Asset Allocation and Returns in the Portfolios of the Wealthy*

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Abstract

Despite accounting for a large amount of total wealth, there is little direct empirical evidence of the investment behavior of wealthy households. Based on a proprietary database of investment portfolios and returns, we document three new facts about ultra-high net worth portfolios. First, asset allocations change strongly with total wealth, as super-wealthy households hold a much larger share of alternative investments, such as private equity and hedge funds, and a lower share of liquid assets, such as public equities. The data includes a significant number of portfolios large enough to explore allocations and returns within the top percentile of the wealth distribution, including the top 0.01 percent. Second, while realized returns are increasing with wealth, Sharpe ratios are broadly similar across the top of the wealth distribution. This suggests that investment skill does not differ among investors in upper portions of the wealth distribution, but that risk tolerance increases with total wealth. Third, we use the data to explore whether returns differ within narrow asset classes, and find that returns on alternative assets in particular are increasing in wealth. This indicates that access and manager selection play a large part in determining returns and raises questions about the benefits of broadening access to delegated investing in private assets. Taken together, these findings substantially improve on existing empirical evidence on return heterogeneity in the U.S., which is increasingly understood to be critical in both macroeconomic dynamics and asset pricing.

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1 Introduction

There is little direct empirical evidence of the investment behavior of wealthy households in the United States, despite the fact that they account for a large proportion of total wealth. Estimates of top wealth vary, and are sensitive to misreporting in survey data or assumptions about the mapping of tax income to wealth. Understanding the portfolio allocations and performance of wealthy investors is critical for both the distribution and dynamics of total household wealth, as well as asset prices.[1]

In this paper, we present novel data and analysis based on a proprietary database of investment portfolios and returns, which sheds light on the allocations and returns of a large sample of wealthy U.S. investors. This data covers roughly 60,000 investors with mean wealth of 16.8 million (median 1.3 million) from 2016 to 2020, and includes a significant number of portfolios large enough to provide evidence on the allocations and returns of the top 1, 0.1, and 0.01 percent. In addition, we observe a significant number of investors who represent a large share of investment in a wide range of asset classes.

The characteristics of the data are nearly ideal, as it is based on the portfolio positions and returns recorded by wealth managers and family offices. This includes an exhaustive breakdown of individual investments into relevant categories, which allows us not only to distinguish among asset classes but also measure diversification within asset classes. The data include details of the overall household financial wealth, investment income, cash flows from investments, and overall returns including unrealized gains, reported at a quarterly frequency and down to narrowly-defined sub-asset classes as used by professional wealth advisors. Wealth advisors play an important intermediary role for households, in particular the super-wealthy, and track portfolio allocations, monitor investment returns and give detailed financial advice. As a consequence, our data coverage on individual asset holdings and returns is highly scrutinized and likely to be both comprehensive and accurate.

Importantly, the reporting of realized returns in our data includes realized and unrealized capital gains, as well as flow payments, thus bypassing the significant challenges often faced in the measurement of wealth returns. Because we observe the same reported portfolio and returns as observed by investors' wealth advisors, this data is unlikely to suffer from the bias inherent in survey data, under-reporting, or measurement error, such as the assumptions necessary when mapping portfolio holdings based on publicly available data on returns. Although our sample is largely limited to components of financial wealth, it includes data

[1] Hubmer et al. (2020) and Kuhn et al. (2020) in particular emphasize the need for better data on portfolio heterogeneity and asset price movements to match short and medium run dynamics in wealth inequality.

on wealth held in private businesses and real estate, at the values reported to or imputed by wealth managers. Based on this data, we document three new facts about high net worth and ultra-high net worth investor portfolios.

First, asset allocations change strongly with total wealth. Wealthier households hold a much larger share of alternative investments and a lower share of fixed income and public equity. Among the very wealthy, the share of equities in total wealth falls and is replaced by investments in alternative asset classes, such as hedge funds and private equity. Investors with less than three million in total wealth allocate 47 percent of their portfolio to public equities and 11 percent to alternatives, while households with more than 100 million in total wealth hold 30 percent of their assets in public equities and 27 percent in alternatives.

The allocation patterns we report differ from established academic benchmarks for the portfolio allocations of U.S. investors. The primary datasets used in academic research on household income and wealth in the U.S. are the Panel Study of Income Dynamics (PSID) and the Survey of Consumer Finances (SCF). The PSID does not track the upper end of the income and wealth distribution. The SCF is a cross-sectional survey, conducted triennially. While the SCF does oversample wealthy households, it is a voluntary survey. Survey completion among the top percentile of households is roughly 12 percent, and only around 700 households from the top percentile are included (Kennickell, 2017). By contrast, we observe approximately 19,000 investors with wealth above three million, which is estimated by Smith et al. (2020) to be the wealth threshold of the top percentile. The SCF also excludes the wealthiest 400 individuals as listed by Forbes. We observe approximately 8 percent of investors in the top 0.01 percent of the wealth distribution.[2]

This also provides a different picture than the one generated by the capitalization method used in Saez and Zucman (2016) and Smith et al. (2020). This approach capitalizes the income earned on assets and reported in annual tax filings at an assumed rate of return to estimate portfolio allocations. There is considerable debate over the correct rates of return to use in this methodology. It is also possible that the structure of investments does not map cleanly to tax liabilities, which is particularly likely for households with higher marginal tax rates (Poterba and Samwick, 2003).

Although we observe primarily financial wealth, our data has detailed portfolio allocations and realized performance. The few existing datasets that include both returns and wealth are based on U.S. foundations and university endowments (Piketty, 2014; Saez and Zucman,

[2]Based on the wealth thresholds estimated by Smith et al. (2020), the 2016 cutoff for the top 0.01 percent is 72.2 million, and this includes 23,800 individuals. At the end of 2019, we observe 1,951 portfolios with wealth greater than this cutoff.

2016). Our simultaneous coverage of wealth, portfolio choices, and returns allows us to not only detail how allocations differ with wealth, but also how wealth is related to returns.

Second, we report precise estimates of realized returns at the top end of the wealth distribution, and show that overall portfolio returns increase with wealth, while risk-adjusted returns are broadly similar across the top of the wealth distribution. This suggests that investment skill does not differ among investors at the upper end of the wealth distribution, but that tolerance for systematic and idiosyncratic risk goes up with total wealth.

Over the sample period, the average annualized portfolio return is 4.68 percent, with large variation across time and individuals (standard deviation: 14.4 percent). Our measure of returns is based on reported realized performance at a narrow sub-asset class level, which we aggregate up to the asset class and then the portfolio level using portfolio shares as weights. Because we observe realized performance, we do not need to calculate returns by scaling income flows over assets, which may be biased by the timing of asset purchases and sales (Dietz, 1968). While we do not observe portfolio returns for the average or median U.S. investor, it is useful to note that the average return on a risk-free asset (i.e. one month T-bills) over this period was 1.33 percent, while the average value weighted stock market return was 9.52 percent.

Among investors with less than three million in assets under management, the average return is 4.38 percent, while for investors with more than 100 million in wealth, the average return increases to 6.37 percent. This pattern of increasing return is mirrored in the standard deviation of returns, which rises from 13.9 percent among the least wealthy investors to 19.8 percent at the top of the wealth distribution. Median returns increase less steeply with wealth, and median standard deviations do not increase, indicating that dispersion in returns and volatility also increase with wealth.

This is qualitatively consistent with the findings of Bach et al. (2019) and Fagereng et al. (2020) in Sweden and Norway, respectively, but quantitatively novel among a subset of U.S. households for which accurate data has to date been limited. An analysis of returns based on the SCF finds average returns to wealth between 1990 and 2019 of 8.25 percent for the top percentile of wealth, implying a premium over the aggregate return of 6.8 percent, and a substantial premium over the bottom 90 percent who earn less than 4 percent (Xavier, 2020). With additional data on realized returns at the top, our analysis suggests that returns increase with wealth even within the top percentile.[3]

[3]Bach et al. (2019) present a similar reconciliation of their findings in Sweden to the US based on the 2007 SCF, noting that for the top 1-0.5 percent, the expected excess return was 5.3 percent, while for the top 0.01 percent, the expected excess return on gross wealth was 6.6 percent.

Taking the first and second fact together leads one to wonder if the increasing pattern of returns can be explained by portfolio allocations. Comparing mean returns by asset class rules out the idea that higher returns are driven by portfolio allocations alone. Public equities perform much better on average than other assets over our sample period. This implies that if an investor with median wealth were to increase their exposure to alternatives, for example to match the allocations of the wealthiest investors in the data, their mean return would fall. There must therefore be different returns for wealthy investors within asset classes.

Third, we explore the evidence for higher risk-adjusted returns for wealthier investors within narrow asset categories. Among liquid, publicly investable assets, such as fixed income and public equities, risk-adjusted returns do not increase with wealth. Within fixed income, wealthy investors typically have higher non-US allocations. Within equities, the share of assets invested in ETFs and mutual funds falls with wealth. Factor pricing regressions indicate that wealthy investors appear to load less heavily on the aggregate market, and more strongly on small-cap and growth stocks. Although returns in these asset categories increase with wealth, investors' Sharpe ratios do not.

In contrast, returns are steeply increasing in wealth in alternative assets, on both a realized and risk-adjusted basis. We further decompose this return into its constituent parts, by looking at the return to hedge funds, private equity and venture capital, and real estate fund investments separately. While hedge funds are the largest share of alternatives for investors with less than 10 million in wealth, investors with greater wealth more heavily invest in private equity, venture capital, and other funds such as real estate focused funds and private debt.

Within the narrow asset classes reported in alternatives, we find that both realized and risk-adjusted returns increase systematically with wealth. Hedge fund returns are low, in particular for less wealthy investors, and increase with wealth on average and weakly on a risk-adjusted basis. Private equity and venture capital investments generated higher average returns for all wealth groups, and also show a pronounced pattern of higher risk-adjusted returns among investors with higher wealth. Several different methodologies have been used to measure private equity returns.[4] Our finding of abnormal risk-adjusted returns on private equity is in contrast to the findings of Bach et al. (2019) and Moskowitz and Vissing-Jorgensen (2002), but consistent with Kartashova (2014), in more recent data.

[4]Fagereng et al. (2020) use the ratio of accounting earnings to the tax value of equity. Bach et al. (2019) instead apply a trading multiple based on unlisted firms' book equity, and the market-to-book ratio of listed firms in the same industrial sector. Gupta and Nieuwerburgh (2019) propose a new methodology to value private equity using a cash-flow replicating portfolio.

The systematic variation of risk-adjusted returns in alternative, intermediated assets - but not in liquid assets such as equities and bonds - indicates that access and manager selection play a large part in determining returns. In turn, this raises questions about the benefits of broadening access to delegated investing in private assets. In contrast to hedge funds, private equity and venture capital, real estate funds show only a weak pattern of increasing realized returns, and in a pattern that appears to provide lower risk-adjusted returns among wealthier investors. This is a less commonly held asset class, which investors may be less familiar with or have less access to. Altogether, these findings raise questions as to what extent access and selection lead wealthier investors to earn higher returns in alternatives.

Taken together, these results provide novel evidence of both wealth and capital income in the U.S. at a micro level. The frontier of academic research on wealthy individuals makes use of comprehensive administrative data in Sweden and Norway. The Swedish data analyzed in Bach et al. (2019) includes detailed position-level balance sheets for the full population, and demonstrates that expected returns are both persistent and increasing in wealth, as evidenced by risk exposure. Fagereng et al. (2020) construct realized returns at an annual frequency using Norwegian data, based on detailed financial holdings. In this setting, not only do returns increase with wealth due to increasing risk tolerance, but financial sophistication and talent also explain some of the return differentials. Nonetheless, some challenges in the construction of realized returns remain, as well as questions regarding whether wealth dynamics in Sweden or Norway may differ from other countries.

This evidence relates to a large literature on wealth inequality in macroeconomics (Nardi and Fella, 2017; Benhabib and Bisin, 2018). Benhabib et al. (2011) argue that capital income risk rather than labor income drives the observed right-skewness of wealth, and the notion that returns are correlated with wealth, which is referred to as "scale dependence," has been shown by Gabaix et al. (2016) to be critical in matching the speed of changes in inequality experienced in the U.S. In a related contribution, Hubmer et al. (2020) find evidence that the decline in tax progressivity and scale dependence as calibrated to match the evidence in Bach et al. (2019) are both necessary to account for the changes in U.S. wealth inequality over the past forty years. Benhabib et al. (2019) similarly argue that stochastic idiosyncratic returns to wealth in Fagereng et al. (2020) appear close to what would be necessary to generate the cross-sectional distribution of wealth and social mobility in the United States.

Our findings are also closely related to a number of papers that have suggested different explanations for the heterogeneity in returns across investors. These include differences in entrepreneurial ability (Lucas, 1978), information (Peress, 2004), and sophistication (Kacperczyk et al., 2019). Several recent papers study return heterogeneity within a specific asset

class, including financial wealth (Fagereng et al., 2016), bank deposits (Deuflhard et al., 2018), and stock portfolios (Campbell et al., 2019). As in Calvet et al. (2007), we are able to analyze the majority of financial assets, but cannot observe pension wealth and have limited data on debt. Like Bach et al. (2019), we find risk exposure to be an important driver of returns, and similar to Fagereng et al. (2020) we find that risk exposure does not explain the full extent of return heterogeneity, in particular in specific illiquid asset classes.

The remainder of the paper is structured as follows. Section 2 describes the data. Portfolio allocations are shown in Section 3, while portfolio returns are analyzed in Section 4. Section 5 explores returns within narrow asset classes, highlighting the differences between liquid assets (e.g. fixed income and public equities) and intermediated alternatives. The final section concludes.

2 Data

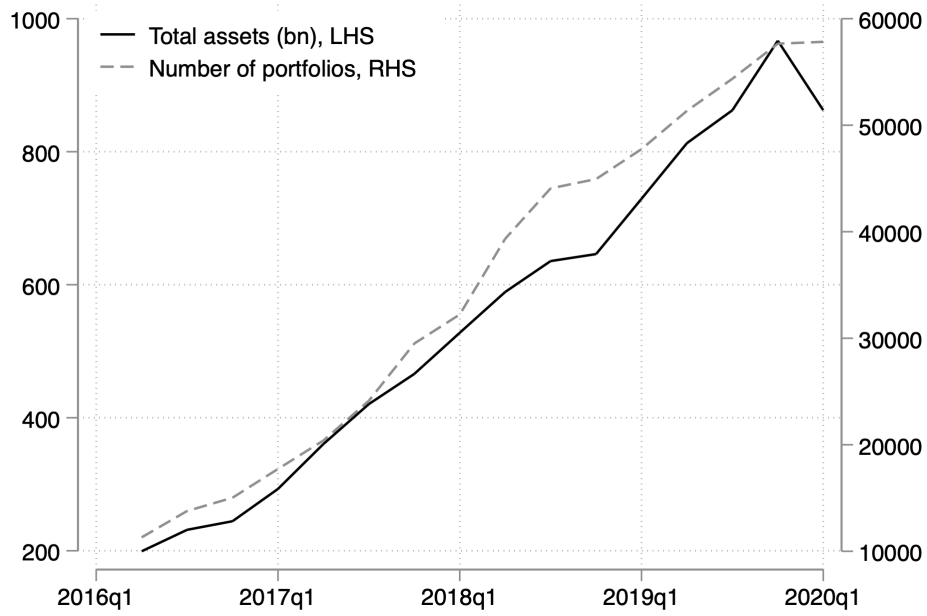
In this paper, we use anonymized portfolio-level data from Addepar, a leading technology provider for the wealth management industry. Addepar provides an advanced financial reporting and analysis software platform for private wealth advisors. These advisors range in scale from single family offices to large wealth management firms with thousands of individual advisors and client portfolios. Advisors use the platform to get a comprehensive picture of asset holdings and returns across different asset and sub-asset classes, ranging from standard equity and fixed income investments to private equity, real estate and collectibles. While individual investors can access their own account data directly, advisors are the primary users of the software. These include family offices, private wealth advisors at banks, and other advisors.

Across 373 managing firms, we observe over 50,000 client portfolios on the platform, each representing an individual household. The range of total holdings ranges from the mid-six figures to multi-billion dollar portfolios, with an average total size of portfolios of 16.8 million (median 1.3 million) at the end of 2019. By this time, there are close to 1 trillion in assets recorded on the platform, representing a growing sample of underlying investors, as shown in Figure 1 (a). Among the 11,308 investors on the platform at the start of 2016, mean wealth was 16.4 million (median: 1.3 million). The composition of assets on the Addepar platform as of 2019 Q4 is shown in Figure 1 (b).

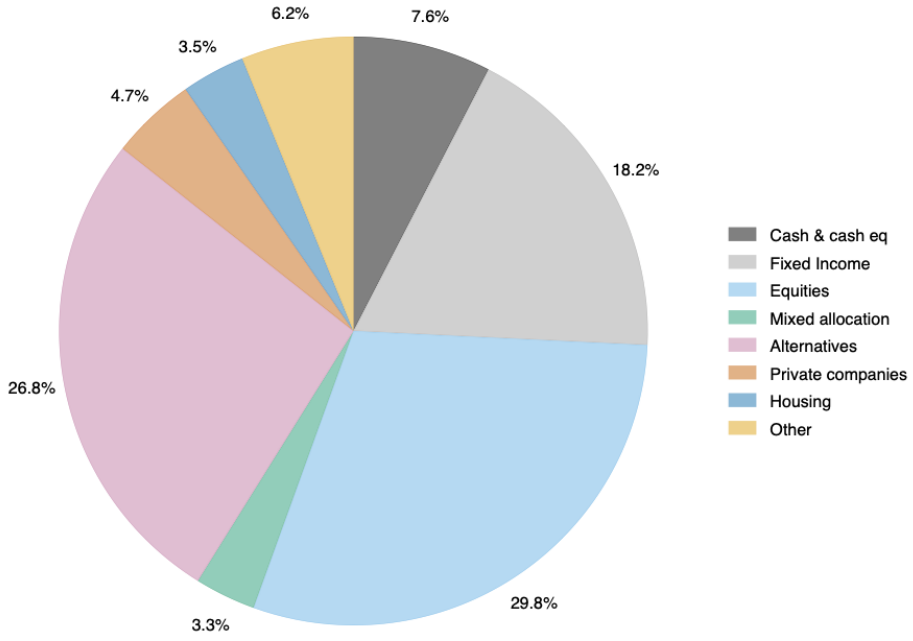
We observe portfolio holdings and return data at the sub-asset class, while it is available at the security-level for end users. Portfolio positions are mapped to sub-asset classes, each

Figure 1: Platform coverage

(a) Assets and portfolios



(b) Allocations by asset type (%, 2019Q4)



of which aggregated into a broad asset class, according to the categories set out in Table 1. We denote investors with the subscript i, asset classes with the subscript j, and sub-asset classes with the letter k. The broad asset classes are cash and cash equivalents, fixed income, equities, mixed allocation funds, alternative investments, private businesses, directly held real estate, and other.

For each investor i we observe the start and end nominal allocations for each sub-asset class in each quarter t, which we denote $x_{ik,t}$ and $x_{ik,t-1}$. Fixed income is broken down by types of U.S. bonds, including Treasuries, TIPS, investment grade and high yield corporate bonds, and bank loans, and then for international developed market bonds, emerging markets bonds, opportunistic bond funds, other, and unknown fixed income. For equities, we observe exposure by location (US, global, Americas, EMEA, Asia, emerging and frontier markets, other), and can also measure the breakdown between ETF, mutual fund, and single stock investment. Mixed allocation vehicles include any funds with a multi-asset investing strategy, or accounts that are held away such as 401Ks, in which the underlying asset composition cannot be observed. Alternatives are broken down into several intermediated investment types: hedge funds, private equity and venture capital (including private debt), real estate funds, other (commodities, cryptocurrencies), and unknown. Private businesses refer to wealth held in a privately owned company, and housing consists of real estate that is directly held, such as homes and apartments. Collectibles and other non-financial assets are classified as "Other."

The data coverage of individual asset holdings and returns is highly scrutinized and likely to be accurate and comprehensive. As wealth advisors play a critical intermediary role for individuals, especially the super-wealthy, they are charged with tracking portfolio allocations, monitoring investment returns and giving detailed financial advice. Especially at higher wealth levels, advisors provide advice on a broad range of financial questions beyond liquid investment portfolios, which provides a strong incentive to the end-client to provide full disclosure of all assets and liabilities. Crucially, this includes the introduction and sourcing of investment managers, especially in the alternatives space (hedge funds, private equity or venture capital). As a consequence, data coverage on individual asset holdings and returns is highly scrutinized and likely to be comprehensive. In some steps of the analysis, we drop portfolios with positive holdings in fewer than three different sub-asset classes to exclude partially-captured portfolios from the analysis.[5]

[5]Partially-captured portfolios may reflect new advisor-client relationships that involve the piecemeal transition of assets and investments. While we cannot test for this directly, anecdotal evidence from practitioners in the field indicates that households generally consolidate all their financial wealth with a single advisor, so that an individual household's finances should adequately be reflected in the observed investment portfolio.

It may not be of interest to an individual to report all of their housing, pension, and non-financial wealth to their wealth advisor. We similarly do not observe many portfolios that report debt. While these components of wealth may be under-reported, we expect such under-reporting to be more likely for portfolios at the bottom end of the wealth distribution in our data, for which other sources of data already provide reasonable proxies for the overall allocation of total wealth. For ultra high net worth investors we are able to substantially improve on the understanding that is based on survey or administrative data, and because we have narrow asset class returns, we can compare these by investor wealth.

Investment returns are reported directly from security custodians for liquid assets, and are manually entered by wealth advisors for alternative and private assets. While returns, flows, and portfolio allocations are updated on the platform daily, we observe portfolio positions and returns at a quarterly frequency. We observe quarterly starting and ending positions, total returns, transactions, and cash flows, all in U.S. dollars, as well as investment performance, which captures the time-weighted rate of return in percent of invested assets.

Table 2 provides summary statistics for the average and median wealth of an investor on the platform in 2016 Q1 and 2019 Q4. Although the majority of investors on the platform have less than three million in total wealth, there is a considerable number of investors in the upper parts of the wealth distribution. To maintain confidentiality, the sizes of positions in equity or alternatives in excess of one billion are not shown. There are 37 portfolios from which these assets are censored.

We calculate the portfolio share of each sub-asset within each asset class as:

$$\omega_{ikt} = \frac{x_{ik,t}}{\sum_{k \in j} x_{ik,t}}.$$

where $k \in j$ follows the mapping set out in Table 1, and $\sum_{k \in j} \omega_{ik,t} = 1$ for all j. Each category is then aggregated up to an asset-class share:

$$\omega_{ijt} = \frac{\sum_{k \in j} x_{ik,t}}{\sum_{j \in J} \sum_{k \in j} x_{ik,t}}.$$

where $\sum_{j \in J} \omega_{ij,t} = 1$ for all investors. Returns are reported at the sub-asset class level in percentage points and total nominal return. We use reported returns as our primary measure at the sub-asset class leve, and construct returns at the asset class level using:

$$r_{ijt} = \sum_{k \in j} r_{ik,t}\, \omega_{ik,t-1}$$

Table 1: Asset classification

Asset class j	Sub asset classes k
Cash & cash eq	Cash, cash equivalents
Fixed income	U.S. Treasuries, U.S. TIPS, Investment Grade, High Yield, U.S. bank loans, international developed markets, emerging markets, Opportunistic Bond Funds, other, unknown
Equities	US, global, Americas, EMEA, Asia, emerging and frontier markets, other; including ETF, mutual funds, and single stocks
Mixed allocation	Multi-asset allocation vehicles, held away accounts
Alternatives	Hedge funds, private equity and venture capital, real estate funds, other, unknown
Private businesses	Equity in private companies
Housing	Directly held real estate
Other	Collectibles, other

Notes: Concentrated positions (> 1 bn) in single equities and alternatives are excluded.

Table 2: Investors' assets under management (millions)

	2016 Q1			2019 Q4		
Wealth group	Mean	Median	N	Mean	Median	N
<3m	0.8	0.5	7,166	0.9	0.6	38,869
3m-10m	5.1	4.7	2,092	5.5	5.0	9,686
10m-30m	16.0	15.4	1,101	17.3	16.0	4,955
30m-100m	51.6	45.4	646	53.5	48.7	2,714
>100m	390.7	203.1	303	453.3	204.6	1,432
Total	16.4	1.3	11,308	16.8	1.3	57,656

Notes: There are 112 managers on the platform in 2016Q1, and 373 by the end of the sample. Concentrated positions (> 1 bn) in single equities and alternatives are excluded.

which uses the portfolio shares from the start of the period as weights. We can also calculate returns at the portfolio level using:

$$r_{it} = \sum_{j \in J} r_{ijt}\, \omega_{ij,t-1}$$

which is equivalent to taking the weighted average of the performance of each sub-asset category, using the share of each sub-asset in the total portfolio at the start of the period as the weight.

The sample of investors whose portfolios are shown in the data may not be representative of the population of wealthy households in the US. Given the voluntary nature of participation in the platform, the data may include individuals that are more financially sophisticated, as they have by construction selected a wealth manager or established a family office that elected to use Addepar for portfolio monitoring. Selection may also skew away from the best investors, whose skill is sufficiently high so as to not need an external manager or to have limited use for the services provided by a wealth management platform, though individual family offices may cover this subsection of investors at least at the top end of the wealth distribution.

3 Portfolio allocations

How portfolio allocations change with wealth among wealthy U.S. investors is a question for which prior data presents only a partial picture. In our data, there is a large shift in asset allocation as wealth increases, as shown for the end of 2019 in Figure 2 and Table 3.

For all wealth groups, the portfolio share of cash and cash equivalents was roughly 8 percent. While we abstract from the non-pecuniary services that investors may derive from holding liquid assets, we assume that this must drive allocations to short duration and cash-like securities, across the wealth distribution. Despite the consistency of cash and liquid assets, the patterns of asset allocation otherwise differ among the investors we observe.

The share of fixed income, public equities, and mixed allocation funds declines with wealth, from a total of roughly 78 percent among investors with less than three million in assets, to 46 percent among the wealthiest group of investors. In contrast, the share invested in alternative asset classes, private businesses, housing, and other assets rises from 15 percent among the lowest wealth group, to 46 percent among the wealthiest investors.

These findings are close to the averages reported by UBS (2018), which surveyed 311 family

investment offices globally regarding their portfolio allocations. Among the respondents to this survey, the average cash allocation was 7 percent, fixed income was 16 percent, equities was 28 percent, alternatives were 46 percent, and commodities were 3.3 percent.[6]

The allocation patterns we report differ from established academic benchmarks for the wealth and portfolio allocations of U.S. investors. In the 2019 SCF, for which asset allocations are shown for the full population in Figure 3 (a), financial wealth, pensions, and private businesses comprise roughly 50 percent of assets of the bottom half of the wealth distribution, but more than 80 percent of the wealth of the top 1 percent. However, this is based on survey responses and survey completion among the top percentile of households is estimated to be only 12 percent, or 700 households (Kennickell, 2017). By contrast, we observe approximately 19,000 investors with wealth above three million, which is estimated by Smith et al. (2020) to be the wealth threshold of the top percentile. The portfolio allocations estimated by Smith et al. (2020) are shown in panel (b), for the bottom 90, and top 10-1, 1-0.1, 0.1-0.01, and 0.01 percent. Relative to these estimates, we observe lower allocations towards public equities, and smaller shares attributable to private business.

There are also differences in portfolio allocations within asset classes. Within fixed income, wealthy investors have lower shares of corporate bonds and higher shares of municipal and tax exempt bonds, as shown in Figure 6. Within equities, wealthier households on average invest more in single stocks, whereas less wealthy investors rely more on ETFs and mutual funds, as shown in Figure 7 (a). Within alternatives, shown in Figure 10, hedge funds are the primary subasset held by households with less than three million in wealth, while wealthier investors invest more in private equity, venture capital, and real estate funds.

Naturally one expects that these differences in portfolio allocation also leads to differences in portfolio returns. Testing this idea is the focus of the next section.

4 Overall portfolio returns

In the data, the average annualised portfolio performance from 2016q1 to 2020q1 is 4.68 percent. This and further summary statistics for portfolio returns are shown in Table 4. If all of your money had been in one month Treasury bills you would have earned 1.33 percent. If you had held all equities, your average annualised return would have been 9.52 percent.[7] The average annualised portfolio performance increases as wealth increases, from

[6] In our classification, commodities are captured as a sub-category within the alternatives asset class.

[7] This is the value weighted return of all CRSP firms included in the Fama-French market factor.

Figure 2: Portfolio allocations by asset type and wealth (%, 2019Q4)

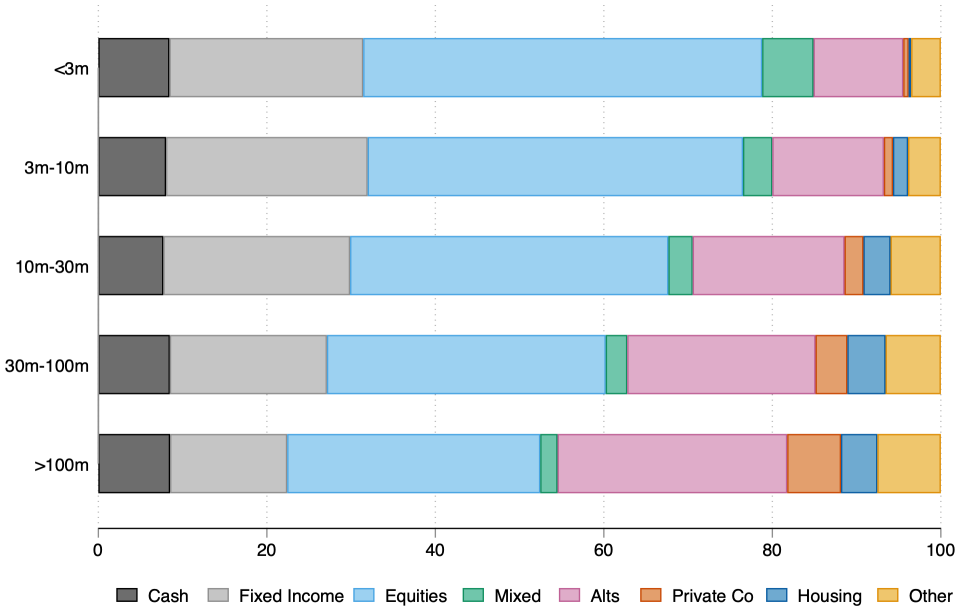


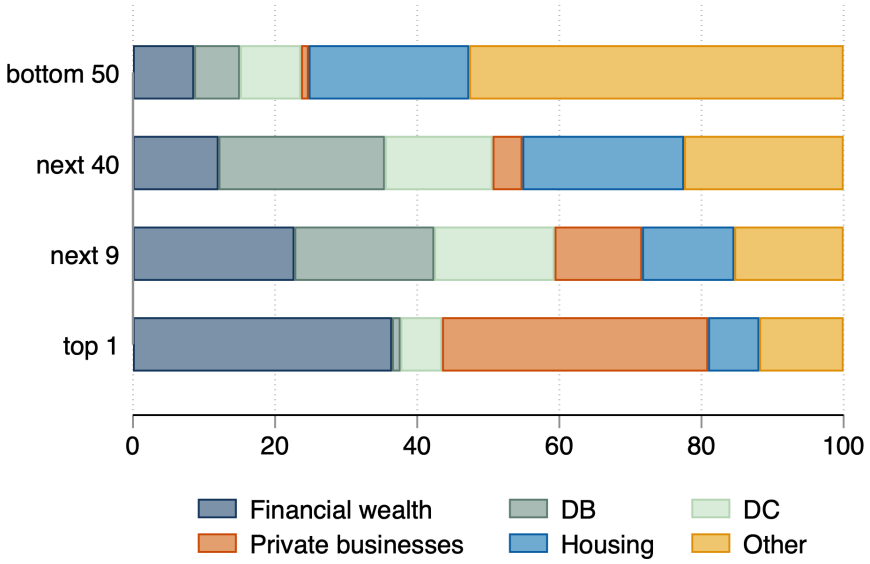
Table 3: Portfolio allocations by asset type and wealth (%, 2019Q4)

Wealth group	Cash & cash eq.	Fixed income	Public equities	Mixed alloc.	Alts	Private companies	Housing	Other
<3m	8.4	23.0	47.4	6.1	10.7	0.6	0.3	3.5
3m-10m	8.0	23.9	44.6	3.5	13.2	1.1	1.8	3.9
10m-30m	7.7	22.2	37.8	2.9	18.0	2.2	3.2	6.0
30m-100m	8.5	18.6	33.1	2.6	22.3	3.8	4.5	6.6
>100m	8.5	13.9	30.0	2.0	27.3	6.4	4.3	7.5

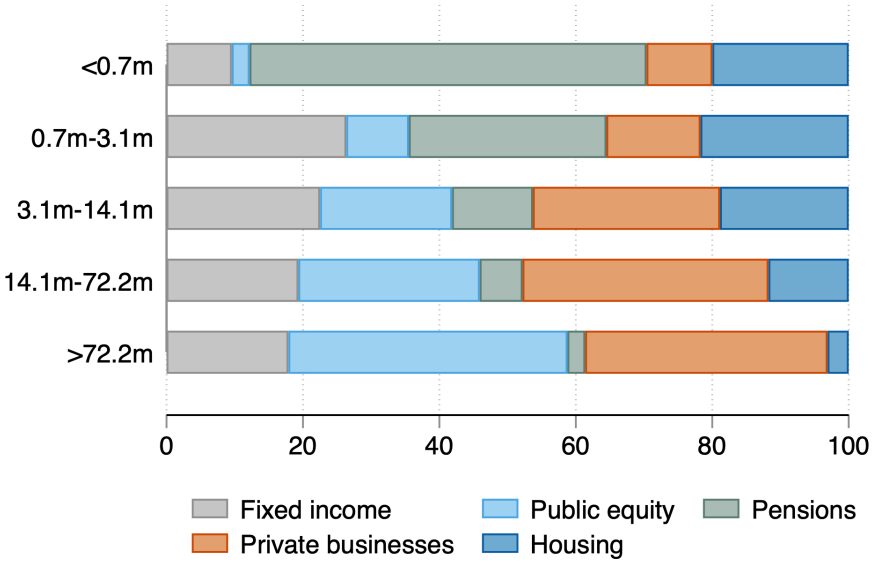
Notes: Portfolios with concentrated positions (> 1 bn) are excluded.

Figure 3: Asset allocations using survey data and capitalization

(a) 2019 Survey of Consumer Finances (SCF)



(b) Smith et al. (2020)



Notes: Panel (a) shows mean asset composition by wealth percentile in the 2019 Survey of Consumer Finances Business includes privately held businesses, houses is home equity in primary residence, financial includes non-retirement financial assets, DC are retirement assets held in accounts, DB are allocated defined benefit wealth, and other are all other assets. Source: Federal Reserve Board. Panel (b) shows the asset allocations estimated by Smith et al. (2020), excluding debt. The wealth groups correspond to the bottom 90, and top 10-1, 1-0.1, 0.1-0.01, and 0.01 percent.

Table 4: Realized portfolio returns (%)

	Return		S.D.		
Wealth group	Mean	Median	Mean	Median	N
<3m	4.38	3.79	13.9	12.1	26,191
3m-10m	5.61	4.84	15.4	11.2	3,546
10m-30m	5.86	4.61	17.5	10.0	1,789
30m-100m	6.06	4.87	15.4	9.5	1,068
>100m	6.37	4.51	19.8	10.3	587
Average	4.68	4.02	14.4	11.8	33,181

Notes: Returns calculated at a quarterly frequency, and annualized according to $r_{it}^a = (1 + r_{it})^4 - 1$ and winsorized at the top and bottom 0.5 percent of observations. The standard deviation of portfolio returns is calculated for the quarterly returns of each investor, annualized, and then winsorized at the top and bottom 0.5 percent of observations. Concentrated positions (> 1 bn) are excluded, as are portfolios with fewer than three subassets, and those observed for fewer than eight quarters.

4.38 percent among investors with less than three million in assets under management, to 6.37 percent among investors with more than 100 million in wealth. As Table 4 shows, this increase in return is mirrored in the standard deviation of investment returns, which increases from 13.9 percent at the bottom to 19.8 percent at the top of the wealth distribution of our sample. The standard deviation of portfolio returns is calculated for the quarterly returns of each investor. It is notable that while median portfolio returns also increase with wealth, the increase is less steep than for the average. Similarly, the median standard deviation does not increase with wealth in contrast to the average. This indicates that dispersion in returns and portfolio volatility also increase with wealth.

To test the relationship between returns and wealth, we run a regression:

$$r_{it} = \delta_g Wealth\, group_{i,t-1} + \gamma_t + \varepsilon_{it} \tag{1}$$

where r_{it} is the annualized realized return on portfolio i in quarter t, and where wealth is used to generate dummy variables for g wealth groups, where we divide the wealth distribution at 3, 10, 30, and 100 million. The coefficient of interest are the δ_g, which capture the extent to which portfolio returns increase with wealth, non-parametrically. The inclusion of time fixed effects captures the mean return in each quarter. We cluster standard errors at the portfolio level and at a date level for each wealth group, because there are correlations in the returns earned in each quarter.[8] To confirm that the improved coverage of portfolios in the

[8]Without interacting the date with the wealth group dummy, there would be 16 date clusters. It is not

more recent quarters of the data does not bias the results, in some specifications we weight the observations so that each quarter is equally represented.

The result of regression (1) in the full sample of data are shown in Table 5 columns (1). The constant indicates that investors with less than three million in assets under management earned an average of 3.46 percent on their portfolios. Relative to this reference group, investors with more wealth earned higher average returns, up to 2.19 percentage points higher for the wealthiest group in the sample. The standard errors are large and so while the differences are not statistically significant, bootstrapping with clusters at the date and portfolio error yields smaller standard errors. Nonetheless, we see that average realized returns are higher in particular for the highest group in the wealth distribution. In column (2), we run the same regression using weighted OLS, with the inverse of the percentage of observations which are observed at each date, to allay concerns that the results may be driven by the greater number of observations that we have in more recent quarters. This has only small effects on the point estimates.

This result can also be visualized by plotting mean portfolio returns against wealth. Figure 4 panel (a) plots a binscatter of the mean excess return against the logarithm of initial wealth, showing the positive relationship between wealth and returns.

In order to test whether risk-adjusted returns increase with wealth, we rely on a subsample of portfolios that contain at minimum eight quarters of data and three sub-asset classes on the platform. We re-run regression (1) on this subsample and show the results in columns (3) and (4) of Table 5. The results do not materially change.

For each portfolio in this subsample we then calculate the Sharpe ratio, by taking the ratio of realized returns minus the risk free rate and the standard deviation of excess returns for that portfolio over the sample. A binscatter of the risk-adjusted return measure against the logarithm of initial wealth is shown in Figure 4 panel (b). Although the line of best fit slopes upward, there is considerable dispersion in the data. We then run regression (1) using the Sharpe ratio as the dependent variable. In columns (5) and (6) of Table 5 we see that having controlled for risk, the point estimates of the Sharpe ratio for very wealthy investors is not higher, and the relationship between returns and wealth remains statistically insignificant.

We can also estimate the α and β of each portfolio by regressing the returns of each individual

recommended to run clustered standard errors if the clustering variables have too few different levels; a frequent rule of thumb is that each cluster variable must have at least 50 different categories. Interacting date with the wealth group dummy results in $16 * 5 = 80$ clusters. Practically speaking these are important because there are correlations in the returns earned in each quarter, which could potentially differ by wealth group. See `http://scorreia.com/software/reghdfe/help-reghdfe.html` for more info.

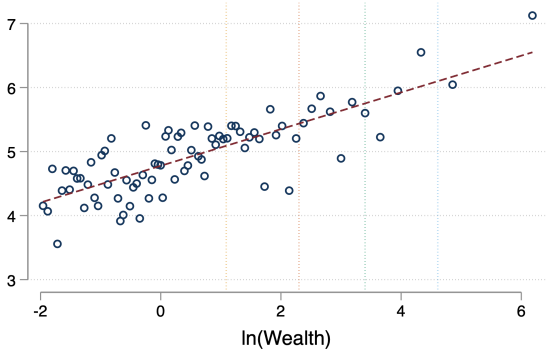
Table 5: Realized portfolio returns and wealth

Dependent variable	Full sample Realized return		Main sample Realized return		Main sample Sharpe ratio	
	(1)	(2)	(3)	(4)	(5)	(6)
3m-10m	0.37	0.43**	0.28	0.29	-0.01	0.003
	(0.24)	(0.21)	(0.38)	(0.28)	(0.02)	(0.02)
10m-30m	0.62	0.52	0.37	0.25	-0.04	-0.01
	(0.69)	(0.50)	(0.89)	(0.60)	(0.03)	(0.03)
30m-100m	1.14	0.91	0.93	0.70	-0.04	-0.01
	(1.17)	(0.81)	(1.33)	(0.87)	(0.06)	(0.05)
>100m	2.19	1.94	2.08	1.80	0.01	0.003
	(1.57)	(1.18)	(1.74)	(1.25)	(0.12)	(0.08)
Time fixed effect	Y	Y	Y	Y	Y	Y
Weighted OLS		Y		Y		Y
Constant	3.46	5.41	4.79	6.51	0.28	0.49
Observations	561,059	561,059	388,473	388,473	387,801	387,801
R-squared	0.51	0.43	0.53	0.42	0.55	0.44

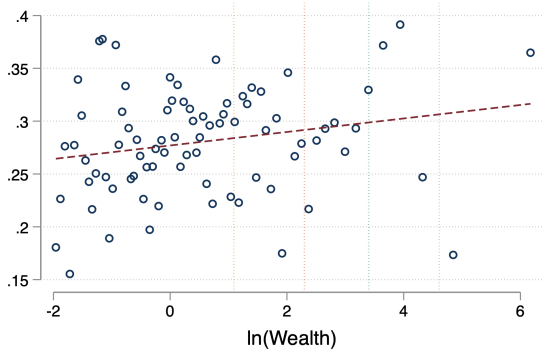
Notes: Portfolio performance is calculated using a weighted average of reported performance and portfolio allocations at the start of each quarter, and is winsorized at the top and bottom 0.5 percent of observations. Returns are observed at quarterly frequency, and annualized. Wealth is measured in millions. The main sample excludes portfolios with fewer than three subassets, and those observed for fewer than eight quarters. Standard errors are double clustered at the portfolio level and at the date level for each wealth group, significance follows * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 4: Portfolio returns

(a) Mean return



(b) Sharpe ratio



Notes: Binned scatterplots, excluding portfolios with fewer than three subassets, and those observed for fewer than eight quarters. Risk is calculated as the standard deviation of excess returns for each portfolio. Wealth is in millions and measured on the first date each investor is observed on the platform. Colored lines show the wealth cutoffs that correspond to 3, 10, 30, and 100 million.

portfolio on the CAPM factor. This regression is mechanically influenced by the lower equity market participation of the wealthiest investors in our sample, which tends to lead to betas which decrease and alphas that increase in wealth. The results are shown in the Appendix. It is more informative to estimate this type of model for equity returns alone, which we do in Section 5.

While these results are based on realized returns between 2016 and 2020, it is not known whether these return patterns held in previous years or will hold in the future. In particular, the high returns to U.S. equities during the sample period tend to benefit investors in the lower portions of the wealth distribution in the sample.

To calculate expected returns, we use the portfolio allocations documented in Section 3 and the long run returns in each asset class between 2001 and 2020.[9] We assume cash earns no excess return, that equities earned the S&P 500 Index return, fixed income earned the return on the Barclays US Aggregate Bond Index, and that mixed allocation funds earned the average of equities and fixed income. For housing we use the Case-Shiller index. Among alternative investments, we use three benchmarks from Preqin for the returns of hedge funds, private equity, and real estate funds, along with data on the alternatives allocations of each wealth group as reported in Section 5. For private companies we assume the return is equal to the return on private equity. On this basis, the expected return for each wealth group is as shown in Table 6.

The difference in expected excess returns for investors with less than three million in wealth and those with more than 100 million in wealth is 0.35 percentage points, which is smaller than the difference in realized returns observed in our sample. This indicates a role for return differentials across wealth groups within asset classes in explaining the differences in realized returns, which we explore in greater depth in the next section.

[9]For alternatives, the indices we use begin in 2001.

Table 6: Expected excess returns and wealth (%)

Wealth group	Expected excess return (%)
<3m	4.70
3m-10m	4.72
10m-30m	4.75
30m-100m	4.84
>100m	5.05
Average	4.81

Notes: Expected excess returns are calculated using portfolio allocations documented in Section 3 and returns in each asset class between 2001 and 2020. Cash is assumed to earn no excess returns. The expected excess return on equities is based on the S&P 500 Index excess return, fixed income is based on the Barclays US Aggregate Bond Index, and mixed allocation funds are based on the average of equities and fixed income. The Case-Shiller index is used for housing. Among alternative investments, we use three benchmarks from Preqin for the returns of hedge funds, private equity, and real estate funds, and the average allocations of each wealth group to alternative strategies as documented in Section 5 to calculate a weighted average. For private companies we assume the return is equal to the return on private equity.

5 Do wealthy investors have an edge?

In this section, we explore how returns differ within narrow asset classes. We observe both different portfolio allocations and higher returns among wealthy investors. It is of interest to know whether higher returns are driven by portfolio allocations, or whether wealthier investors earn higher returns within narrow asset classes. A quick look at mean returns by asset class rules out the idea that higher returns are driven by portfolio allocations alone.

Mean returns by asset class are plotted in Figure 5 panel (a), against the average standard deviation of realized excess returns in each asset class. There is a positive relationship between risk and return. On average, the highest performing asset class is equities. This implies that if an investor with average or median wealth were to increase their portfolio allocations towards the allocations of the wealthiest investors, who hold a smaller share of total wealth in public equities and more in alternative assets like private equity, their mean return would actually fall. There must therefore be different returns for wealthy investors within asset classes.

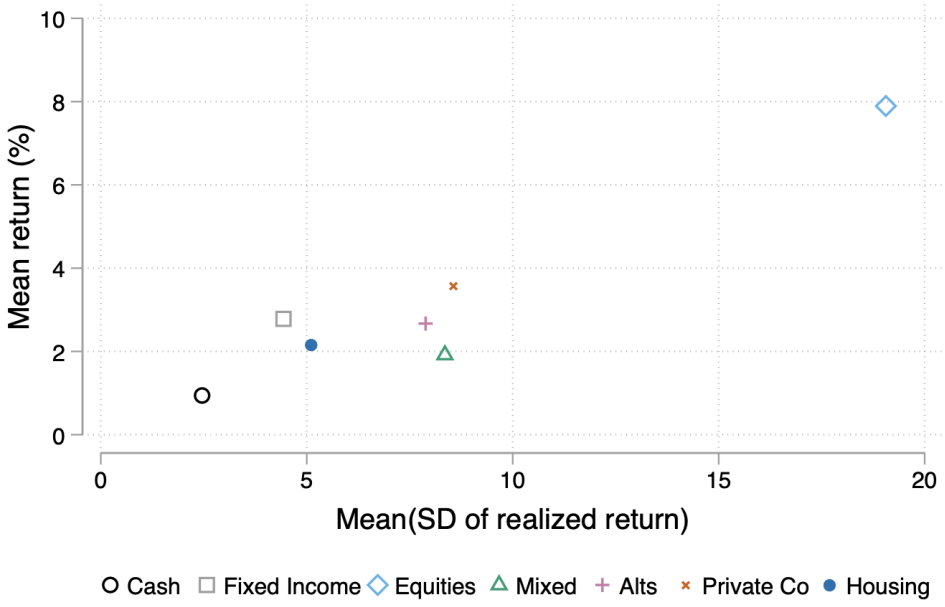
On average, wealthier investors earn higher returns in equities, alternatives, cash, private businesses, and housing. We plot mean returns against the mean standard deviation of excess returns for each wealth group in each asset class in Figure 5 panel (b), where the size of the marker corresponds to the returns and risk for groups of increasing wealth. For cash and cash equivalents, equities, alternatives, private businesses, and housing, average returns tends to increase with wealth. For fixed income returns are broadly similar across the wealth distribution, and for mixed allocation vehicles mean returns fall with wealth.

In the rest of this section, we test whether there is evidence of statistically significantly higher risk-adjusted returns among wealthy investors. As a first test, we run regression (1) on the returns of each portfolio within a broad asset class, where the return is calculated as the weighted average of realized returns at the sub-asset class level, with the share of assets invested in each sub-asset as the weight. These results are shown for fixed income, equities, alternatives, and private businesses in Table 7, for realized returns and risk-adjusted realized returns. The standard errors shown in parentheses are double clustered at both the portfolio and date level. In each column, the constant represents the mean return earned by investors with less than three million in wealth, over the sample period. We include time fixed effects to remove the average return in each time period, which is helpful to avoid biasing the average return by the greater participation on the platform later in the sample.

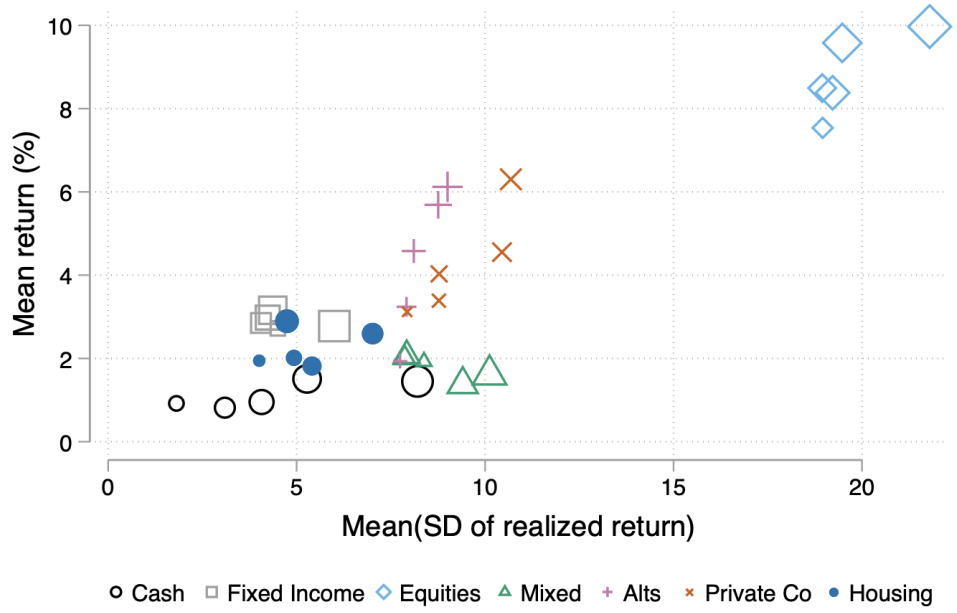
We divide the remaining analysis into two sections, where we first look at liquid assets, in which there is evidence that wealthier investors earn higher returns but not higher risk-

Figure 5: Mean returns and risk, by asset class and wealth

(a) Overall



(b) By wealth group



Notes: Excludes portfolios with fewer than three subassets, and those observed for fewer than eight quarters. Risk is calculated as the average standard deviation of excess returns for each portfolio. In panel (b), the asset class markers match the legend in panel (a), while the size of markers correspond to the wealth groups, where increasing size indicates higher wealth (smallest: <3m, small: 3-10m, medium: 10-30m, large: 30-100m, largest: >100m).

adjusted returns, and then turn to alternative asset classes, where wealthier investors earn higher risk-adjusted returns.

Table 7: Realized returns by asset class and wealth

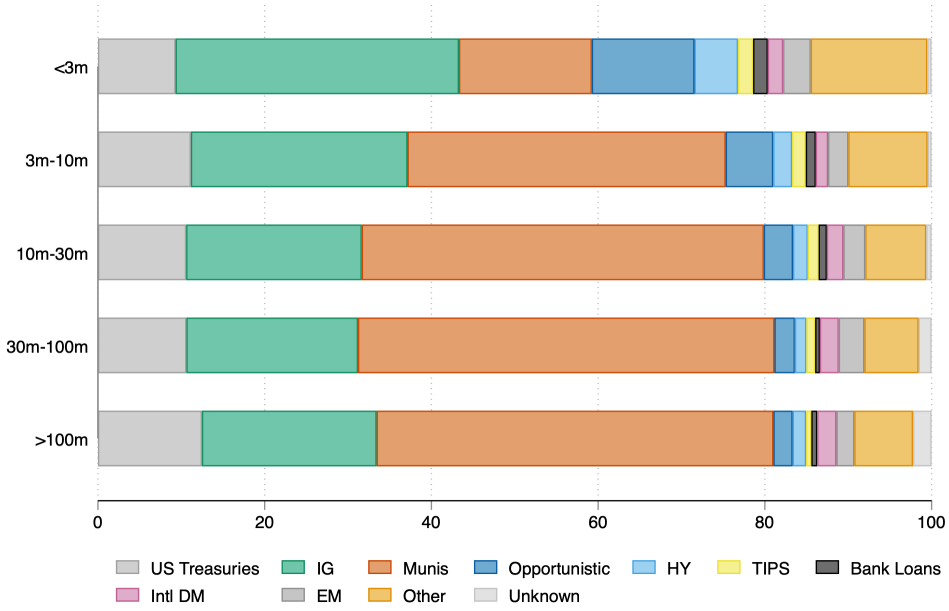
	Fixed income (1)	Equities (2)	Alternatives (3)	Private co. (4)
Panel A: Realized return				
3m-10m	0.08	1.04***	1.39***	0.28
	(0.22)	(0.33)	(0.29)	(0.42)
10m-30m	0.30	0.93**	2.70***	0.95
	(0.32)	(0.42)	(0.45)	(0.71)
30m-100m	0.58	1.71**	3.69***	1.25
	(0.33)	(0.71)	(0.58)	(1.34)
>100m	-0.01	2.11	4.94***	2.92*
	(0.43)	(1.33)	(0.87)	(1.62)
Time fixed effect	Y	Y	Y	Y
Constant	2.71	7.48	1.75	3.06
Observations	346,631	365,195	323,690	123,476
R-squared	0.15	0.68	0.14	0.06
Panel B: Risk-adjusted returns				
3m-10m	0.13	0.08***	0.29***	0.07
	(0.08)	(0.02)	(0.05)	(0.07)
10m-30m	0.09	0.04	0.46***	-0.02
	(0.10)	(0.03)	(0.07)	(0.10)
30m-100m	0.12	0.05	0.63***	-0.03
	(0.11)	(0.03)	(0.08)	(0.13)
>100m	0.04	-0.00	0.82***	0.29
	(0.10)	(0.07)	(0.10)	(0.17)
Time fixed effect	Y	Y	Y	Y
Constant	0.04	0.23	-0.44	-1.06
Observations	346,631	365,195	323,690	123,476
R-squared	0.22	0.56	0.11	0.04

Notes: Portfolio performance is calculated using a weighted average of reported performance and portfolio allocations at the start of each quarter, and is winsorized at the top and bottom 0.5 percent of observations. The quarterly returns are annualized. Wealth is measured in millions. The main sample excludes portfolios with fewer than three subassets, and those observed for fewer than eight quarters. Standard errors double clustered at the portfolio and date level, significance follows * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.1 Fixed income and equities

Portfolio allocation within fixed income varies with wealth. While households with lower wealth levels invest more in investment grade and high-yield corporate bonds, as well as opportunistic bond funds, higher-wealth portfolios hold more municipal bonds, likely reflecting their preferential tax treatment. These allocations are shown in Figure 6. Despite these differences in allocations, realized returns on fixed income are broadly similar across the wealth distribution.

Figure 6: Fixed income allocations by asset type and wealth (%, 2019Q4)



Notes: US Treasuries include US government debt and agency debt (e.g. Fannie/Freddie). IG includes Investment Grade Corporate bonds. HY includes High Yield Corporate bonds. TIPS are Treasury Inflation Protected Securities. Int'l DM includes corporate and government debt securities and pooled vehicles with primary exposure to Developed Markets (e.g. France). EM includes corporate and government debt securities and pooled vehicles with primary exposure to emerging markets (e.g. Argentina). Opportunistic indicates unconstrained and total return strategy bond funds. Other includes derivatives such as swaps, CDS, forwards, and options.

As shown in column (1) of Table 7, investors with less than three million in wealth earn an average return of 2.71 percent on their fixed income investments. It is useful to keep in mind that the average risk-free return over this period was 1.33 percent. While the average return for wealthier investors is higher than this, it is not statistically significantly different. It is therefore unsurprising that the risk-adjusted return is also insignificant.

Allocations within equities differ by wealth. The share of public equities that is held in the form of single stocks relative to ETFs or mutual funds is strongly increasing in wealth.[10] The breakdown of equity investments allocated to ETFs, mutual funds, and single stocks is shown Figure 7 (a).

The breakdown of equity investments by geographic region is shown in Figure 7 (b). That roughly 80 percent of equities are invested in US equity markets is clear evidence of portfolio home bias, which persists across the wealth distribution (French and Poterba, 1991). Global captures funds without regional specialization, which are likely to be heavily exposed to US equity markets. Wealthy investors have slightly more investments in non-US equities, including both developed and emerging markets.

For equities, investors with wealth below three million earned 7.48 percent on their equity investments on average. These returns are shown in Table 7 column (2). For investors with greater wealth, the average return on equities is higher. The average return on the market portfolio was 9.52 percent over this period. The average returns for investors with less than 100 million in assets is therefore lower than the market return. In parts, this underperformance can likely be attributed to fees and how they are reflected on the platform.[11] While returns on mutual funds are reported after fees are subtracted, if households pay their immediate investment advisor for the management of a single-stock portfolio, these fees would not be reflected in performance figures.[12]

Equity returns for investors with wealth of more than 100 million is 9.59 percent, on average. We also show this in a binscatter plot of mean returns against wealth, in Figure 8 panel (a). Once we adjust for risk, there is no longer an increasing relationship between returns and wealth, as evidenced by column (2) in Table 7 panel B, and in Figure 8 panel (b).

We test for systematic variation in the factor loadings in equity portfolios across the wealth distribution, using a three-factor model (Fama and French, 1993). For these tests we restrict the sample to 31,096 portfolios with at least three subassets and eight quarters of data on the platform. Binscatter plots of the factor loadings estimated from these regressions are shown in Figure 9 (a). While the time series is short, we find that exposure to the overall market (beta) falls with wealth. Higher-wealth households load more heavily on the SML

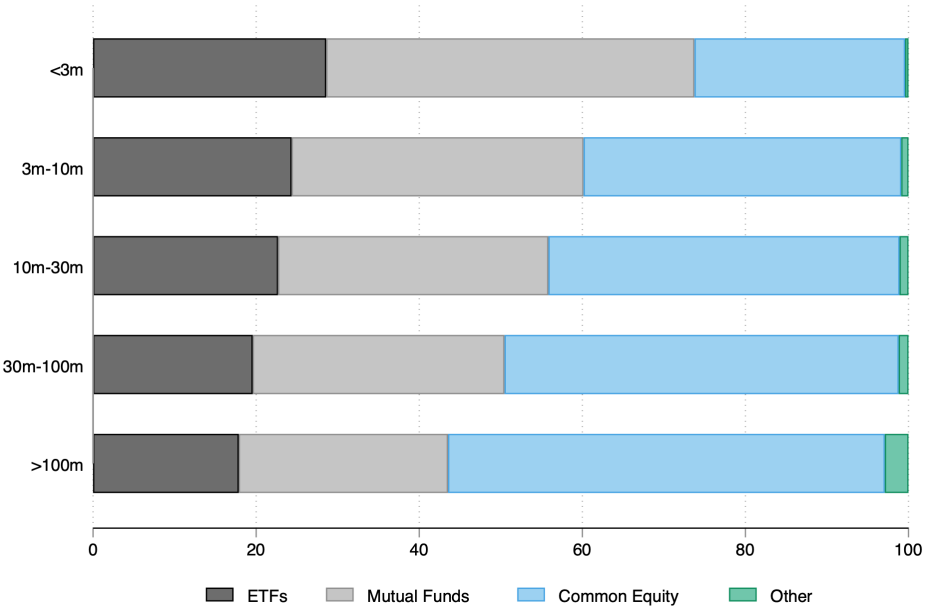
[10] This may also reflect the prevalence of separately-managed accounts (SMAs) among higher net-worth investors. SMAs are replications of existing mutual funds or investment funds within an investor's brokerage account. By owning the underlying securities directly, households preserve greater flexibility on the efficient management of tax liabilities.

[11] Hortacsu and Syverson (2004) report widely dispersed fees across equity funds, which average 100 basis points for S&P index funds, to over 225 basis points for global and international funds.

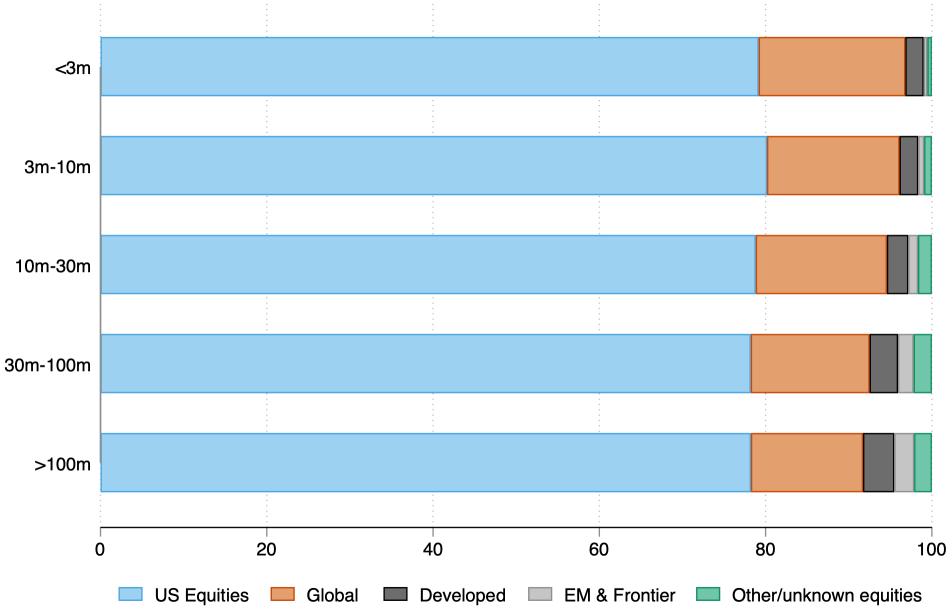
[12] General wealth advisor management fees are being paid out of cash holdings at pre-determined times of the year.

Figure 7: Equity allocations by category and wealth

(a) Type

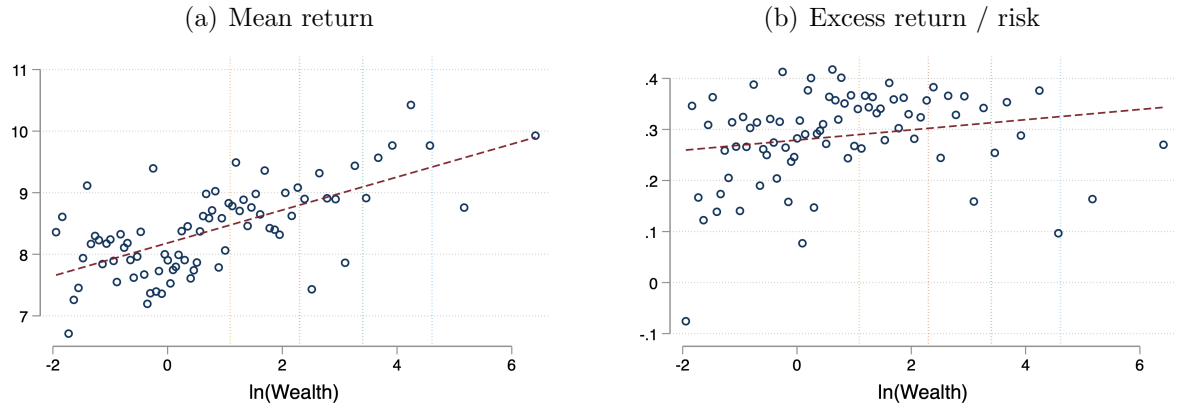


(b) Geography



Notes: Panel (a) shows equity investments by type in 2020 Q1. Panel (b) shows equity investments by geographic region, as invested or reported by the underlying mutual fund or ETF, in 2019 Q4. Global captures funds without regional specialization, which are likely to be heavily exposed to US equity markets.

Figure 8: Equities

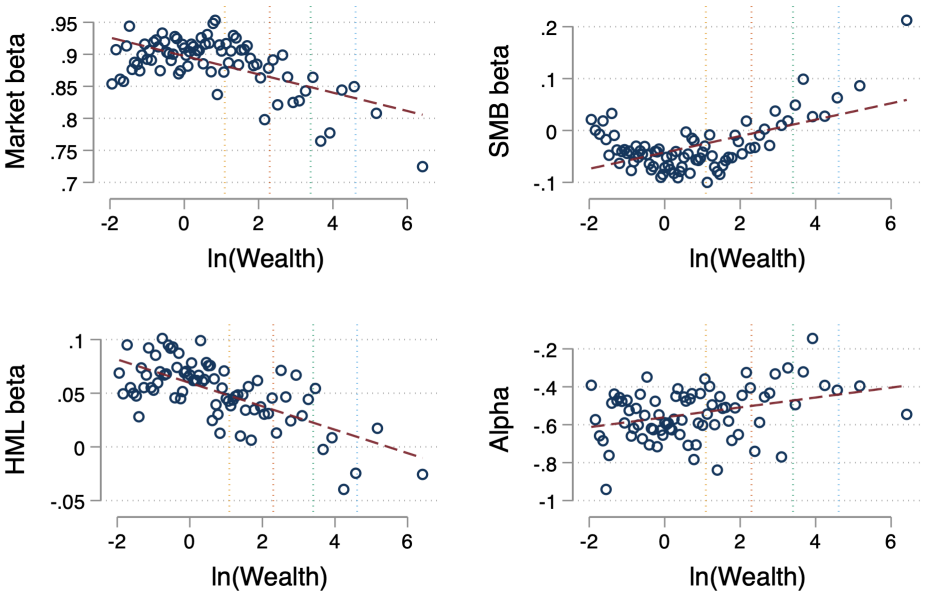


Notes: Binned scatterplots, excluding portfolios with fewer than three subassets, and those observed for fewer than eight quarters. Risk is calculated as the standard deviation of excess returns for each portfolio. Wealth is measured at the earliest date we observe an investor on the platform. Colored lines show the wealth cutoffs that correspond to 3, 10, 30, and 100 million.

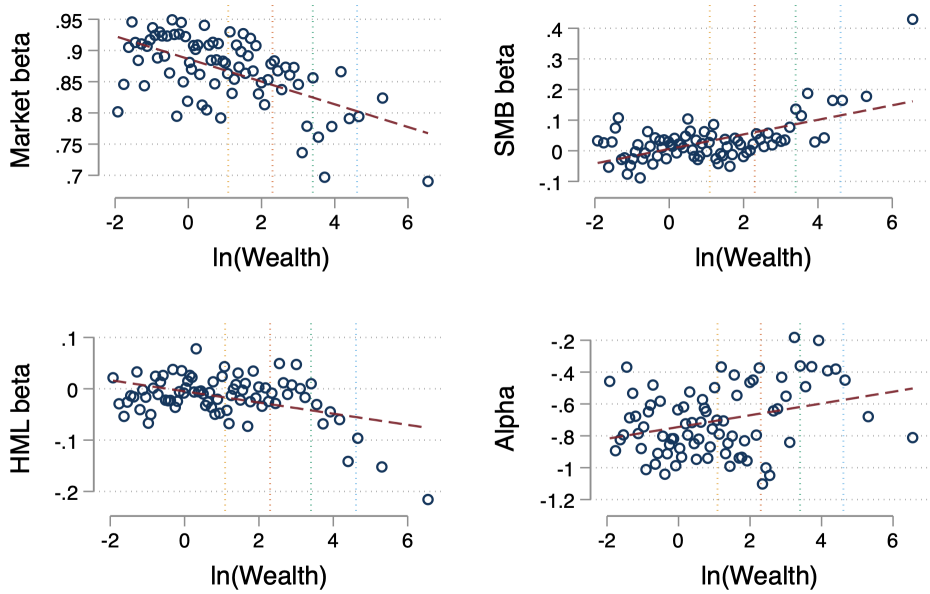
factor, reflecting an increased focus on small-cap companies. High net worth portfolios also load more negatively on the HML factor, meaning that they have more exposure to growth companies than lower wealth investors. These results are robust to sample selection, such as only considering portfolios 16 quarters of data, of which we have 7,121, as shown in Figure 9 (b)

Figure 9: Equity betas

(a) Main sample



(b) Balanced panel



Notes: Betas estimated using a three-factor model, excluding portfolios with fewer than three subassets. Alpha is quarterly. Wealth is measured at the earliest date we observe an investor on the platform. Panel (a) includes 31,096 portfolios observed for at least eight quarters, panel (b) consists of 7,121 investors observed for 16 quarters.

5.2 Alternatives

In this subsection we explore not only the patterns of allocation and returns at the sub-asset class level (e.g. hedge funds, private equity), but also analyze how the characteristics of individual investment positions differ, and to what extent they can explain return differentials. As alternatives are the main asset type in which risk-adjusted returns increase with wealth, understanding what investments may account for the difference is of interest.

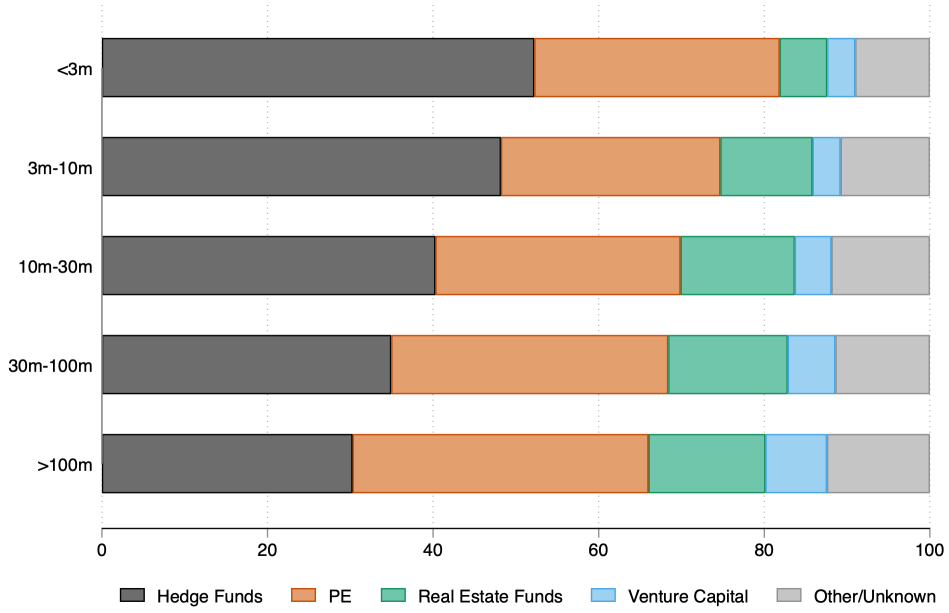
On alternatives overall, investors with less than three million in wealth earn an average return of 1.75 percent. This is not much higher than the average risk-free return in the period (1.33). However, wealthier investors earn systematically higher average returns in alternatives. For investors with between three and 10 million in assets, the average return rises by 1.39 percent. For those with between 10 and 30 million, the average return is 2.70 percentage points higher than the reference group (<3 million). For investors in the top two groups, the average alternatives return is 5.44 (= 1.75 + 3.69) and 6.69 percent (= 4.94 + 1.75), respectively. Risk-adjusted returns also increase with investors' wealth. These returns are shown in Table 7 column (3).

By comparison, private companies have higher average returns, of 3.06 percent for investors with less than three million in wealth. The mean point estimate increases with wealth but is only statistically significantly different for the ultra high wealth group, whose private businesses return 2.92 percent more on average. When adjusting for risk the return on private companies is no longer statistically significantly different.

As alternatives remain the primary asset for which risk-adjusted returns increase with wealth, we explore further details as to what drives this result. Using data on the portfolio holdings at the level of individual investment positions, we can measure large differences in the average number and size of positions held across the top of the wealth distribution. As shown in Table 9, investors with less than three million in assets hold two alternatives investments, on average, with a mean size of 0.3 million. In contrast, investors with more than 100 million in assets hold more than 30 alternatives positions with an average size of 17.7 million.

One potential concern with the return differentials found on alternatives overall is that the performance of illiquid private assets may be marked infrequently. In column (3) of Table 9, we show that the frequency of updating is decreasing in wealth. This may be due to wealthier investors holding more opaque alternative assets whose performance is not managed by a custodian, but in any case should make it less likely to find higher returns among the wealthiest investors. In other words, the bias here goes in the opposite direction of the result in column (3) of Table 7.

Figure 10: Alternatives allocations by type and wealth (%)



Notes: Date shown is 2019 Q4.

Table 8: Alternatives returns (%)

	Realized return			Sharpe ratio		
	Hedge Funds (1)	PE & VC (2)	Real Estate (3)	Hedge Funds (4)	PE & VC (5)	Real Estate (6)
3m-10m	1.02**	1.65***	-0.17	0.05*	-0.002	-0.15**
	(0.39)	(0.33)	(0.58)	(0.02)	(0.02)	(0.06)
10m-30m	2.34***	3.39***	-0.50	0.12**	0.05	-0.21**
	(0.67)	(0.66)	(0.61)	(0.04)	(0.03)	(0.08)
30m-100m	3.16***	4.38***	0.01	0.10	0.11**	-0.40***
	(1.06)	(0.77)	(1.08)	(0.06)	(0.04)	(0.10)
>100m	3.86**	6.35***	-0.01	0.11	0.18***	-0.53***
	(1.49)	(1.12)	(0.98)	(0.07)	(0.05)	(0.10)
Time fixed effect	Y	Y	Y	Y	Y	Y
Constant	1.02	3.83	6.43	0.18	0.42	0.80
Observations	269,327	188,741	49,575	269,327	188,741	49,575
R-squared	0.167	0.072	0.006	0.201	0.070	0.028

Notes: Performance is calculated using a weighted average of reported performance and sub-asset allocations at the start of each quarter, minus the risk free rate, and is winsorized at the top and bottom 0.5 percent of observations. The quarterly returns are annualized. Wealth is measured in millions. The main sample excludes portfolios with fewer than three subassets, and those observed for fewer than eight quarters. Standard errors double clustered at the portfolio and date level, significance follows * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Roughly half of all individual investment positions in our sample can be matched to a unique security captured by Preqin, a commercial data provider for alternative investments, though matched positions account for 60 percent of total funds invested in the asset class. Preqin provides detailed information on assets captured in their database, including security characteristics and returns. We next explore in more detail to what extent these characteristics may explain return heterogeneity.

Figure 10 shows the allocations within alternatives and how they change with wealth. Wealthier investors have larger investments in private equity, real estate, and venture capital funds, whereas investors with less overall wealth have higher exposure to hedge funds.[13] This pattern likely reflects two distinct features. First, hedge funds tend to have a better liquidity profile than private equity funds. Since hedge fund investments are usually traded securities, even funds with strong lock-up agreements allow for withdrawal within a few quarters. Private equity, real estate, and venture capital funds generally require investors to commit capital for anywhere between 5 and 10 years or longer, reflecting the illiquidity of the underlying assets. Second, hedge funds have progressed further along on the path to become an investment option for personal investing. Following strong performance, hedge funds gained popularity in the early 2000s, resulting in substantial growth in the number of managers and assets under management. Wealth managers are also offering a broader menu of hedge fund investments to their clients. In contrast, private equity has gained popularity primarily due to strong returns over the last decade, and access to its options has been less democratized, reflected in higher minimum investment amounts, for example.

If we compare the returns within sub-assets by wealth group, by running regression (1) at the sub-asset class level, several patterns emerge. These results are reported in Table 8.

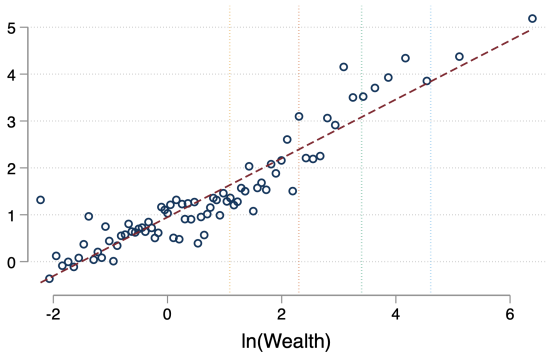
In Table 8 column (1), we shown the results for returns on hedge funds by wealth group. The average return for the lowest wealth group is 1.02 percent over our sample. Average returns increase with wealth by between one and four percentage points per year for higher wealth groups. The results for regressions of the Sharpe ratio on wealth are shown in column (4). Risk-adjusted returns are higher for investors with wealth above 10 million, but the risk adjusted return is not statistically significantly higher for the wealthiest investors. Binscatter plots of these mean returns and Sharpe ratios are also shown in Figure 11 (a).

Sharpe ratios overall are much higher in private equity. Private equity and venture capital investments' average return for the lowest wealth group was 3.83 percent over the sample period. Wealthier investors earn significantly higher average returns, as shown in Table 8

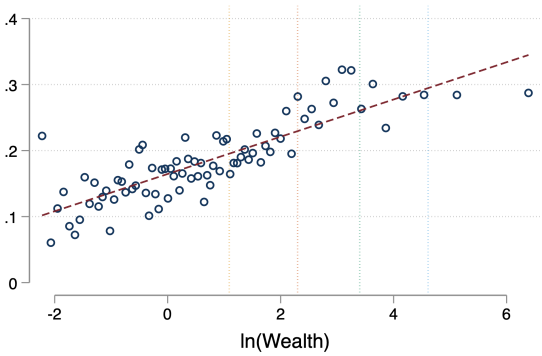
[13]For matched positions, we rely on the Preqin strategy to classify assets. Where this is unavailable, we use the category assigned by Addepar and the wealth manager.

Figure 11: Alternatives returns by sub-asset class

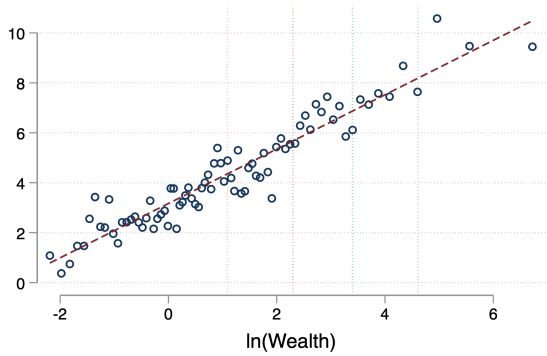
(a) Hedge funds return



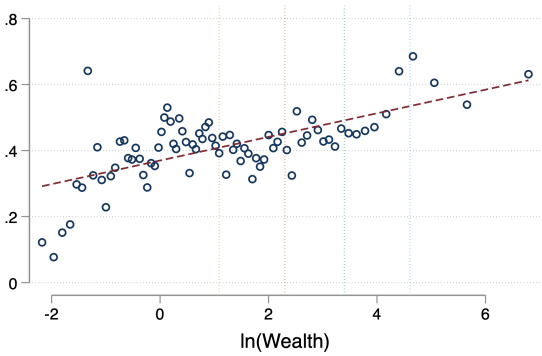
(b) Hedge funds excess return / risk



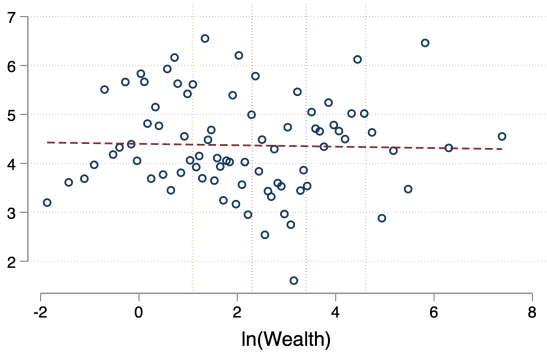
(c) PE and VC returns



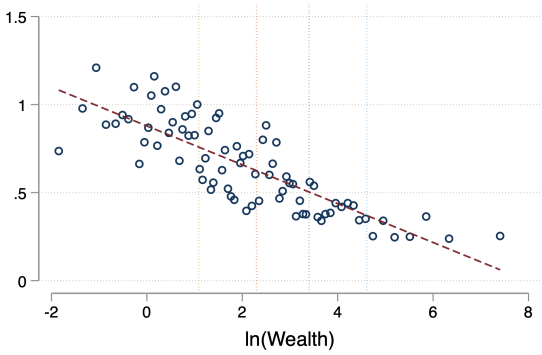
(d) PE and VC excess return / risk



(e) RE funds return



(f) RE Funds excess return / risk



Notes: Binned scatterplots, excluding portfolios with fewer than three subassets, and those observed for fewer than eight quarters. Risk is calculated as the standard deviation of excess returns for each portfolio. Wealth is measured at the earliest date we observe an investor on the platform. Colored lines show the wealth cutoffs that correspond to 3, 10, 30, and 100 million.

column (2), and also higher risk-adjusted returns in column (5). Binscatter plots of these mean returns and Sharpe ratios are also shown in Figure 11 (b).

Because of the inherent illiquidity of their investments, reported returns on private equity and venture capital have to be considered with some degree of caution. Assets that private equity funds invest in may generate immediate cash flow that can be paid out to investors, but a large part of total returns accrue towards the end of a fund's life cycle when the underlying asset is sold. This is particularly true for venture funds that invest in early-stage companies without cash flows. The reported rate of return on these funds consists both of the realized cash flow, observable separately in our data, and implied capital appreciation. Fund managers update the marking of the value of the underlying assets, based on market multiples of comparable public companies and private market transactions. While these markings are usually done at a quarterly frequency, fund managers have some discretion over the underlying assumptions, which creates the possibility that reported returns are too smooth relative to the true realized returns (Gupta and Nieuwerburgh, 2019).[14]

Real estate funds provide a high return for investors in the lowest wealth group; while this return increases with wealth, it is not statistically significantly higher. Real estate funds also provide a high average Sharpe ratio for investors in the lowest wealth group, but appear to provide a much lower Sharpe ratio for the wealthiest investors (e.g. 0.80 - 0.53 = 0.29).

With the exception of real estate funds, which make up a small fraction of the overall allocation to the asset class, wealthier investors earn higher risk-adjusted returns in intermediated alternative assets, which stands in contrast to the lack of scale dependence in liquid asset classes such as equities and fixed income. This suggests that scale dependence in alternatives returns does not reflect investment skill. Instead, it may reflect differing levels of access or ability to identify high-performing investment managers. Higher-wealth investors may receive preferential access to better-performing managers because they can offer larger amounts of funds at once, which reduces marketing and related overhead costs to the fund manager. This will be of particular relevance for smaller but high-performing investment managers. In contrast, lower-wealth investors may only receive access to hedge fund and private equity solutions that are distributed through advanced marketing networks and are originated by large platform operators. However, funds that provide more accessibility may deliver worse performance (Eisfeldt et al., 2020).

[14]Investors make a capital commitment to private equity and venture capital funds but the general partner (fund manager) can choose the point in time at which to call the funds. This means that investors hold on to the un-called but committed funds until the capital is deployed. Since these funds are held in other assets, often but not exclusively cash, we only consider deployed capital for the calculation of realized returns.

Investor return heterogeneity at the portfolio level also survives at the level of individual investments, and is more pronounced among identified securities. This suggests that return heterogeneity is not due to systematic differences in the marking of individual securities. Return heterogeneity is much smaller and statistically insignificantly different across wealth groups in positions that cannot be matched to Preqin, which provides a standardized source for alternatives pricing data.

Using the sub sample of identified positions, we can further test if specific asset characteristics are related to returns and return heterogeneity. First, we find that differences in returns by investor wealth cannot be explained by the vintage of the underlying asset, implemented by adding dummy variables for each vintage in each quarter. It is therefore not the case that wealthier investors earn higher returns in alternative assets simply because they own illiquid assets that may be closer to redemption, for example. We also find evidence that levels of intermediation and the extent of investor participation are both negatively correlated with returns. Investment vehicles that are classified as fund-of-funds deliver returns that are almost exactly two percentage points lower on an annualized basis, evidence for fees imposed by the additional layer of management. Additionally, we construct a measure of investor access by taking the inverse of the total number of investors on the Addepar platform that own a specific alternative security. The regression results indicate that assets with limited investor participation are significantly related to higher investment returns. Still, neither investor concentration nor intermediation fully explain return heterogeneity as the estimated coefficients on investor wealth remain large and significant. Lastly, we also do not find evidence for systematic differences in fees charged on the same assets for investors with higher total wealth. Wealthier investors do not report statistically significantly higher returns on the same individual asset than other investors.

Further suggestive evidence that access to high-performing managers rather than household sophistication drives return differences within alternative assets can be seen by studying the special case of single family offices (SFOs). SFOs are investment offices set up solely to manage the funds of a single individual or family. Because of the expense of employing skilled investment professionals as well as related overhead expenses, SFOs are generally only an option for ultra-high net worth individuals. However, in addition to a primary portfolio, SFOs also occasionally manage separate portfolios for relatives or others associated with the owner of the SFO, which may have substantially fewer assets. This allows us to compare the performance of portfolios that are managed by an SFO with that of portfolios of the same wealth level, but managed by a non-SFO investment advisor.

Across wealth buckets, portfolios managed by an SFO generally do better at the aggregate

Table 9: Summary statistics for alternatives positions

Wealth group	Average positions	Size (m)	Frequency of updating (%)	Matched positions (% by value)
<3m	1.8	0.3	94.9	66.7
3m-10m	4.3	0.6	87.1	58.7
10m-30m	8.7	1.5	78.7	50.9
30m-100m	17.4	3.3	69.2	44.7
>100m	35.2	17.7	64.1	41.5

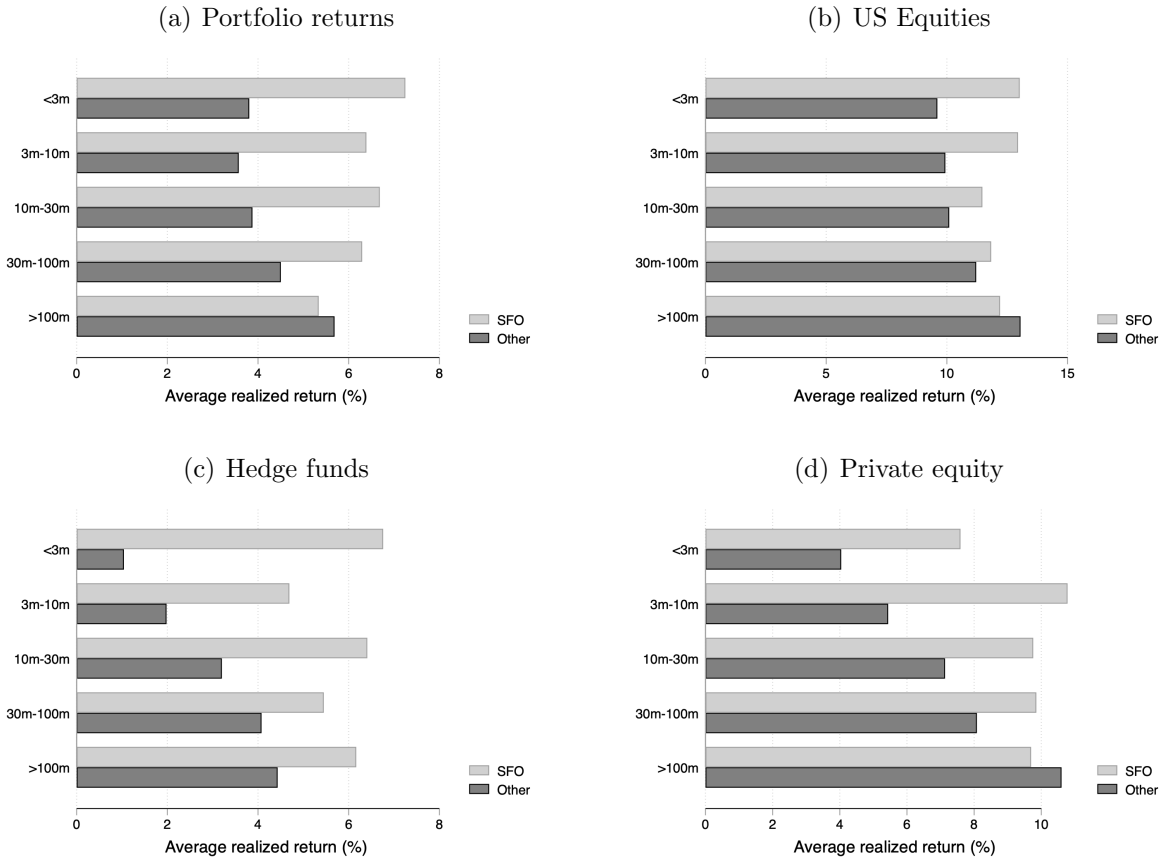
Notes: Mean number, size, and updating frequency of positions in the alternatives space, by wealth group.

Table 10: Alternatives returns at the position level, weighted by allocation (%)

	All	Unmatched	Matched positions				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
3m-10m	1.15	0.37	2.25***	1.79***	1.85***	1.67***	-0.01
	(0.67)	(1.00)	(0.57)	(0.50)	(0.48)	(0.47)	(0.22)
10m-30m	2.81**	1.48	4.54***	3.79***	3.83***	3.47***	-0.37
	(1.23)	(1.57)	(0.97)	(0.89)	(0.88)	(0.83)	(0.44)
30m-100m	5.24***	3.09	8.09***	6.67***	6.62***	5.91***	-0.86*
	(1.36)	(1.86)	(1.09)	(1.00)	(1.01)	(0.93)	(0.48)
>100m	7.18***	3.08	12.03***	9.70***	9.66***	8.69***	-0.33
	(1.85)	(1.95)	(2.67)	(1.93)	(1.93)	(1.85)	(0.60)
Fund of funds					-1.97*	-1.98*	
					(1.05)	(1.05)	
Investors^{-1}						7.02***	
						(2.15)	
Time fixed effect	Y	Y	Y				
Vintage-time f.e.				Y	Y	Y	
Position-time f.e.							Y
Constant	5.91	6.34	5.24	5.10	5.34	5.11	6.53
Observations	1,692,380	798,204	894,176	727,263	727,263	727,263	713,808
R-squared	0.022	0.023	0.024	0.054	0.054	0.054	0.707

Notes: Reported quarterly performance, winsorized at the top and bottom 0.5 percent of observations, and annualized. Excludes portfolios with fewer than three subassets, and those observed for fewer than eight quarters. Standard errors double clustered at the portfolio and date level, significance follows * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 12: Alternatives returns by manager type



Notes: Mean realized returns for single family offices (SFO) compared to non-SFO managers. There are 889 portfolios with less than 3 million in assets managed by SFOs, 264 with between 3 and 10 million, 284 between 10 and 30 million, 281 between 30 and 100 million, and 312 above 100 million. The non-SFO portfolios number 59,287, 11,453, 5,105, 2,405, and 998 in each wealth bucket, respectively.

and at the asset-class level, as shown in Figure 12. There are 889 portfolios with less than 3 million in assets managed by SFOs, 264 with between 3 and 10 million, 284 between 10 and 30 million, 281 between 30 and 100 million, and 312 above 100 million. The non-SFO portfolios number 59,287, 11,453, 5,105, 2,405, and 998 in each wealth bucket, respectively.

While lower-wealth investors earn substantially lower returns on their hedge fund and private equity investments than ultra-high net worth investors, this does not apply to investors with smaller portfolios that are managed by an SFO. Even SFO investors with less than three million, or 3-10 million earn roughly the same return as those with more than 100 million on their investments in hedge funds and private equity, and substantially more than investors in the same wealth brackets but without SFO management. Access to highly-skilled managers

therefore appears to be a major driver of the scale dependence in returns on alternative assets, likely related to the difficulty of identifying and accessing high-performing alternative investment funds.

6 Conclusion

This paper documents three new facts regarding the investing behavior of ultra high net worth U.S. investors. These findings, based on novel data on individual investment portfolios across a wide range of assets, add important empirical details to a growing literature on the distribution of wealth, and how returns differ across the wealth distribution.

Although portfolio allocations change substantially with total household wealth, realized Sharpe ratios are stable across the wealth distribution. Ultra-high net worth individual invest substantially more in alternative assets, in particular private equity and venture capital, and less in public equity markets. This tells us that wealthier households record higher realized returns on their overall portfolio but do so at the expense of higher volatility.

However, within individual asset classes, wealthier households generate substantially higher risk-adjusted returns in alternative assets that are externally managed, such as hedge funds, private equity, and venture capital. The strong evidence for scale dependence in private equity and venture capital investments holds relevance for public policy. Against the backdrop of high realized returns in recent years, investors and investment managers have proposed lowering the hurdles for investing in the alternative space for less wealthy investors. Our results suggest that in contrast to public equity markets, manager selection and access to high-performing managers makes a large difference for realized returns. This suggests that small-scale investors will be unlikely to generate the same returns that high-net worth investors have been able to earn in this asset class in recent years.

There are several areas in which this analysis can be applied and extended. The higher returns earned by wealthy investors are critical in estimating the dynamics of income and wealth, and their effect on macroeconomic outcomes. In this paper we have abstracted from flows. Since the investors we observe constitute a significant share of several important asset markets, it is likely that their allocations impact equilibrium asset returns (Koijen and Yogo, 2019). A related research area is to study investors' trading behavior and common mistakes in their trading decisions (Odean, 1999; Calvet et al., 2009), or how performance changes during specific market episodes (An et al., 2019). We leave these questions for future work.

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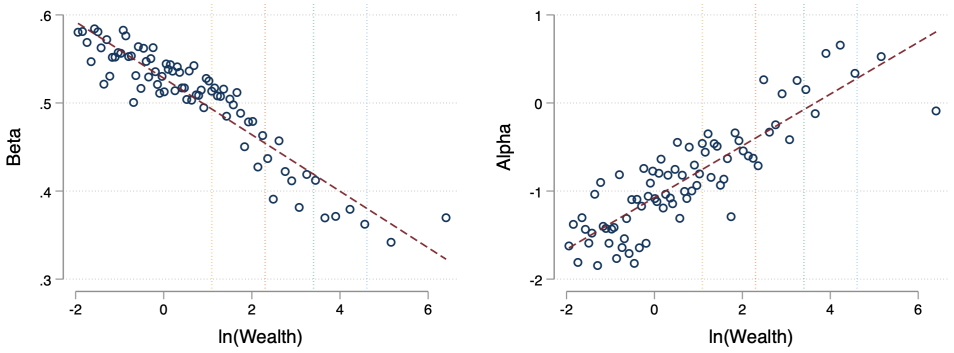
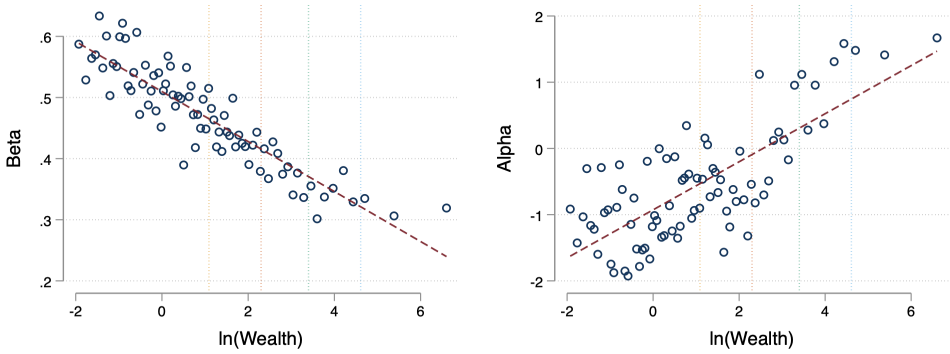
Appendix

Figure A1: Portfolio beta and alpha

(a) Main sample



(b) Balanced panel



Notes: Binned scatterplots, excluding portfolios with fewer than three subassets, and those observed for fewer than eight quarters. Betas and alphas estimated from CAPM regressions of excess portfolio returns on the market excess return. Wealth is measured at the earliest date we observe an investor on the platform. Colored lines show the wealth cutoffs that correspond to 3, 10, 30, and 100 million.