equivalent of lineal descendants of other recipients and gifts to companies, trusts or foundations in which any of the above-mentioned had interests were also tax liable. Interest-free loans, benefits of a loan with below-market interest rate, debt release and sales below market value were all included in the gift concept. From 2008, annual gift amounts up to half of the annual "basic amount" in the Norwegian Social Security Insurance scheme were formally declared to be tax exempt. Before 2008, the boundaries between what was considered ordinary gifts and advancement of inheritance was to a larger degree based on own judgment of what would be "reasonable proportionate to the donor's economic situation".

Norway has fairly strict rules on forced heirship. Under Norwegian laws, the deceased's children and spouse are legally entitled to forced inheritance from the deceased. The law states the deceased's children are entitled to two thirds of the deceased's total estate, split equally among them. From 1998 to 2008, the first tax level was 8 percent for children, foster children and parents whereas it was 20 percent for others. Above the second threshold children, foster children and parents paid 10 percent tax, while others paid 30 percent. In 2009, the tax rates

were lowered to 6 and 8 percent for children, foster children and parents, and to 10 and 15 percent for others. Exception levels changed in 1998, 1999, 2003 and 2009. The reduction in tax rates coupled with higher exception levels in 2009 clearly had an impact on incentives to transfers, and caused a temporary increase in both average and aggregate inheritances in that year.

Before the abolishment of the inheritance tax in 2014, there were different ways to transfer wealth outside of the gift and inheritance taxation system. One avoidance possibility was converting assets into non-listed stocks. While the basis for taxation of listed stocks and equity was market value at the time of transfer, taxation of non-listed stocks were based on assessed valuation January 1st of the current year. Receivers of non-listed stocks were also offered a tax discount. Until 01.01.2009, one could choose between letting 30 percent or 100 percent of the assessed value of non-listed stocks make up the tax base. From 2009, the discount decreased and at least 60 percent of assessed valuation up to NOK 10 mill went into the tax base. Non-listed stocks with valuation exceeding NOK 10 mill got no discount. Transferring non-listed stocks as inter-vivos or inheritances therefore substantially reduced the tax liabilities, both due to assessed valuation and the tax discount, in particular before 2009.

A.2 Calculation of Returns

In this section, we describe the main features of the construction of returns, which follows closely the construction of described in Fagereng *et al.* (2016). We calculate returns for total net worth, safe assets, equity, and housing. In our measure we consider public equity and private equity as one category. We calculate returns on assets as

$$r_{it}^{n} = \frac{y_{it}^{s} + y_{it}^{e} + y_{it}^{h} - y_{it}^{b}}{w_{it}^{g} + F_{it}^{g}/2},$$

- y_{it}^{s}, y_{it}^{e}, and y_{it}^{h} are income from financial assets (e.g. bonds), equity (e.g. stock and private equity), and housing
- y_{it}^{b} is the sum of interest paid in all forms of debt
- w_{it}^{g} is the stock of wealth at the beginning of the period
- F_{it}^{g} is net flows of gross wealth during period (assets yields happens during year and hhs add/subtract from assets)

We calculate similar returns for safe assets, equity, and housing, which income flows are calculated as follows

- y_{it}^{s}: interest income
- y_{it}^{e}: dividend income + capital gains from stock + capital gains from stocks
- y_{it}^{h}: income from non occupied house + capital gains from housing

We calculate returns for household with assets above $500 USD and winsorize top and bottom 0.5% in each year

B Additional Tables

Table A.1 – Wealth Returns

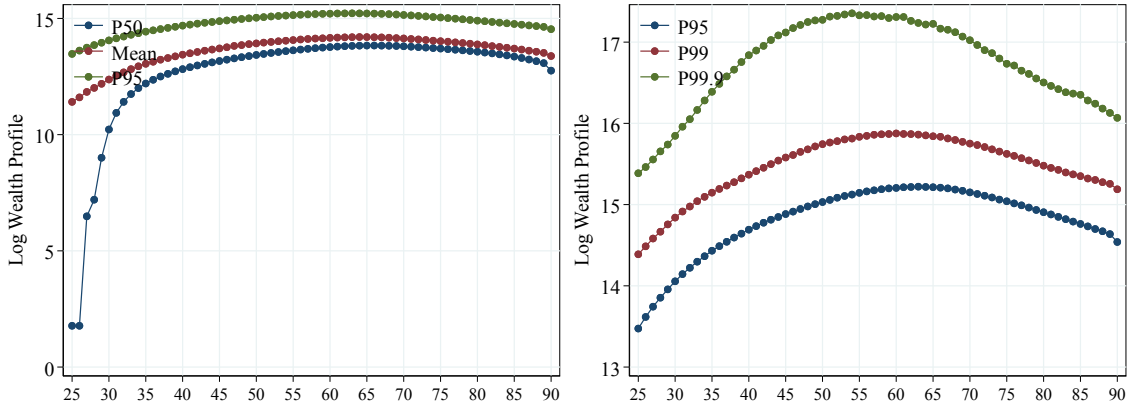
	Mean	SD	P10	P50	P90	P99	P99.9	Skew	Kurt.
Equity (Pub+Priv)	0.123	0.384	-0.023	0.118	0.28	1.314	3.384	-0.047	36.696
Safe	0.023	0.022	0.004	0.016	0.038	0.117	0.243	4.681	40.131
Housing	0.032	0.055	0.017	0.036	0.038	0.119	0.647	1.443	133.325
All	0.005	0.131	-0.027	0.018	0.044	0.263	0.768	-4.219	46.882

Notes: Table A.1 shows cross sectional statistics of the returns distribution for different asset classes based on a pooled sample of households between 2004 and 2015. We calculate returns following Fagereng *et al.* (2016). Equity corresponds to the sum of equity on private and publicly traded firms.

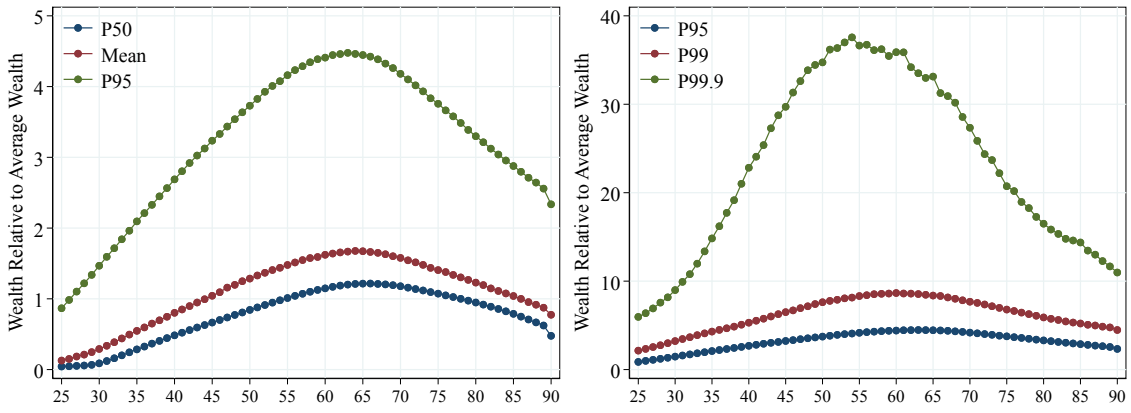
C Additional Figures

Figure A.1 – Life Cycle Wealth Profiles Controlling for Year Effects

(A) Log Wealth Profile

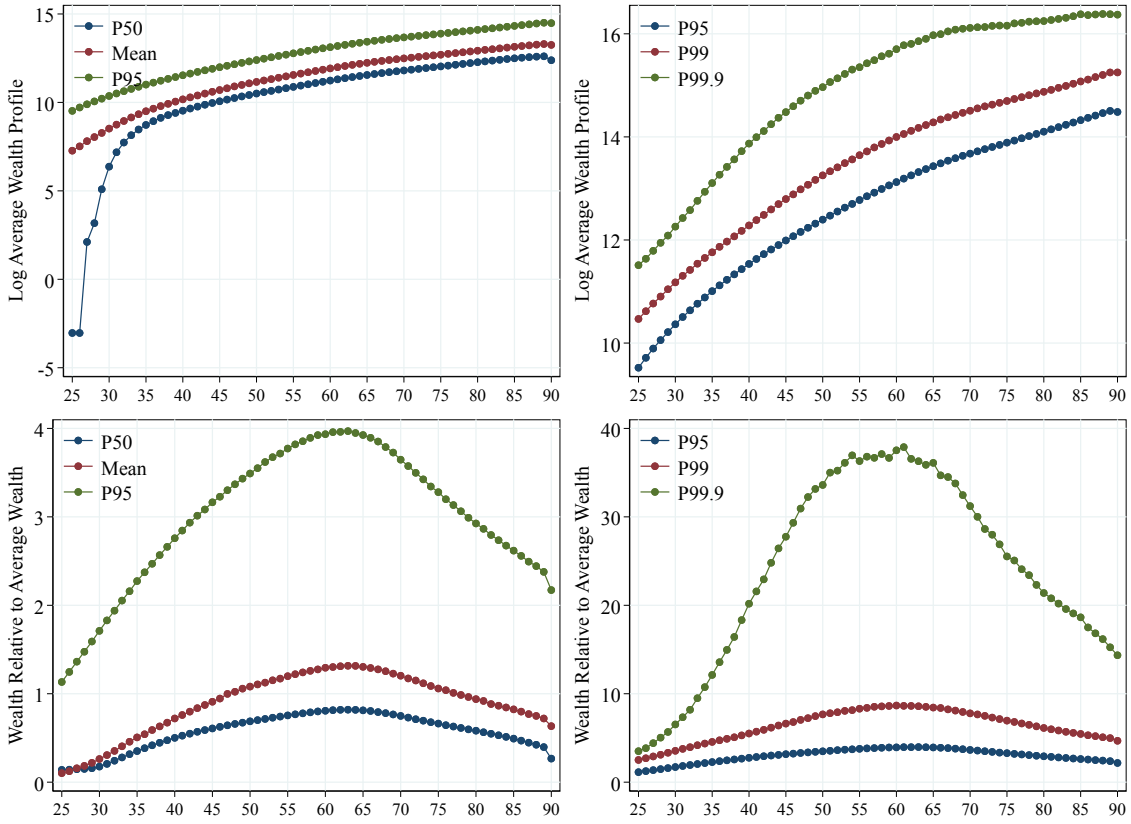


(B) Wealth Profile Relative to Mean Wealth



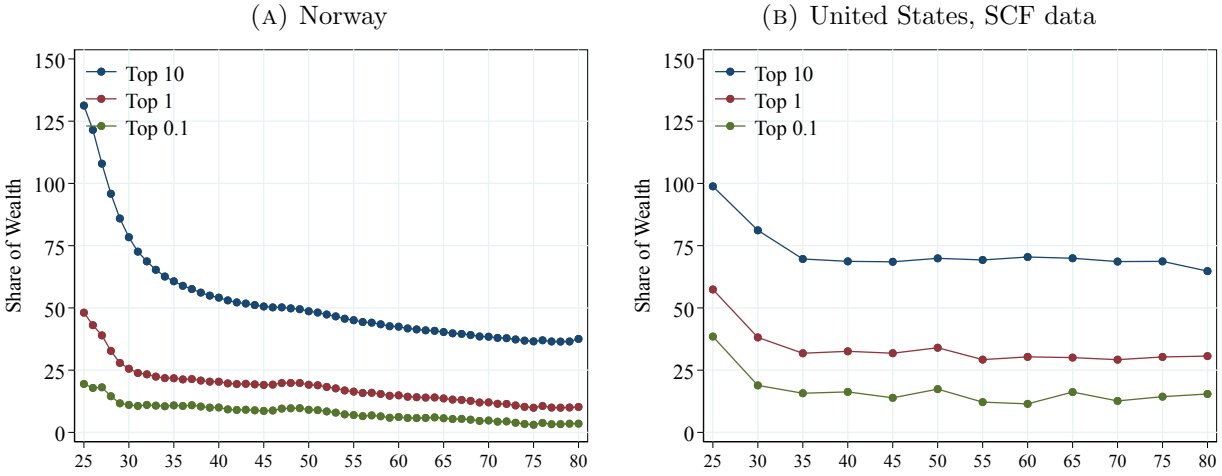
Notes: Figure A.1 shows the evolution of wealth over the cycle. Panel A shows log-levels for the average and for different percentiles. To construct this measures, we first calculate log of the corresponding wealth moment (average, P50, P90, and so on). We then run an OLS regression in which we control for age and year fixed effects. We plot the corresponding coefficients of the age fixed effects. Panel B shows the average and different percentiles of the wealth distribution relative to the average wealth of the economy. To construct this measure, we first calculate each moment within each age-year bin and the average wealth within a year. We then take the ratio of the corresponding moment in an age-year bin relative to the average wealth of the year. We then run an OLS regression controlling for age and year effects. We plot the corresponding coefficients of the age fixed effects.

Figure A.2 – Wealth Profiles Controlling for Cohort Effects



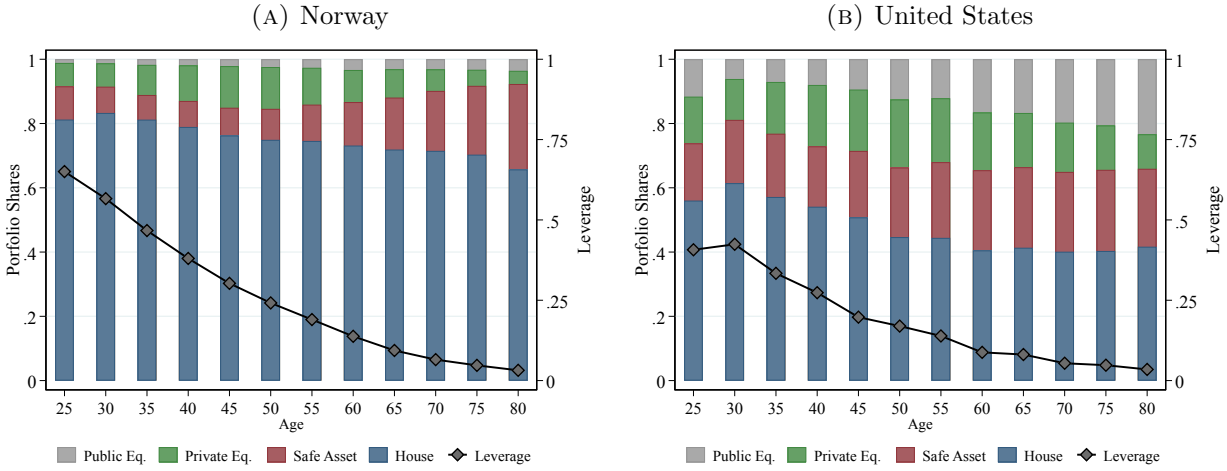
Notes: Figure A.2 shows the evolution of wealth over the life cycle. Top panels show the log-levels for the average and for different percentiles. To construct this measures, we calculate log of the corresponding wealth moment (average, P50, P90, and so on). We then run an OLS regression controlling for age and cohort effects. Bottom panels show the average and different percentiles of the wealth distribution relative to the average wealth of the economy. To construct this measure, we first calculate each moment within each age-year bin and the average wealth within a year. We then take the ratio of the corresponding moment in an age-year bin relative to the average wealth of the year. We then run an OLS regression controlling for age and cohort effects. We plot the corresponding coefficients of the age fixed effects.

Figure A.3 – Life-Cycle Evolution of Wealth Concentration



Notes: Figure A.3 shows the evolution of wealth concentration over the cycle for Norway (Panel A) and the United States (Panel B). To construct this measures, we first calculate top shares of wealth within year-age bins (5-year age groups for the US). We then run an OLS regression in which we control for age and year fixed effects. We plot the corresponding coefficients of the age fixed effects.

Figure A.4 – Portfolio Composition over the Life Cycle



Notes: Figure A.4 shows the portfolio shares and leverage within age groups for Norway (Panel A) and the United States (Panel B). See Appendix A for additional details and definitions.

Figure A.5 – Portfolio Composition over the Wealth Distribution

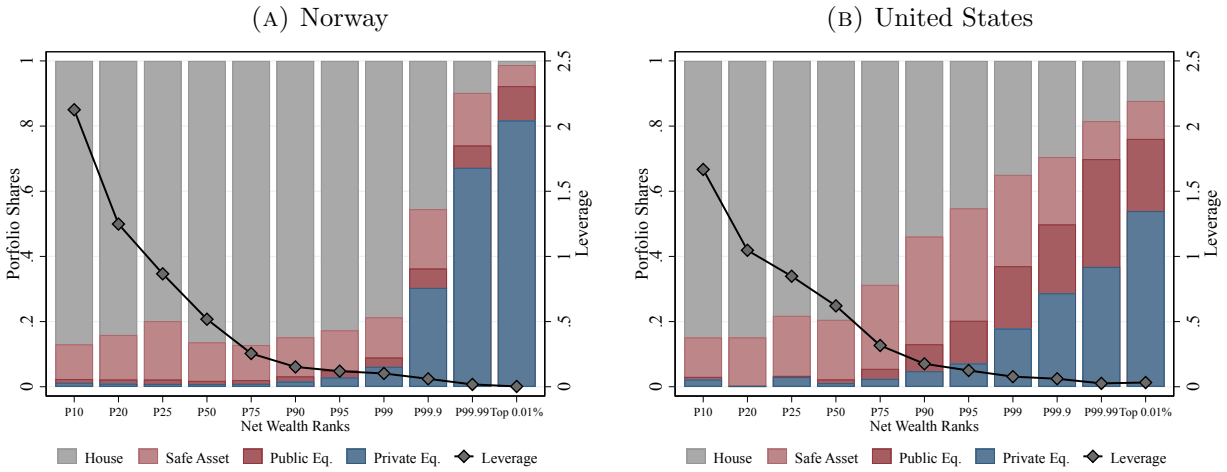
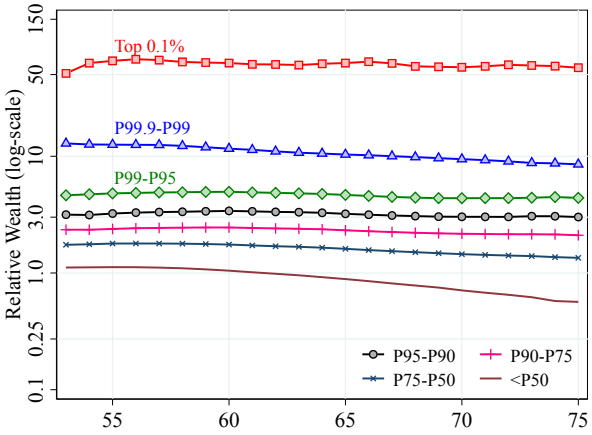
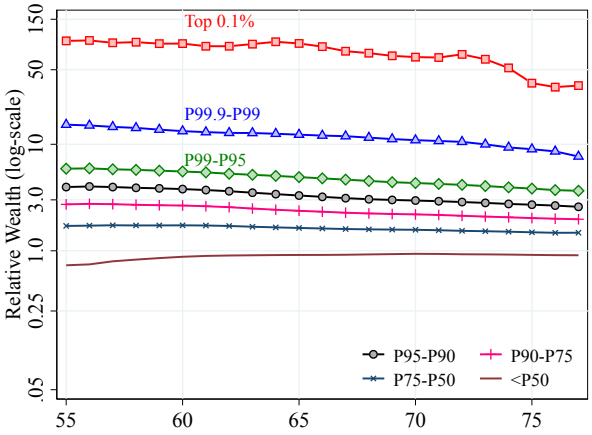


Figure A.6 – Average Wealth Profiles Between Ages 55 and 75

(A) Retrospective Wealth Profile



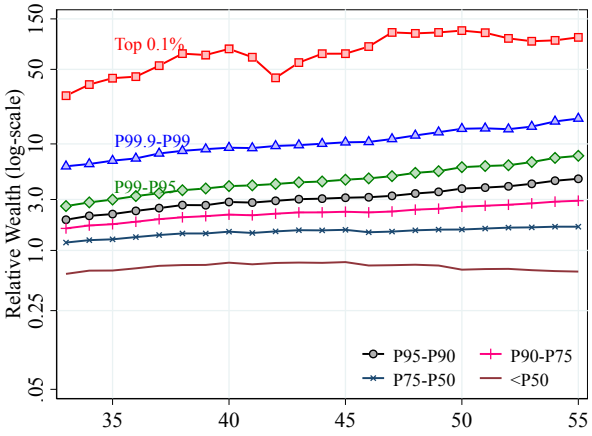
(B) Forward-Looking Wealth Profile



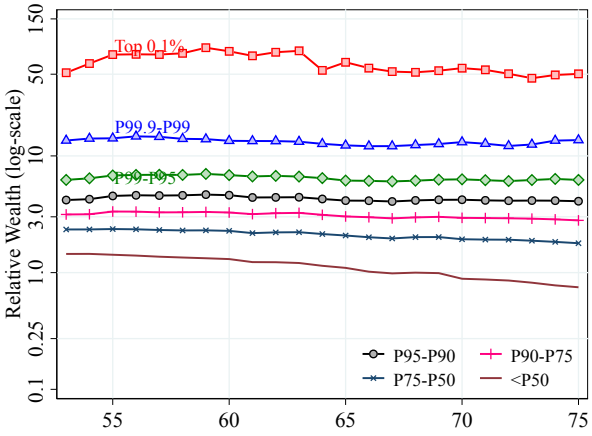
Notes: Figure A.6a shows the evolution of wealth for different household groups conditional on their wealth in 2015 (Panel A) or conditional in their wealth in 1993 (Panel B). Panel A shows the results for households whose head is between 75 and 80 years old in 2015 whereas Panel B shows the results for households who are between 55 and 60 years in 1993. We plot the log of the average wealth within the group relative to the average wealth in the economy.

Figure A.9 – Retrospective Wealth Profiles for Balanced Panel

(A) Age 55 to 60

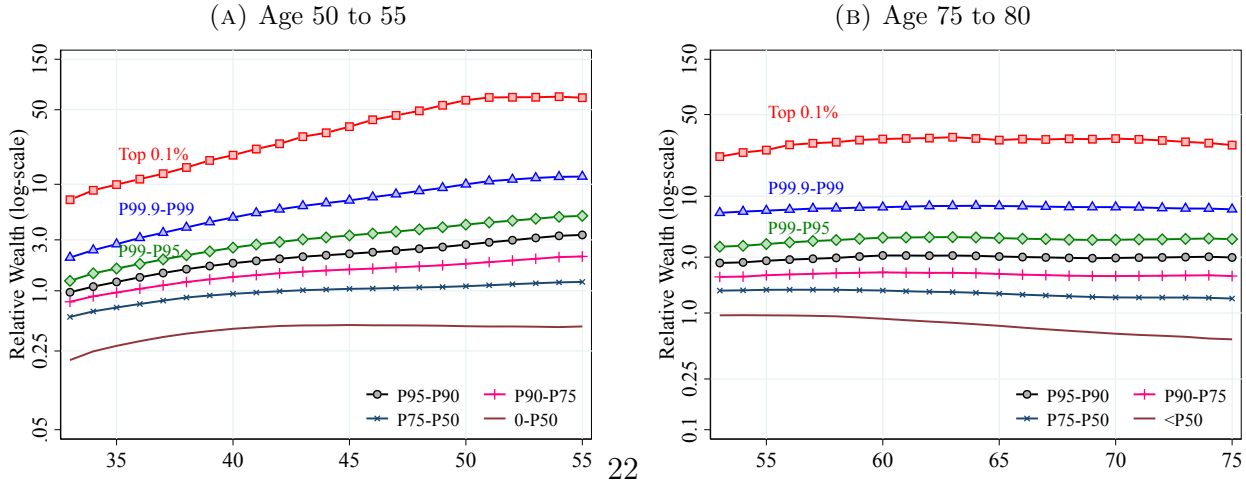


(B) Age 75 to 80



Notes: Figure A.9 shows the evolution of wealth for different household groups conditional on their wealth in 2015. Panel A shows the results for households whose head is between 55 and 60 years old in 2015 whereas Panel B shows the results for households who are between 75 and 80 years in 2015. The sample is balanced, in the sense that we only consider households who are present in 2015 and stay stable (same main earner) for the entire sample period.

FIGURE A.7 – RETROSPECTIVE MEDIAN WEALTH PROFILES



Notes: Figure A.7 shows the evolution of median wealth for different household groups conditional on their wealth in 2015 for different age groups

D How New Money households reach the top

New and Old Money households might differ in several characteristics in addition to their initial wealth, making these two groups difficult to compare. For instance, children of rich parents might have better access to financial markets, receive a large inheritance, or inherit a firm generating large returns (as the results in Figure **??** indicate). To provide a better comparison for New money households, we contrast them to those households who, although have the same age and wealth at the start of our sample, did not reach the top 1% of the wealth distribution.

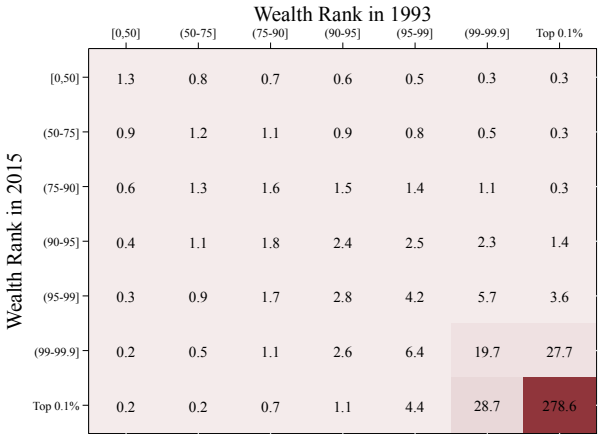
By construction, New Money households and their comparison group start with similar wealth, as shown in Figure A.27a that displays the within-group median wealth as a fraction of the average wealth in the economy. At the start of the sample, when households are around 33 years old, both groups own around 10% of the average wealth in the economy. However, over the next ten years, their (median) wealth diverges quite significantly, with the New money household holding three times the average wealth whereas the Comparison group—line with triangles—only holds half the average wealth. Part of this difference in wealth can be attributed to a significant difference in the labor income these two groups earn, as shown in Figure A.27b: New money households earn on average 1.8 times the age-specific average labor income of the economy whereas their comparison group earns only 90% of the age-specific average income.

New money households are also more likely to receive bequests and inter vivos transfers relative to other households who started with the same wealth, as show in Figure A.27c. For neither group, however, bequests are a significant fraction of their wealth as the average bequest, conditional on receiving a bequest, is around 50% of the average wealth in the economy.

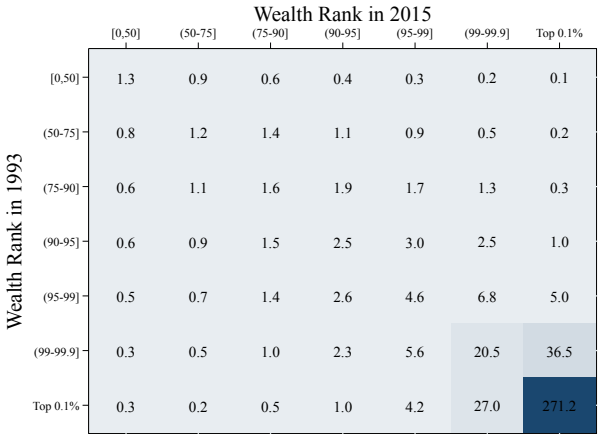
The most striking difference between these two groups of households relates to their portfolio choices. While households who eventually reach the top of the wealth distribution put a significant amount of their wealth in a firm and reduce the importance of housing and other

FIGURE A.8 – Intragenerational Transition Matrix (Normalized)

(A) Backward Looking Transition



(B) Forward Looking Transition



Note: The matrix on the left panel shows the transition probabilities between quantiles of wealth in 2015 (rows) and quantiles of wealth in 1993 (columns) normalized by the measure of the 1993 wealth quantile, therefore, indicating the likelihood relative to the population average. To construct this figure, we rank household among their peers.

assets in their portfolio, as shown in Figure 13b, those household that do not reach the top maintain a sizable fraction of their portfolio in housing (about 85%) and safe assets (about 10%), with only a tiny fraction of their portfolio invested in private or public equity, as shown in Figure A.27d. As a consequence, the median New money household earns an average return of 11% over their lifetime, mostly coming from private equity, whereas the median household who started with the same wealth level only earns a return of 4%. As we show in our model counterfactuals, these differences in returns go a long way in accounting for why some households are able to reach the top of the wealth distribution.

In summary, we find large heterogeneity among households that reach the top 1% of the wealth distribution. While a significant fraction starts with large fortunes, another portion starts very poor, experiences rapid wealth growth especially early in the life-cycle, which is mostly associated with an increase in the share of private equity in their portfolio. This increase in private equity is financed by large leveraged positions that decrease as New-Money households accumulate wealth. As a consequence, those who start at the bottom of the distribution experience significantly larger returns relative to their peers that started with high initial wealth, and most of the difference comes from private equity. These results are consistent with a model in which highly productive, but relatively poor entrepreneurs, start their life with little assets and leverage to finance their firms, which at the beginning are small and, due to decreasing returns to scale, provide very high returns. As individuals experience high returns, they accumulate wealth, expand the size of their business, and returns decline. In Section 4 we describe such a model, contrast its predictions with the empirical evidence presented so far, and use it for structural decompositions and counterfactual analysis.

E Quantitative Appendix: Calibration and Estimation

FIGURE A.10 – Combined Backward-looking Wealth Profiles

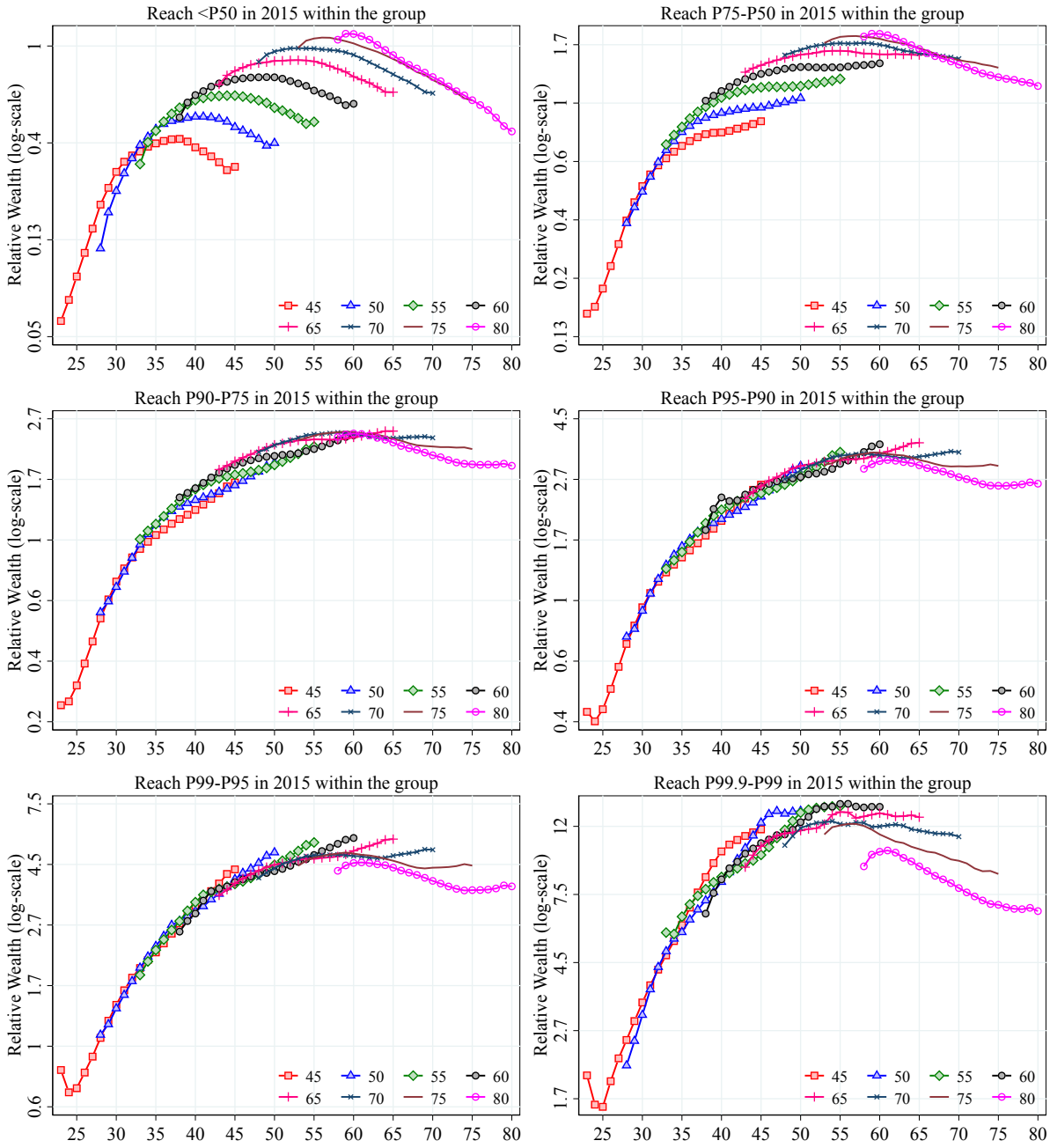


FIGURE A.11 – Combined Forward-Looking Wealth Profiles

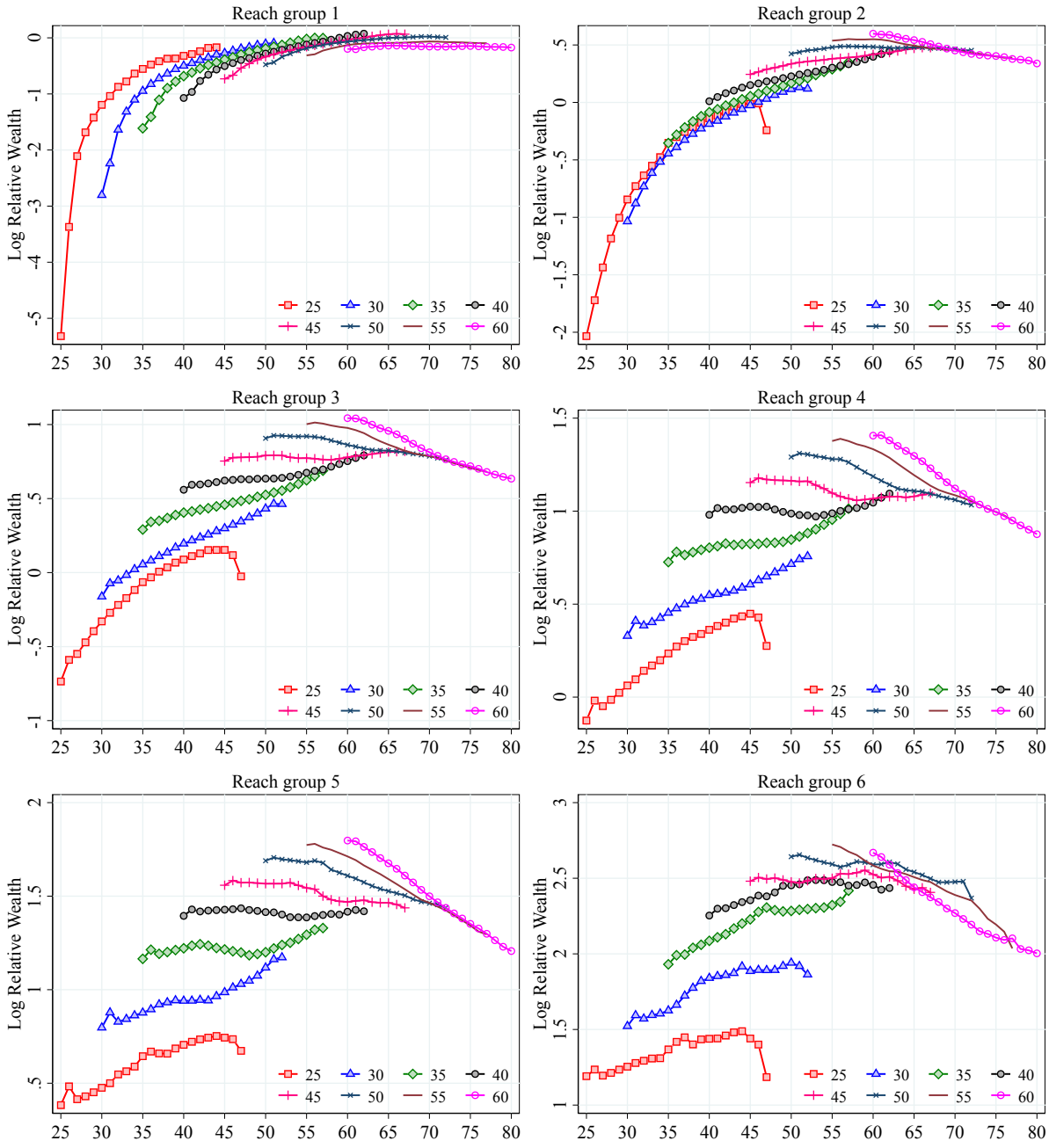
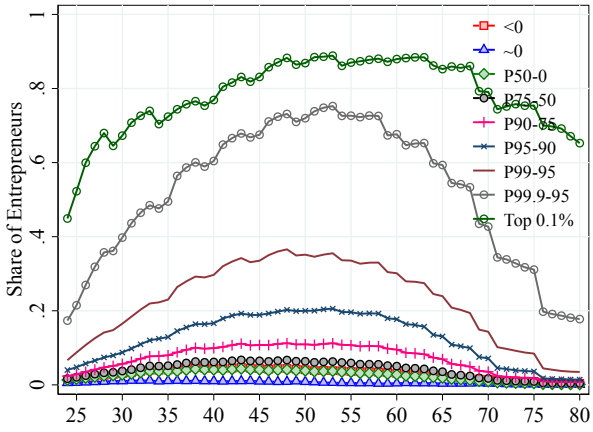
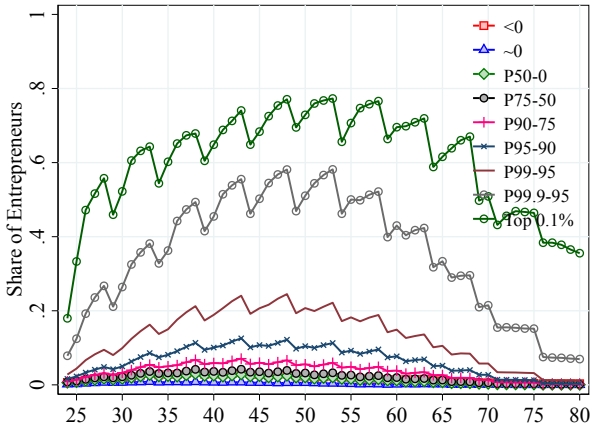


FIGURE A.12 – BACKWARD LOOKING PROFILES OF THE SHARE OF ENTREPRENEURS

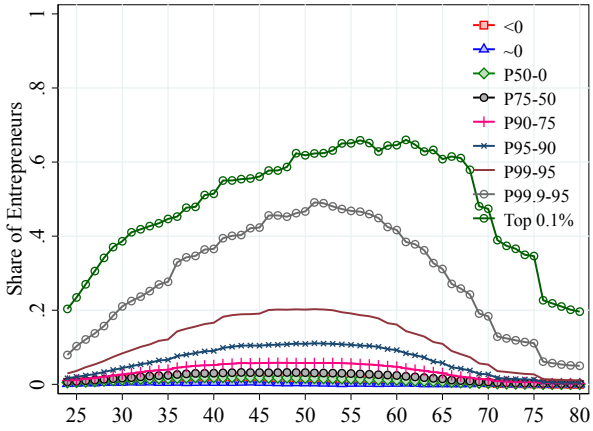
(A) Owns +20% of firm



(B) Owns +20% of firm and Founded



(C) Owns +20% of employee firm



(D) Owns +50% of firm

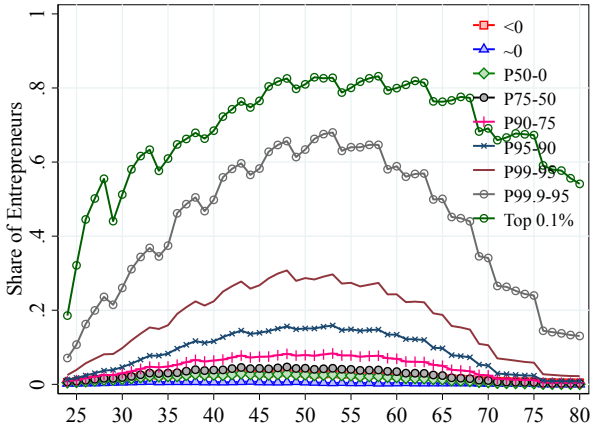
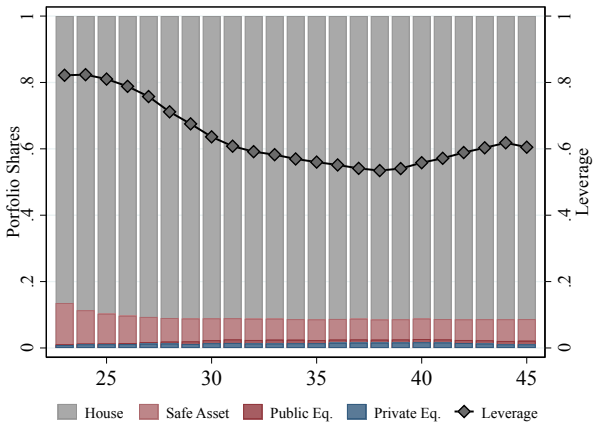
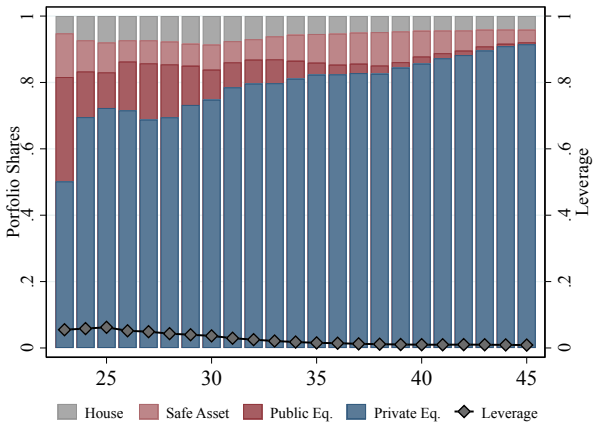


FIGURE A.13 – Portfolio Profiles for Different Age Groups

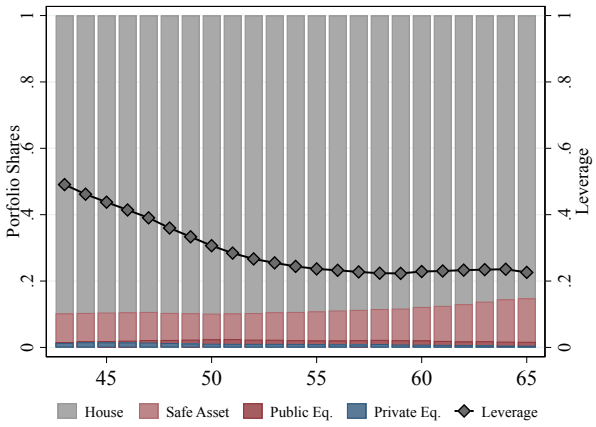
(A) Age 45-50: Households at bottom 50%



(B) Age 45-50: Households at top 0.1%



(C) Age 65-70: Households at bottom 50%



(D) Age 65-70: Households at top 0.1%

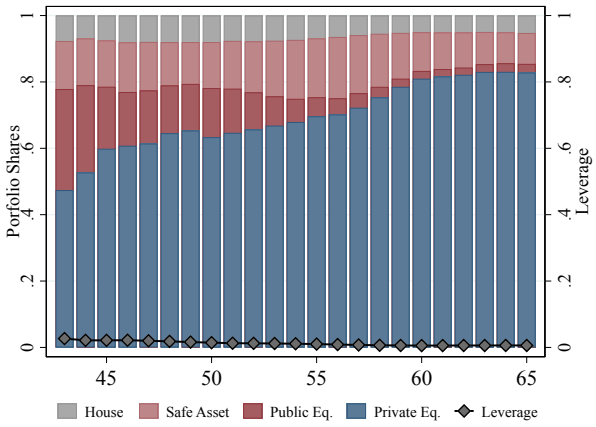
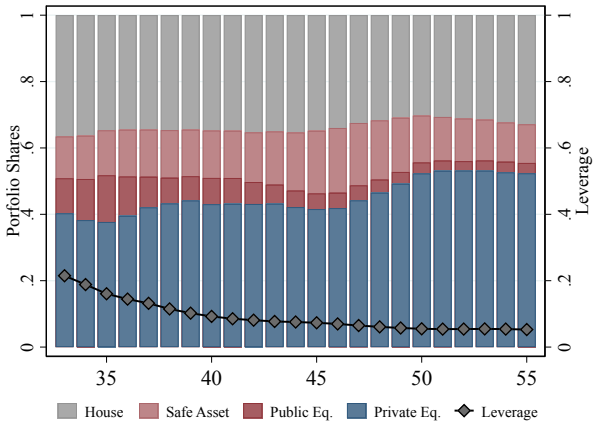
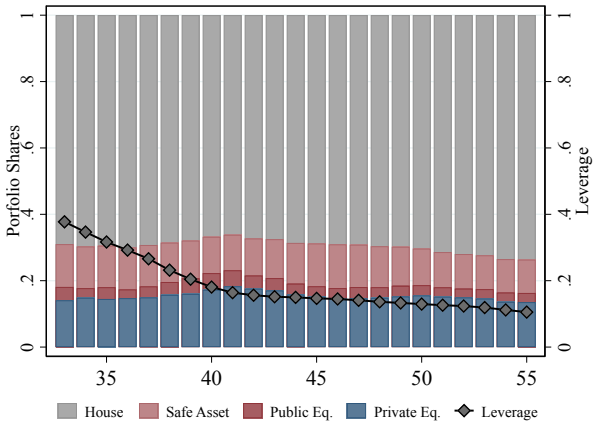


Figure A.14 – Retrospective Portfolio Shares Across the Wealth Distribution

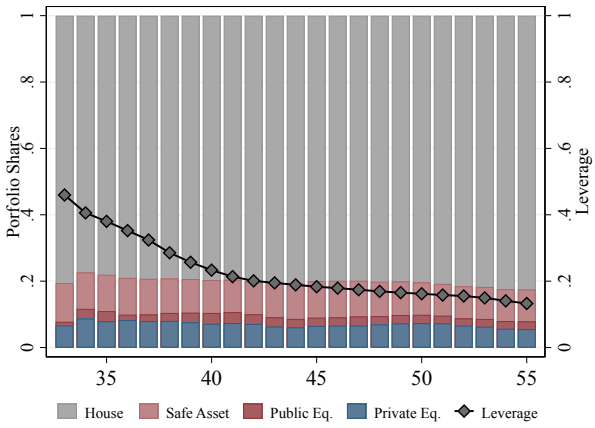
(A) Households between 99 and 99.9th pct.



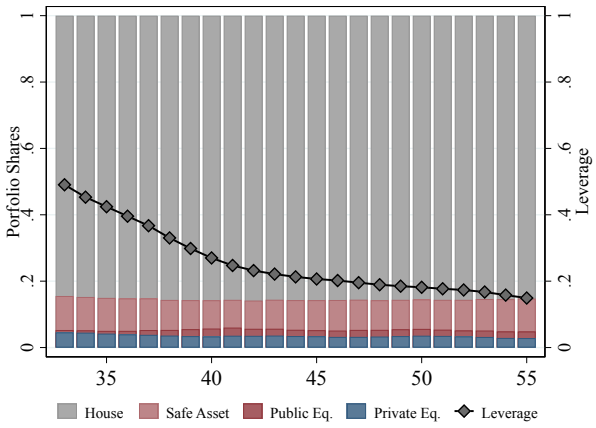
(B) Households between 90 and 95th pct.



(C) Households between 75 and 90th pct.



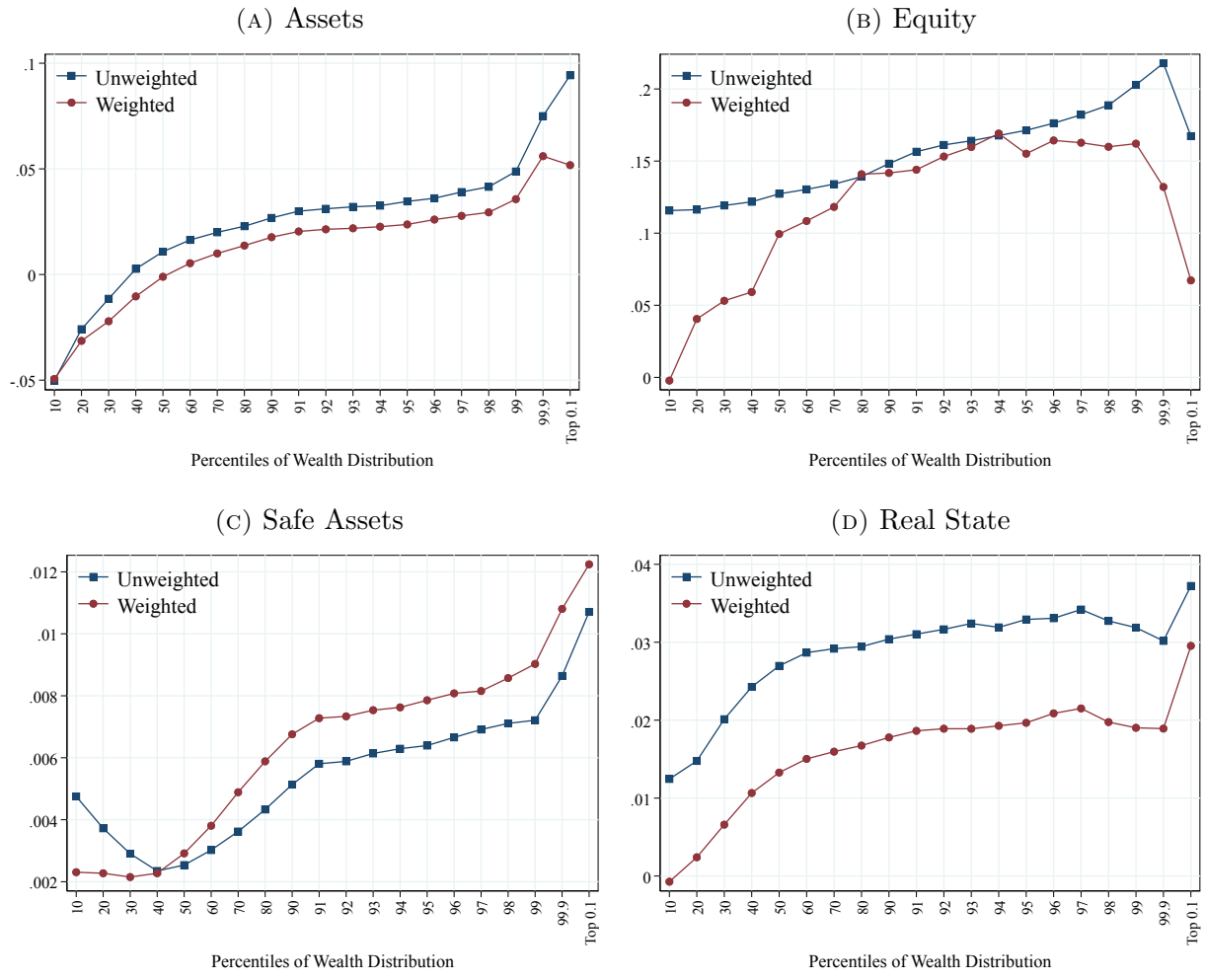
(D) Households between 50 and 75th pct.



Notes:

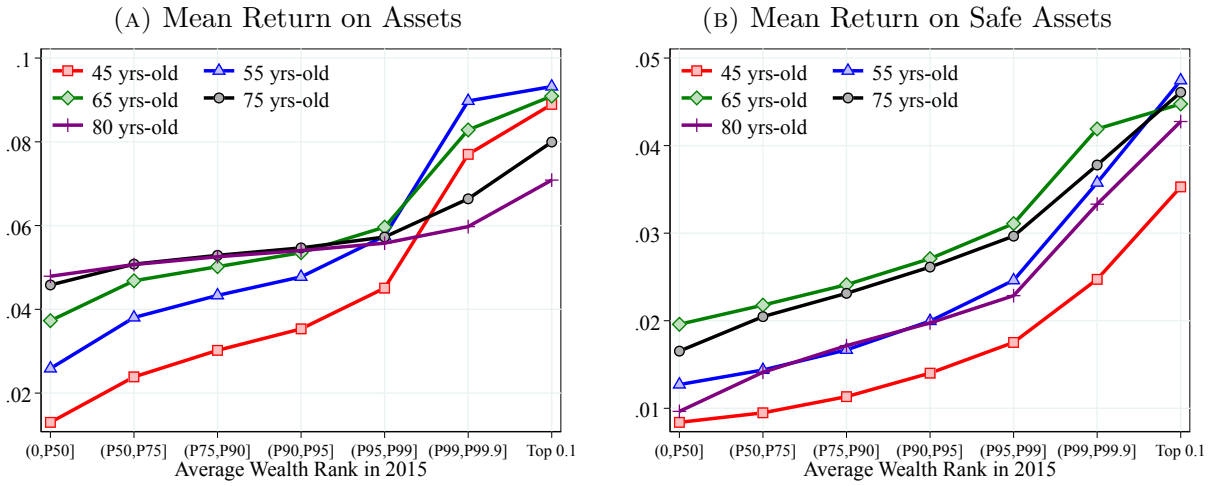
Figure A.14 shows the evolution of the portfolio shares (left y-axis) and leverage (right y-axis) for households whose head is between 55 and 59 years old in 2015. Panel A shows households who in 2015 have positive wealth but are below the 50th percentile of the distribution; Panel B shows households who in 2015 are in the top 0.1% of the wealth distribution. See Appendix A for additional details and definitions.

Figure A.15 – Cross Sectional Mean Returns



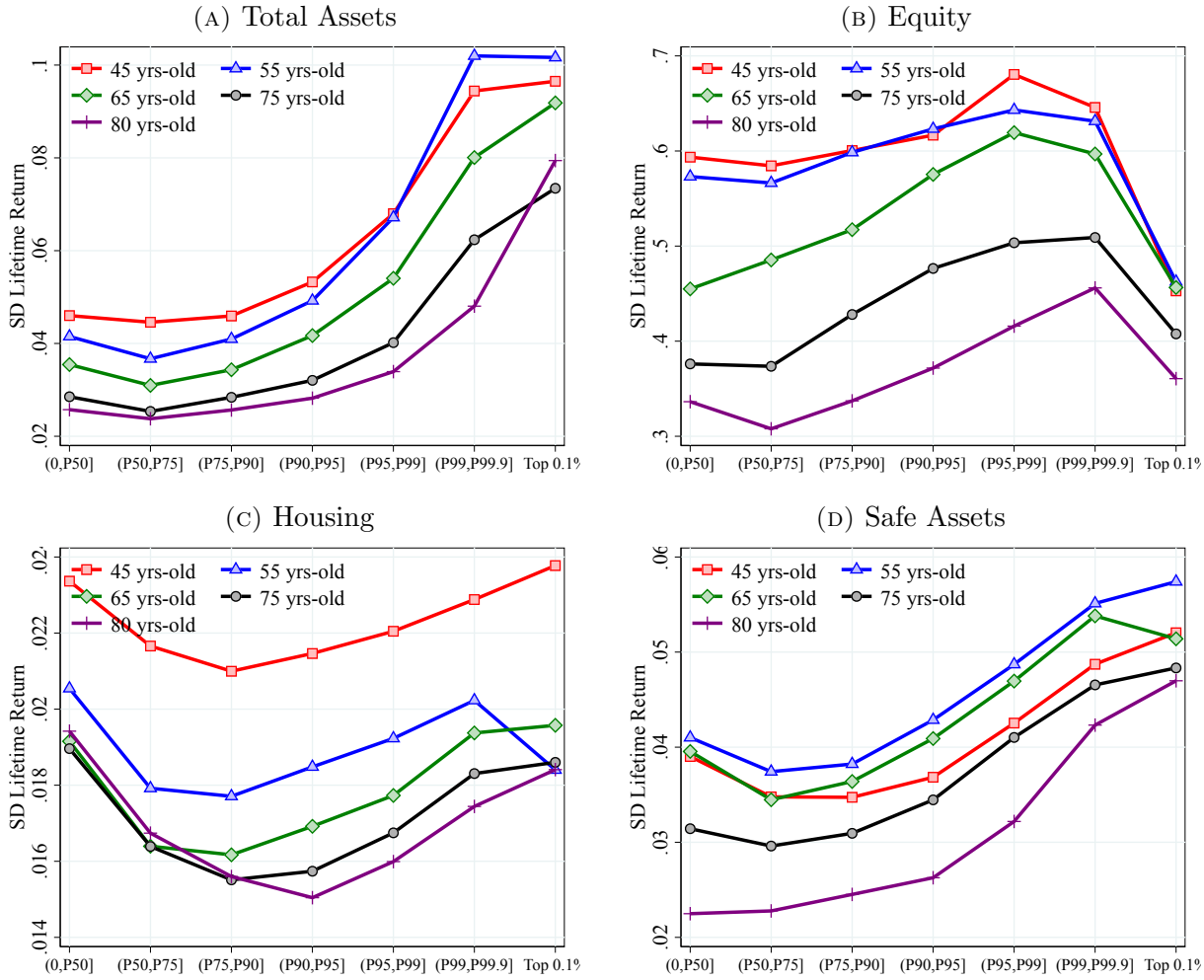
Notes: Figure A.15 shows the average returns within different quantiles of the households net worth distribution. To construct this figure, we pool household observations between 2005 and 2015. Weighted averages are value-weighted. Negative or missing values are assigned a a weight of 0.

FIGURE A.16 – LIFETIME RETURNS ON ASSETS ACROSS THE WEALTH DISTRIBUTION (UNWEIGHTED)



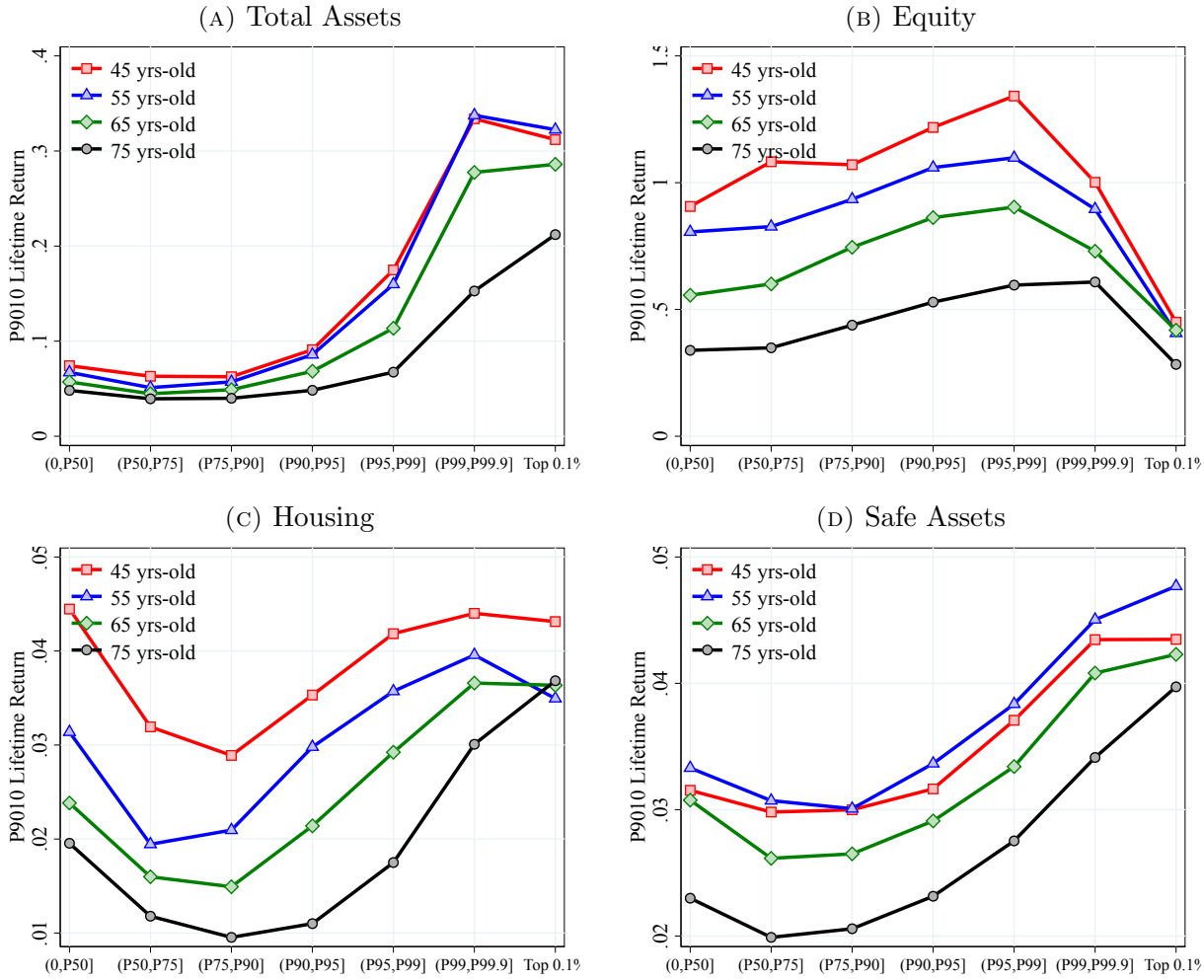
Notes: Figure A.16 show the lifetime average returns for different wealth groups in 2015. Returns are calculated for each household and year and for each asset class. The average lifetime return for each asset class is the average across all households and years available within age-wealth groups. See Appendix A.2 for details on the calculation of returns.

Figure A.17 – Standard Deviation of Value Weighted Returns



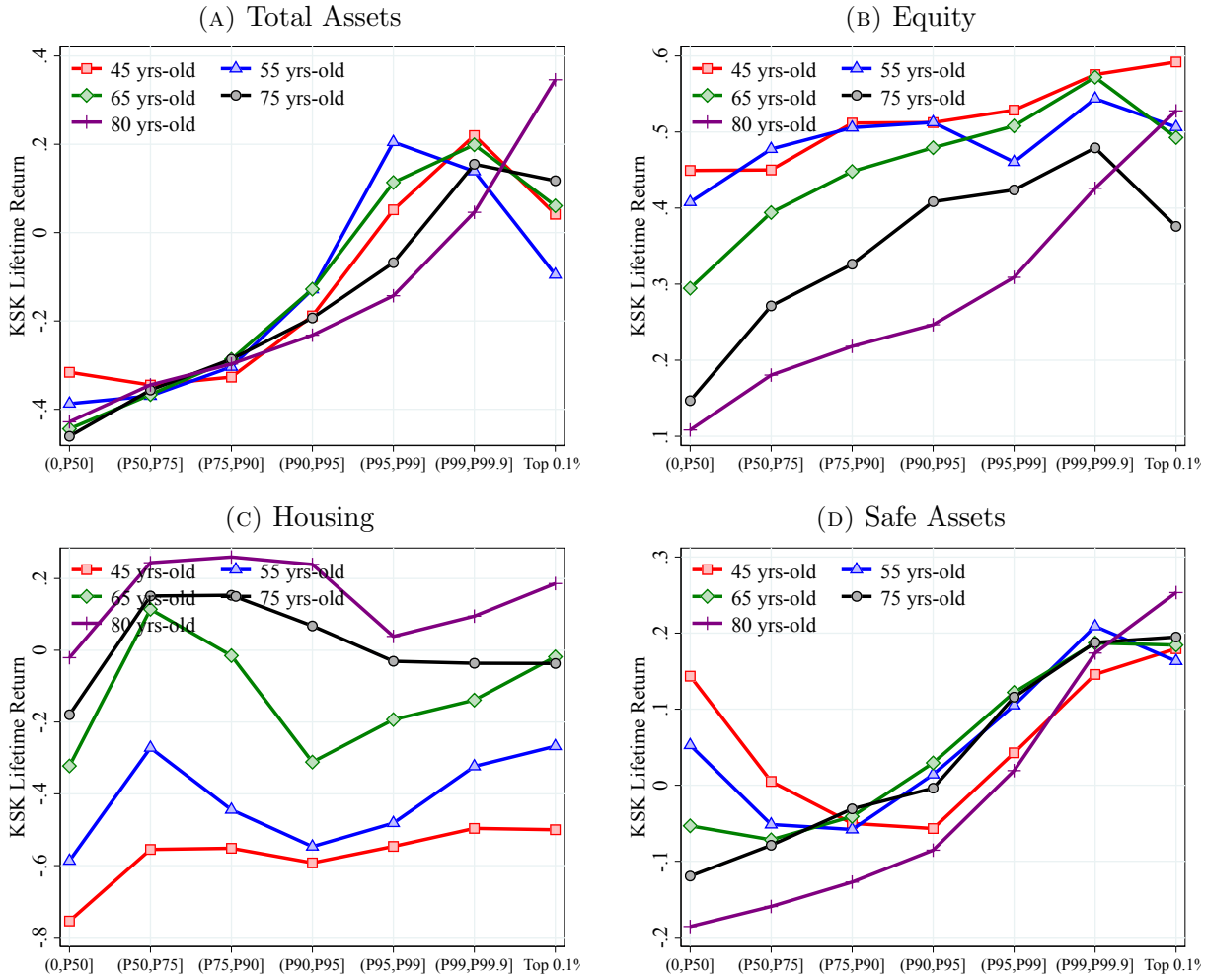
Notes: Table A.17 show the (unweighted) lifetime average of the standard deviation of returns on different assets for household in different wealth groups in 2015. Returns are calculated for each individual and year and for each asset class. The average lifetime time return for each asset class is average across all households and years available within age-wealth groups. See Appendix A.2 for details on the calculation of returns.

Figure A.18 – P90-P10 of Rates of Returns



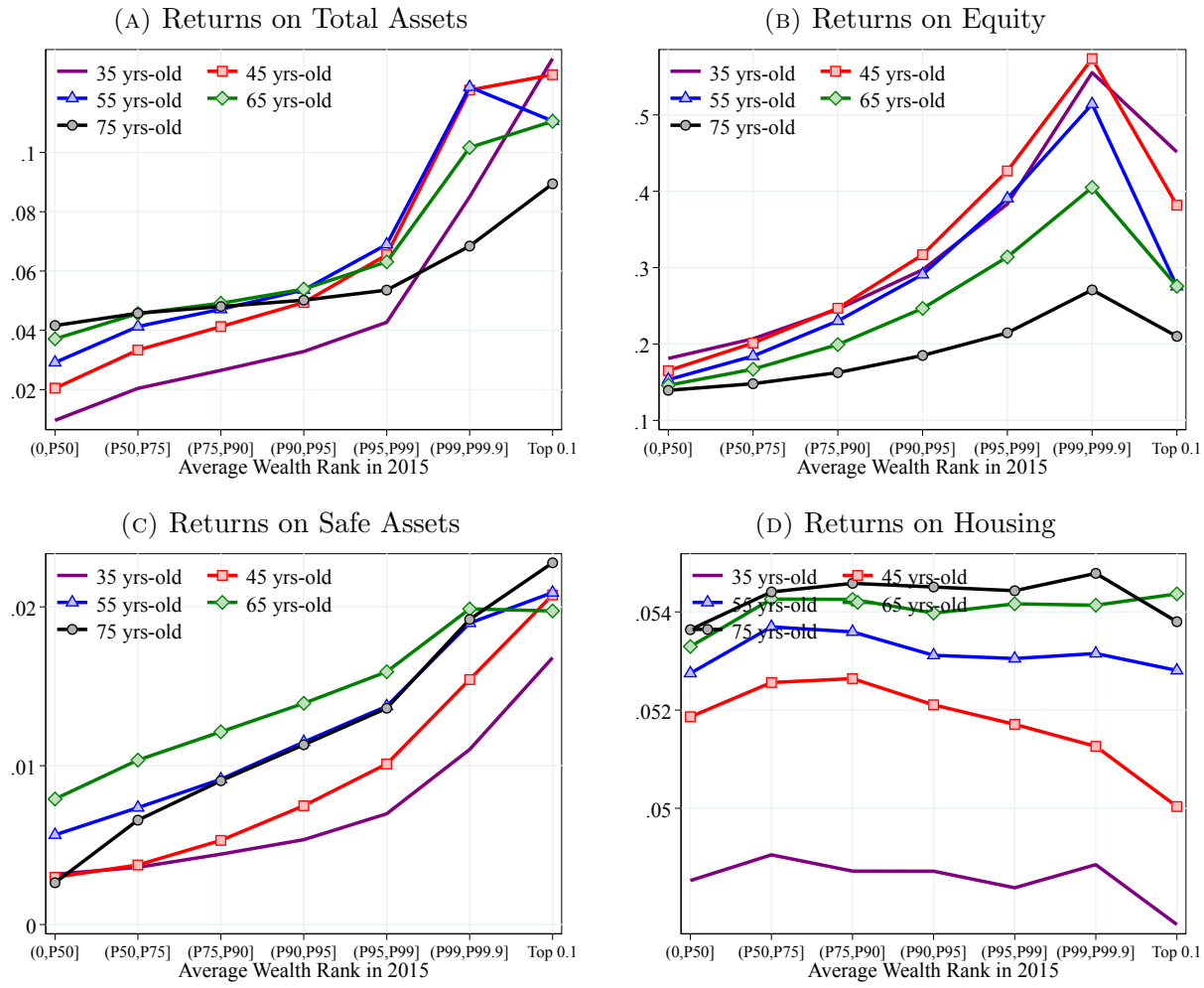
Notes: Table A.18 show the (unweighted) lifetime average of the standard deviation of returns on different assets for household in different wealth groups in 2015. Returns are calculated for each individual and year and for each asset class. The average lifetime time return for each asset class is average across all households and years available within age-wealth groups. See Appendix A.2 for details on the calculation of returns.

Figure A.19 – Kelley Skewness of Rates of Returns



Notes: Table A.19 show the (unweighted) lifetime average of the standard deviation of returns on different assets for household in different wealth groups in 2015. Returns are calculated for each individual and year and for each asset class. The average lifetime time return for each asset class is average across all households and years available within age-wealth groups. See Appendix A.2 for details on the calculation of returns.

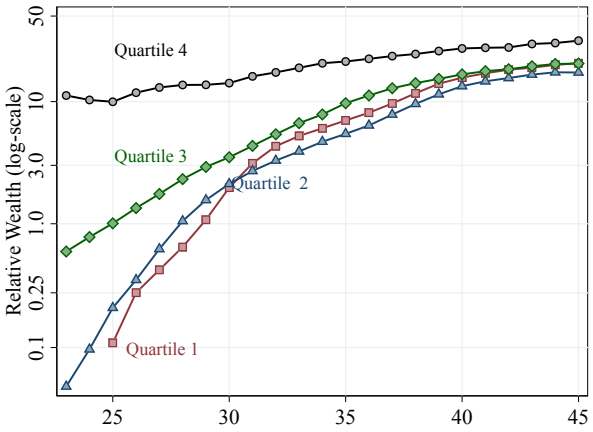
FIGURE A.20 – UN WEIGHTED LIFETIME RETURNS ON ASSETS ACROSS THE WEALTH DISTRIBUTION



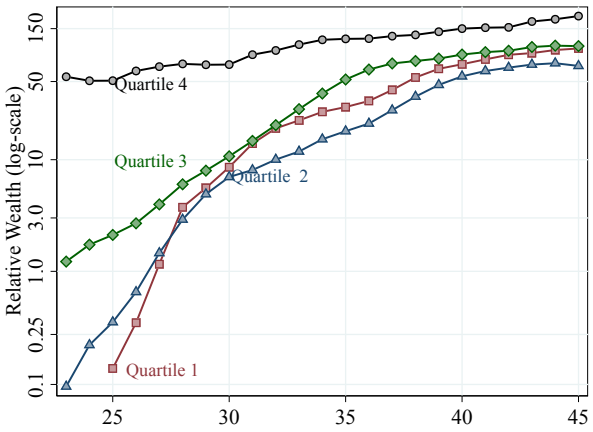
Notes: Table A.20 show the (unweighted) lifetime average returns on different assets for household in different wealth groups in 2015. Returns are calculated for each individual and year and for each asset class. The average lifetime time return for each asset class is average across all households and years available within age-wealth groups. See Appendix A.2 for details on the calculation of returns.

Figure A.21 – Average Wealth Profile: Old Money and New Money

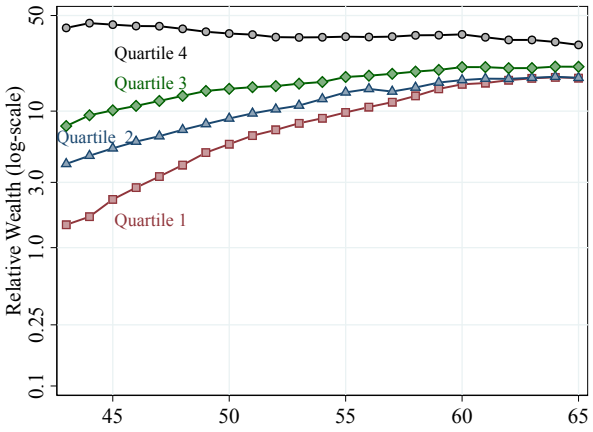
(A) Age 45-50: Top 1% in 2015



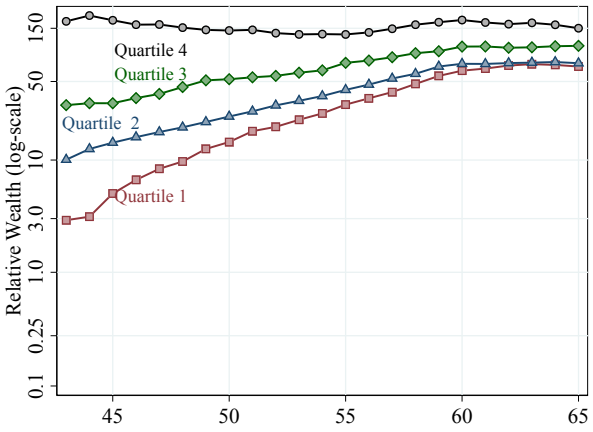
(B) Age 45-50: Top 0.1% in 2015



(C) Age 65-70: Top 1% in 2015



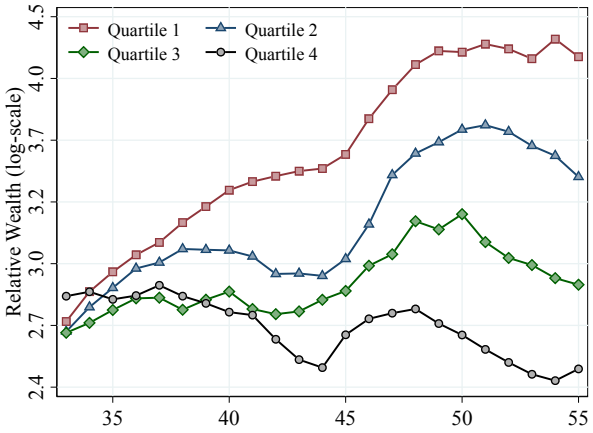
(D) Age 65-70: Top 0.1% in 2015



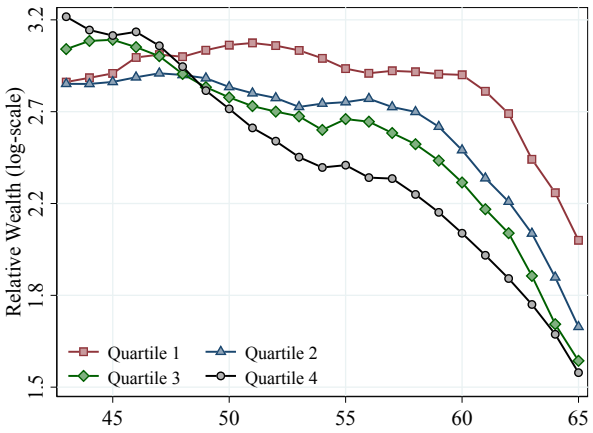
Notes: Figure A.21 shows the average wealth profile for household whose head is between 55 and 60 years old in 2015 and belong to the top 1% (Panel A) and top 0.1% (Panel B) in that year. Each line is the average wealth for individuals in different quartiles of the wealth distribution in 1993.

Figure A.22 – Average Income Profile: Old Money and New Money

(A) Age 55-59

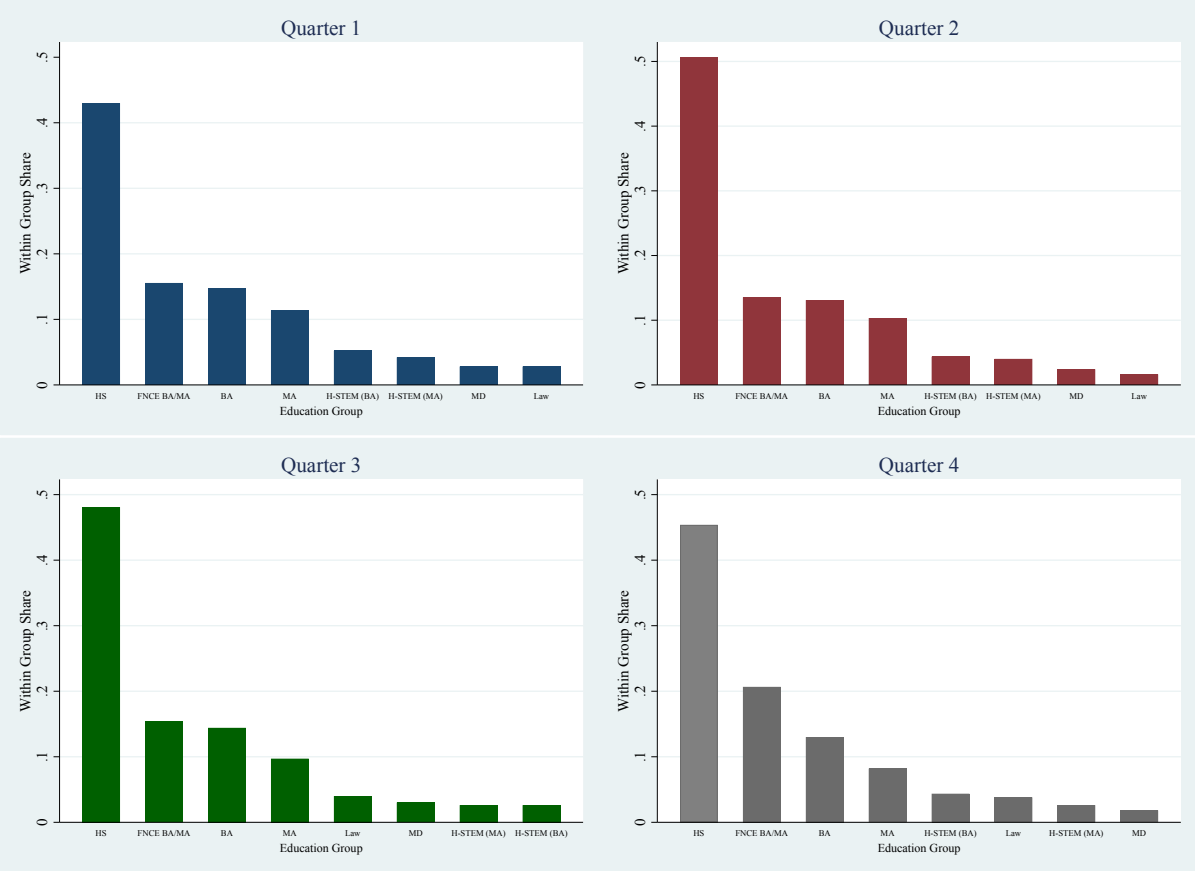


(B) Age 65-70



Notes: Figure A.22 shows the average labor income profile for household that belong to the top 1% of the wealth distribution in that year. Each line is the average labor income for individuals in different quartiles of the wealth distribution in 1993 relative to the economy average of labor income.

Figure A.23 – Education Shares for New and Old Money Households (Age 55/60)

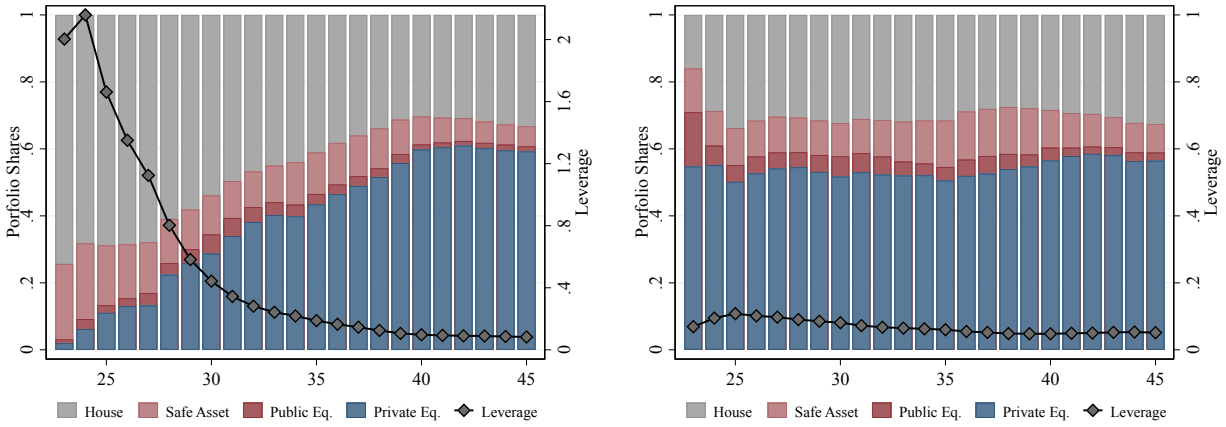


Notes: Figure A.23 the share of different education groups households (highest degree of the head of the household) who reach the top 1% of the wealth distribution in 2015 divided accordingly to their wealth in 1993 (quarterlies of the distribution). HS is High-school or less, FNCE BA/MA is Bachelor or MBA on a finance or business administration major, BA and MA are other bachelor degrees or master degrees, MD is Medical Doctor or Dentist, H-STEM is BA or MA on a health related degree (expect for Medical Doctor or Dentist) and STEM major.

Figure A.24 – Portfolio Shares: Old Money and New Money

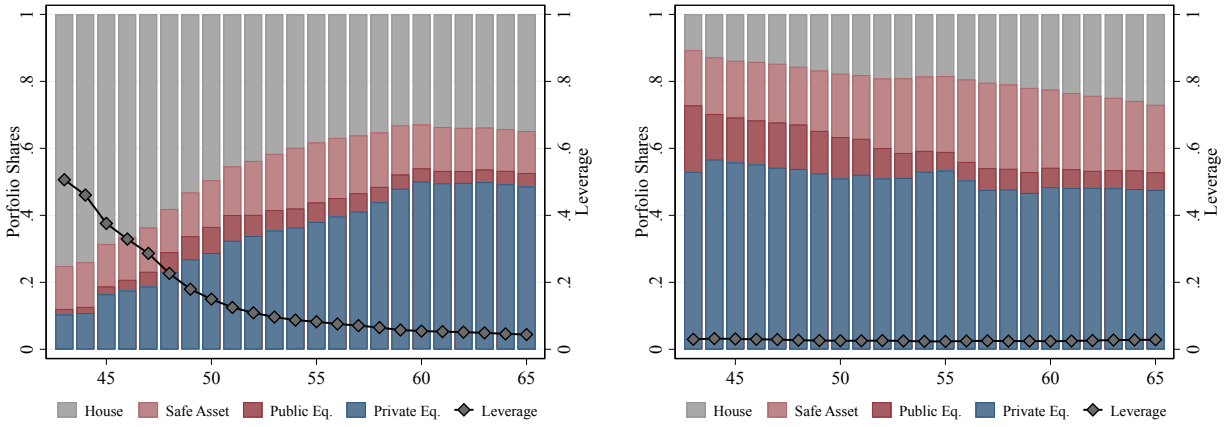
(A) Age 45-50: New Money

(B) Age 45-50: Old Money



(C) Age 65-70: New Money

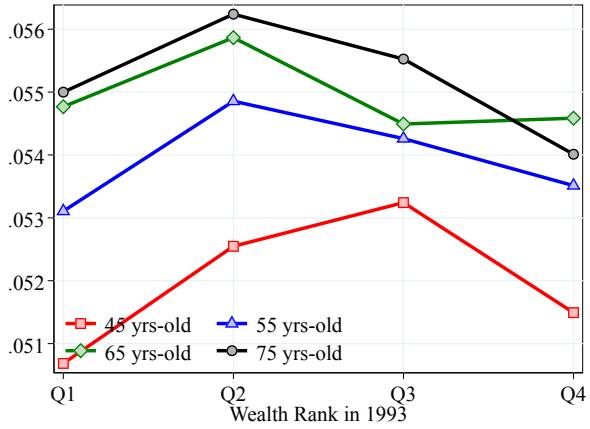
(D) Age 65-70: Old Money



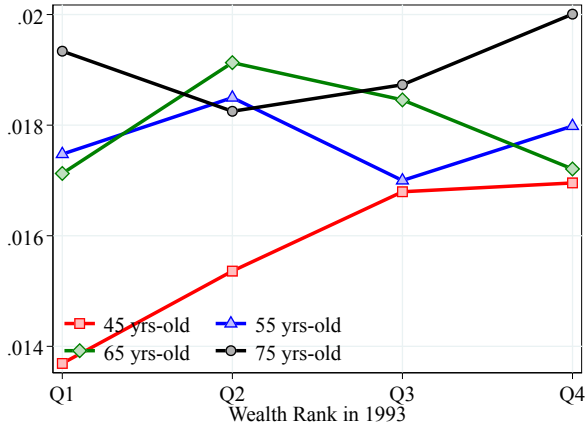
Notes: Figure A.24 shows the portfolio composition and leverage for households that belong to the top 1% in 2015. New Money households (Panel A and C) are those household that where in the first quartile of the wealth distribution in 1993; Old Money households (panel B and D) are those households that were in the four quartile of the wealth distribution in 1993.

Figure A.25 – Lifetime Returns: Old Money and New Money

(A) Returns on Housing

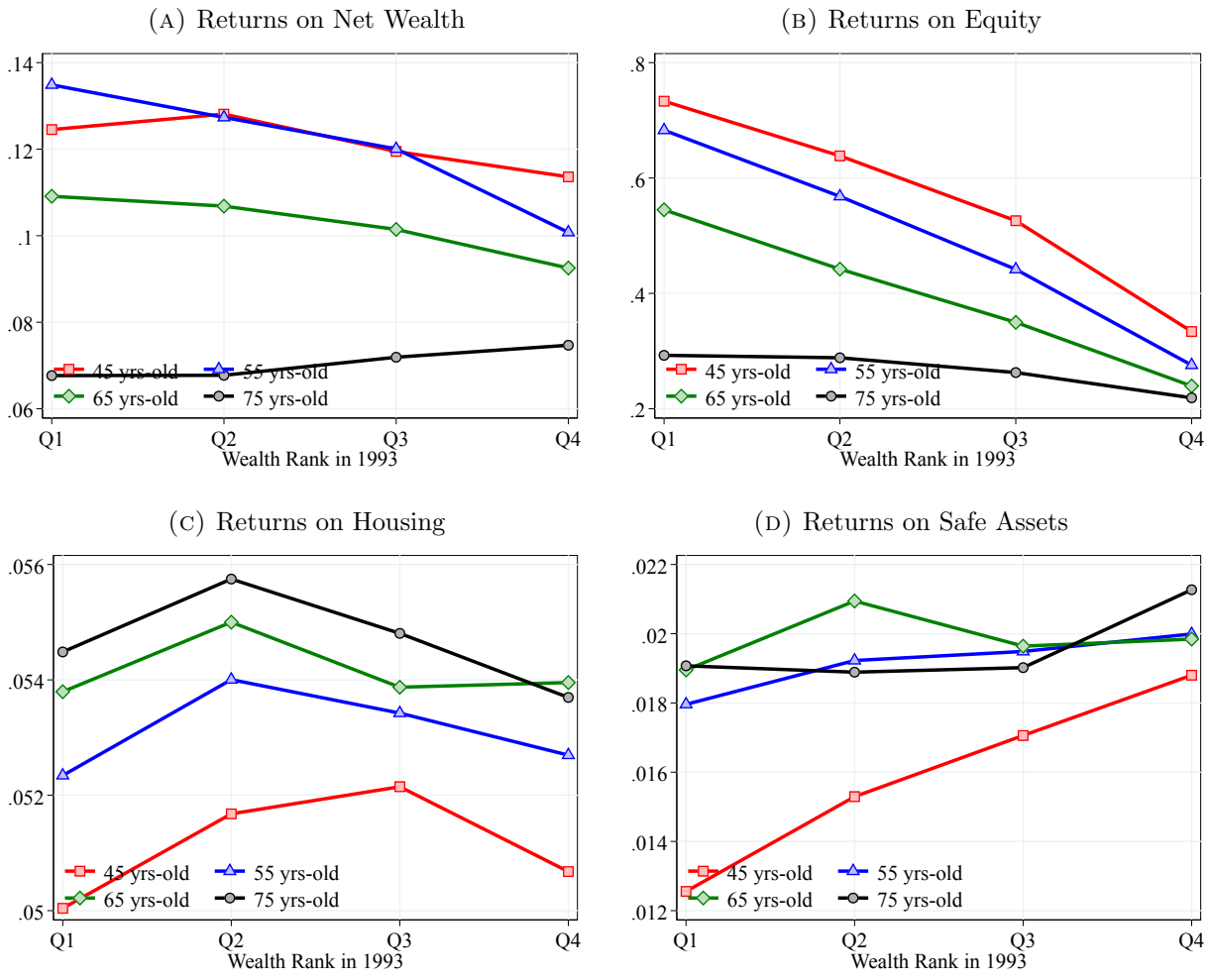


(B) Returns on Safe Assets



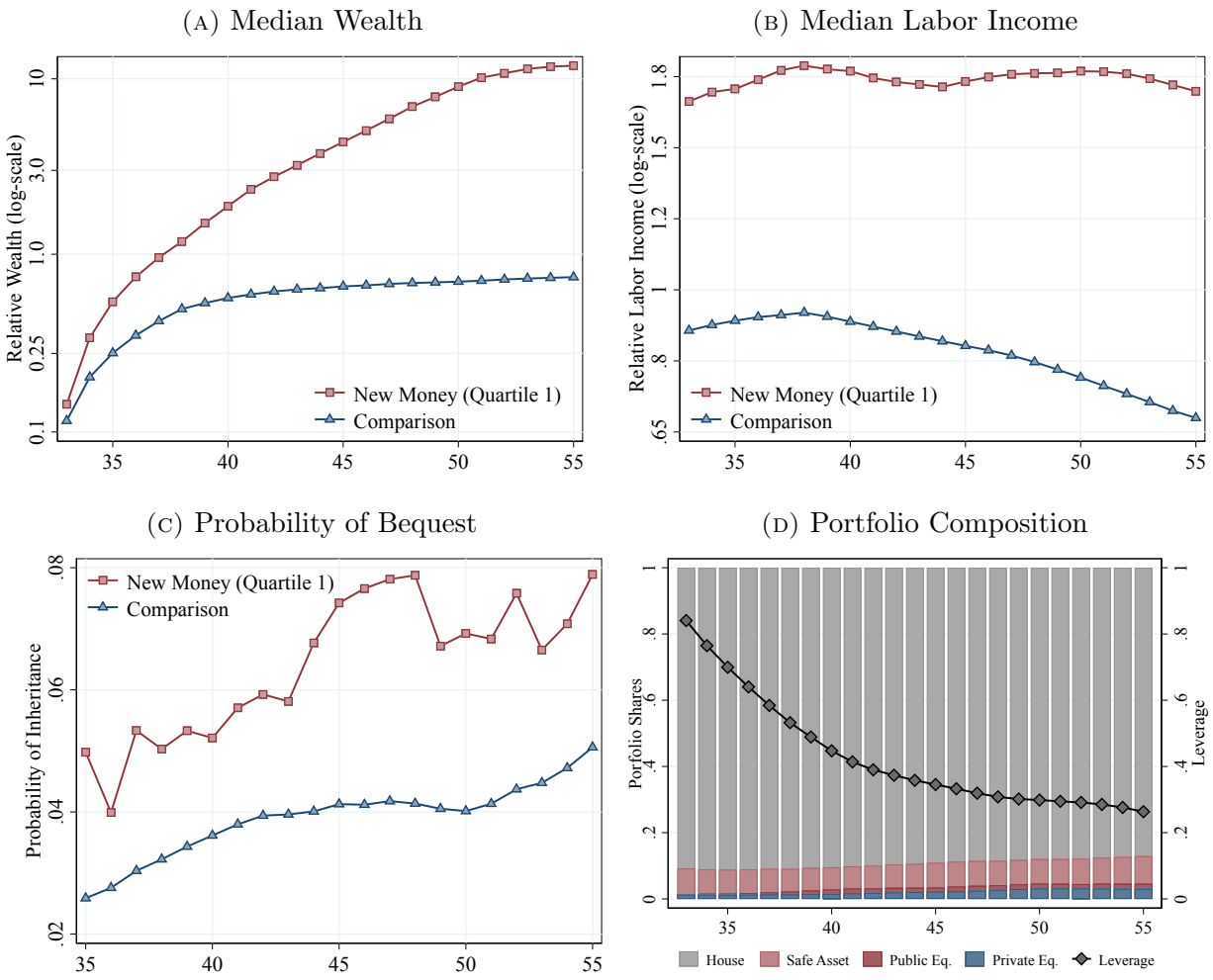
Notes: Figure A.25 shows the value-weighted median lifetime returns for households who are at the top1% of the wealth distribution at the end of the sample period (2015) and were in different quarterlies of the wealth distribution at the start of the sample period (1993).

FIGURE A.26 – LIFETIME RETURNS: OLD MONEY AND NEW MONEY (UNWEIGHTED)



Notes: Figure A.26 shows the average lifetime returns for households who are at the top 1% of the wealth distribution at the end of the sample period (2015) and were in different quarterlies of the wealth distribution at the start of the sample period (1993) identified as Quartile 1 (Q1) to Quartile 4 (Q4).

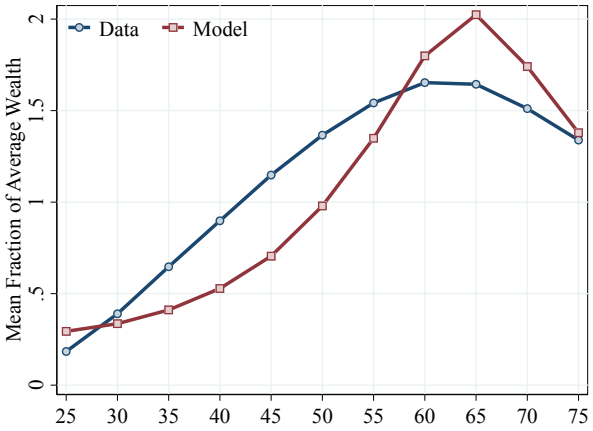
FIGURE A.27 – LIFETIME RETURNS ON ASSETS ACROSS THE WEALTH DISTRIBUTION



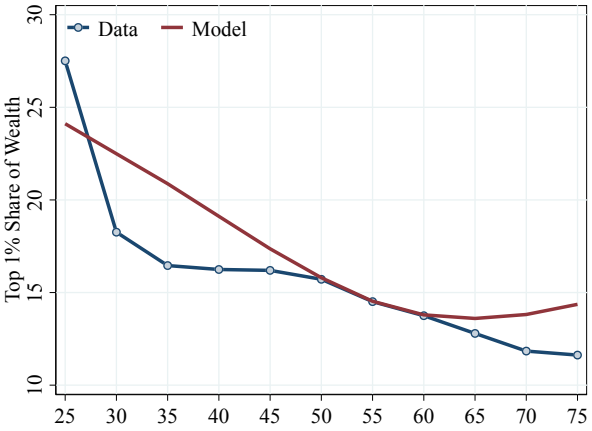
Notes: Table A.27

Figure A.28 – Model and Data Moments for Estimation

(A) Average Wealth Profile



(B) Wealth Concentration



Notes: Figure A.28 shows the evolution of log average wealth (Panel A) and wealth concentration over the cycle in the data and the model. For the empirical estimates, we control for year fixed effects by employing Deaton-Paxson regression. In Panel A, the within-age average wealth is scaled in model and data by the economy-wide average wealth.