APOLLO

Assessing the Impact of Passive Investing over Time: Higher Volatility, Reduced Liquidity, and Increased Concentration

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November 2024

ABSTRACT

The rise of passive investing has had a significant impact on financial markets in the last three decades, especially on its contribution to higher asset-price volatility, reduced liquidity, and possible contribution to heightened market concentration. By analyzing the substantial shift of assets from active to passive strategies—particularly through the growth of Exchange Traded Funds (ETFs) and retirement-savings plans, such as 401(k)—this paper illustrates how passive investors, who primarily track major indices, have contributed to reduced price elasticity and market responsiveness, which, in turn, have led to amplified price movements, decreased liquidity, potential macroeconomic inefficiencies, and a disproportionate concentration of market influence in a few dominant stocks, such as the so-called "Magnificent Seven."[2]

Introduction[3]

Passive investing has grown significantly over the past three decades, accounting for 50% of total equity investing in mutual funds and ETFs globally today.[4]

This paper first discusses the definition of passive versus active investing, with the most common definition being index-tracking strategies.

We then look at the history and the sources of growth in passive investing and illustrate that a significant source of growth has been 401(k) plans and the introduction of low-cost ETFs.

Next, we look at the difference in performance of active versus passive investing, and we gather that 90% of active asset managers in public markets underperform their benchmark over a ten-year period.[5]

Finally, we discuss the effects the rise in passive investing is having on markets and the economy, concluding that higher passive ownership can increase volatility, lower market liquidity, and increase market concentration in large cap names such as the so-called "Magnificent Seven." In addition, we examine the potential macroeconomic inefficiencies driven by passive investment flows. We argue that these flows, particularly from target date funds, may distort price signals in both

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Thanks to Michael Mohr, Roopal-A Pareek, Volodymyr Liakh, J.P. Vicente, and Daniel Craparo for comments.

[2] The Magnificent Seven refers to a group of seven mega-cap stocks: Apple (AAPL), Microsoft (MSFT), Alphabet (GOOGL), Amazon (AMZN), Meta Platforms (META), Nvidia (NVDA), and Tesla (TSLA).

[3] Unless otherwise noted, all data is as of July 2024.

[4] Source: Bloomberg, Apollo Chief Economist (see Exhibit 1)

[5] Source: Morningstar, Apollo Chief Economist (see Exhibit 12)

bond and equity markets. We explore the implications of this shift on macro efficiency, market liquidity, and volatility, highlighting a complex relationship between passive flows and market price dynamics.

What Is Passive Investing?

There are two primary definitions of passive investing:

1. Passive investors are those who choose a portfolio, buy it, and hold it long-term with no regard for profiting from frequent trading or short-term fluctuations.[6]

2. Sharpe (1991) defines a passive investor as an investor who always holds every security from the market, with each represented in the same manner as in the market. Such passive investors can achieve this strategy by investing in index funds or passive ETFs. This is the more commonly used definition, and this definition makes passive identical to index investing.

It is possible to argue that nobody is a passive investor because all buying and selling of securities or ETFs involves an active decision, that is, when to buy or when to sell. From this perspective, even monthly inflows into a target date fund are considered active investing because money is actively added to the fund every month.

For practical purposes, the remainder of this paper will generally define passive investing as index investing, which is the conventional definition used.

Measuring Passive Investing

The simplest way to measure passive investing is to look at the total amount of money in index funds and passive ETFs relative to the overall market. But there are some important additional nuances to consider. For example, active managers are often "closet indexers," or managers charging active fees for full or partial passive management (Cremers and Petajisto, 2009). Active fund portfolios are often 70%-90% passive, and the funds are marketed as providing similar returns to the index with a limited amount of active trading to generate alpha.[7]

Haddad, Huebner, and Loualiche (2021) use the buy-and-hold definition of passive investing in their method for measuring the passive share. They directly measure the price elasticity of demand for each investor in the market for a stock using 13F filings. Any institutional investor managing more than $100 million in assets must report the securities they own in publicly available 13F filings made every quarter. These filings account for 80% of total US stock market capitalization. Using filings from Q1 2001 to Q4 2020, Haddad, Huebner, and Loualiche mark an institution as passive and give it a value of 1 if its elasticity of demand is sufficiently close to zero, such that $|\varepsilon_i| < 0.06$. Active institutions are given a value of 0. The passive share in the market for a certain stock is the weighted average of the binary passive indicator for market participants. This returned an estimate that 41% of the US stock market was passively owned in 2020. This technique can detect non-mutual fund institutions with passive strategies, as well as active funds doing closet indexing.

Using a different method, Chinco and Sammon (2024) estimate that passive investors tracking five of the most popular indexes collectively owned 33.5% of the US stock market in 2021. This is more than double the 16% share of the US stock market that was under the management of index funds in 2021. They instead measure the passive share of the market by looking at trading volumes for stocks at index reconstitution.

In the US, almost all reconstitution trading occurs at market close on the day of reconstitution, so by looking at trading volume when a stock gets added to an index like the Russell 1000, the total amount of money tracking the Russell 1000 can be calculated.

[6] This can be modelled as an investor with a price elasticity of demand (ε_d) of or near 0, see Haddad, Huebner and Loualiche, 2021.

[7] Source: DWS Asset Management

Using this method for every stock dropped or added to the Russell 1000, Russell 2000, S&P 500, S&P MidCap 400, and Nasdaq 100, Sammon and Chinco estimate the total share of the US stock market tracking these indices to be 33.5% in 2021. The real figure for total passive ownership is higher, as there is money tracking other indices (e.g., Vanguard's total stock market ETF with an AUM of $431 billion).[8] This measure is still very useful, however, as it can track exogenous changes in passive ownership on reconstitution days for these indices.

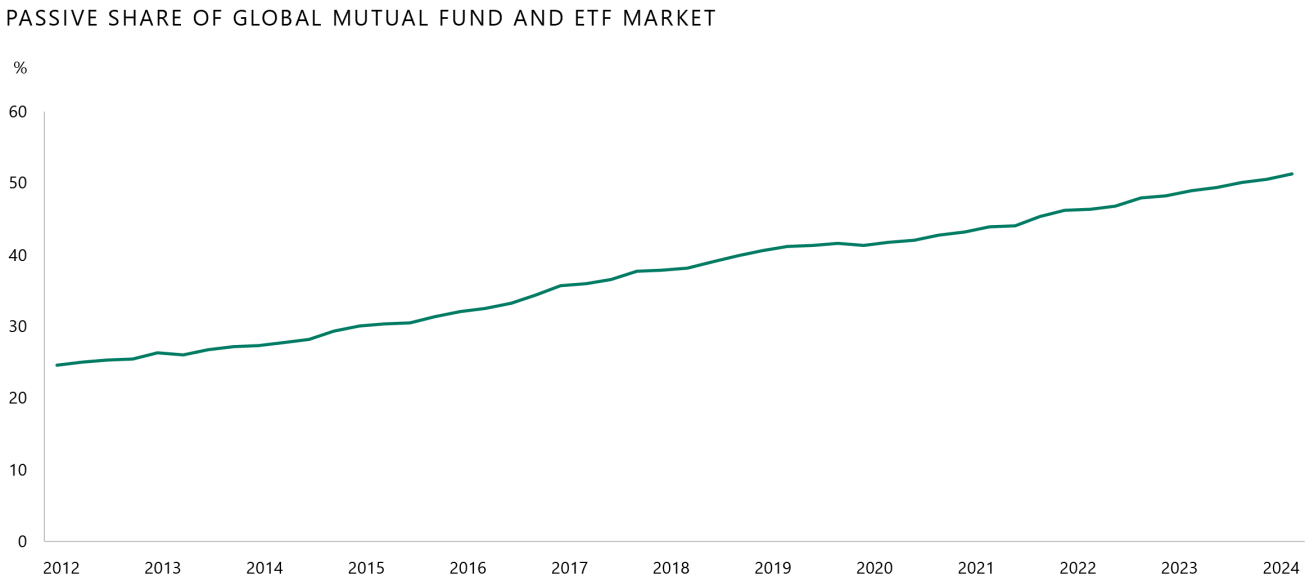
While still flawed, these two measures of passive share are intuitive and capture more passive investing than simply measuring the amount of money in index funds.

Quantifying the Rise in Passive Investing

Using the indexation definition of passive shows that passive ownership of global equity mutual funds and ETFs is 50% (Exhibit 1). While the rate of flows into passive equity has grown at a measured pace since 2012 (Exhibit 2), passive equity commands a sizeable share of AUM relative to active strategies (Exhibit 3). For US equities, the passive share is approximately 60% (Exhibit 4), with non-domestic equities not far behind at close to 50% (Exhibit 5).

In fixed income, the rate of flows into passive is growing much faster (Exhibit 6) and passive fixed income AUM is growing relative to active (Exhibit 7). For fixed income, the passive share is close to 40% (Exhibit 8).

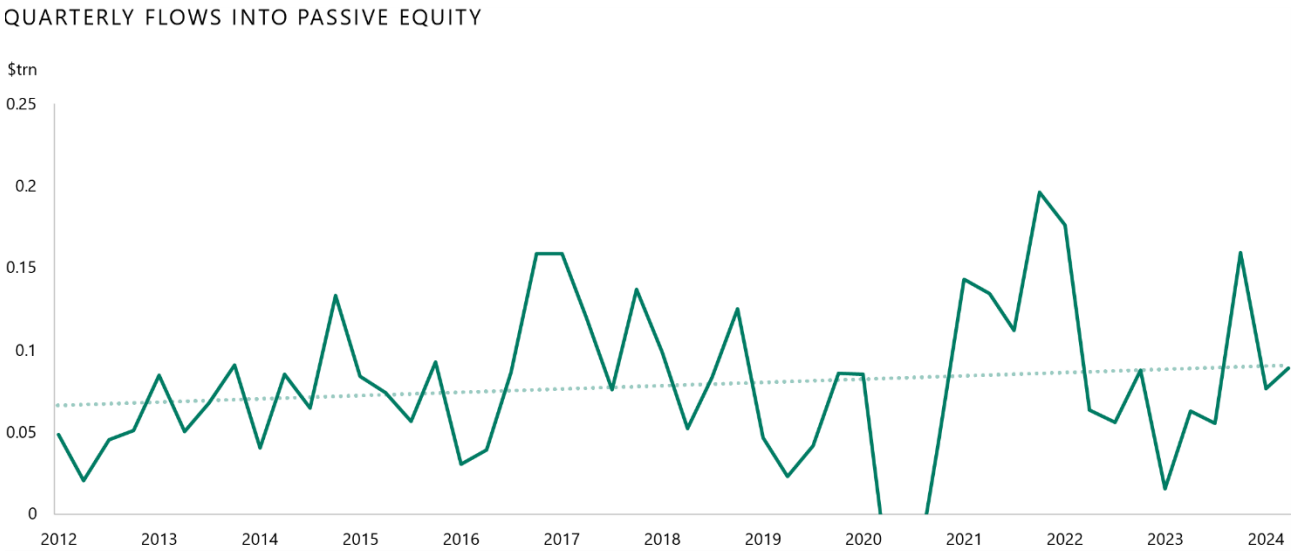
Exhibit 1: Passive investing now makes up over 50% of global equity mutual funds and ETFs



Source: Bloomberg, Apollo Chief Economist

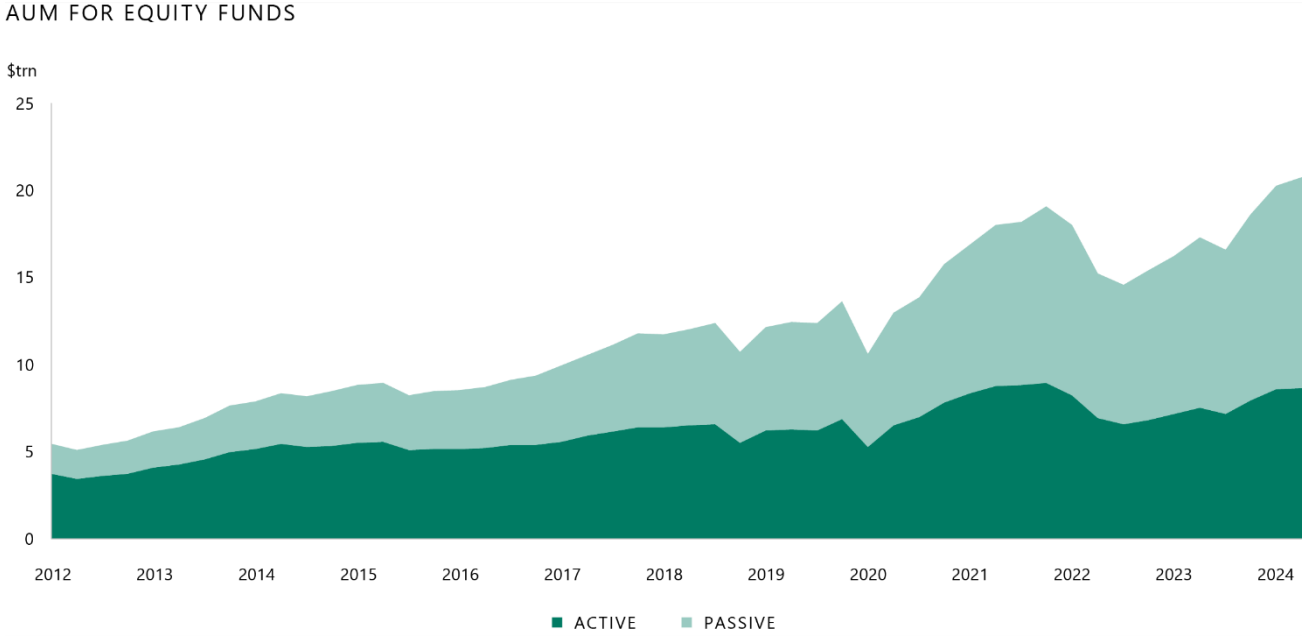
[8] As of August 31, 2024. Source: Vanguard

Exhibit 2: The rate of flows into passive equity funds is growing steadily



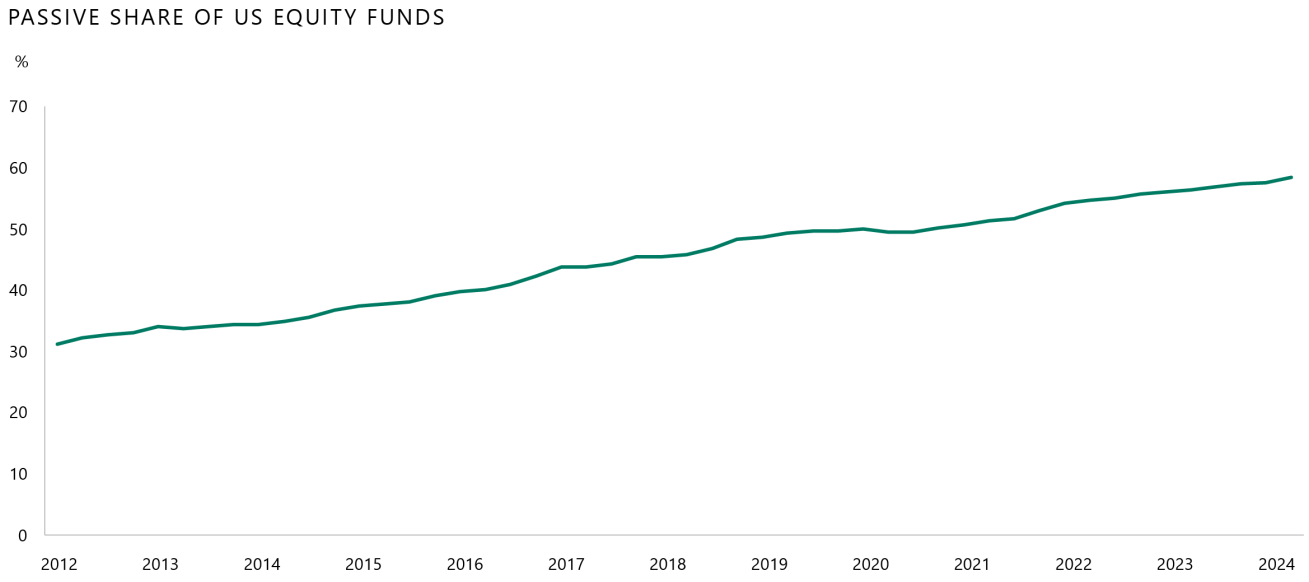
Source: Bloomberg, Apollo Chief Economist

Exhibit 3: Passive equity has a high level of AUM



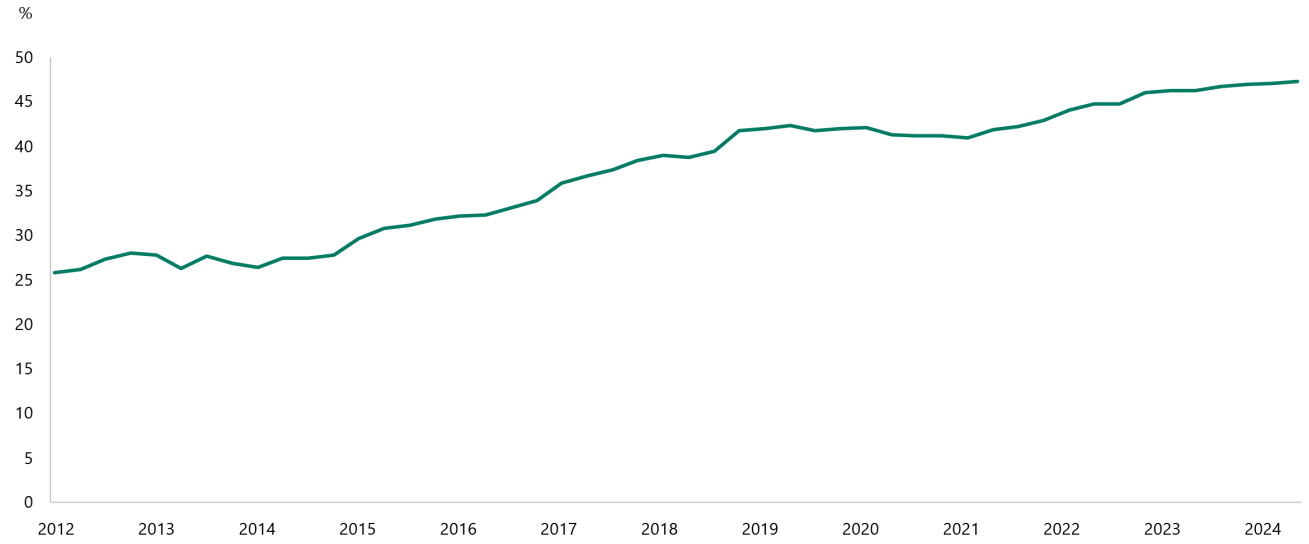
Source: Bloomberg, Apollo Chief Economist

Exhibit 4: Passive equity funds represent nearly 60% of the US market



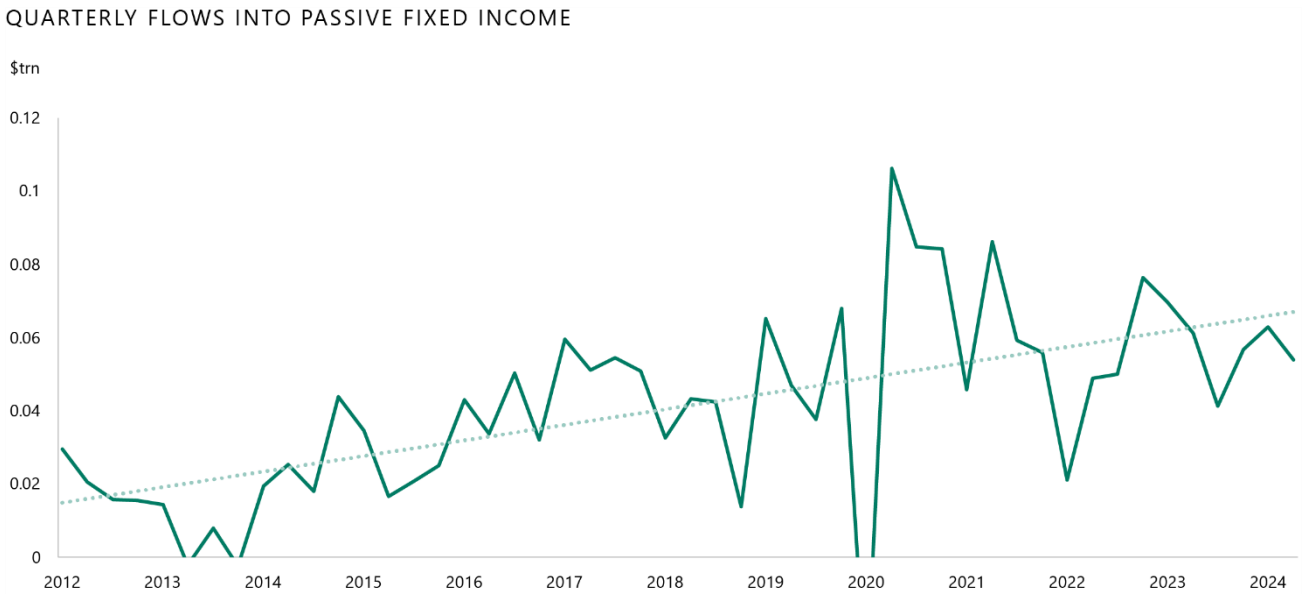
Source: Bloomberg, Apollo Chief Economist

Exhibit 5: The share of passive non-domestic equity funds is not far behind at close to 50%



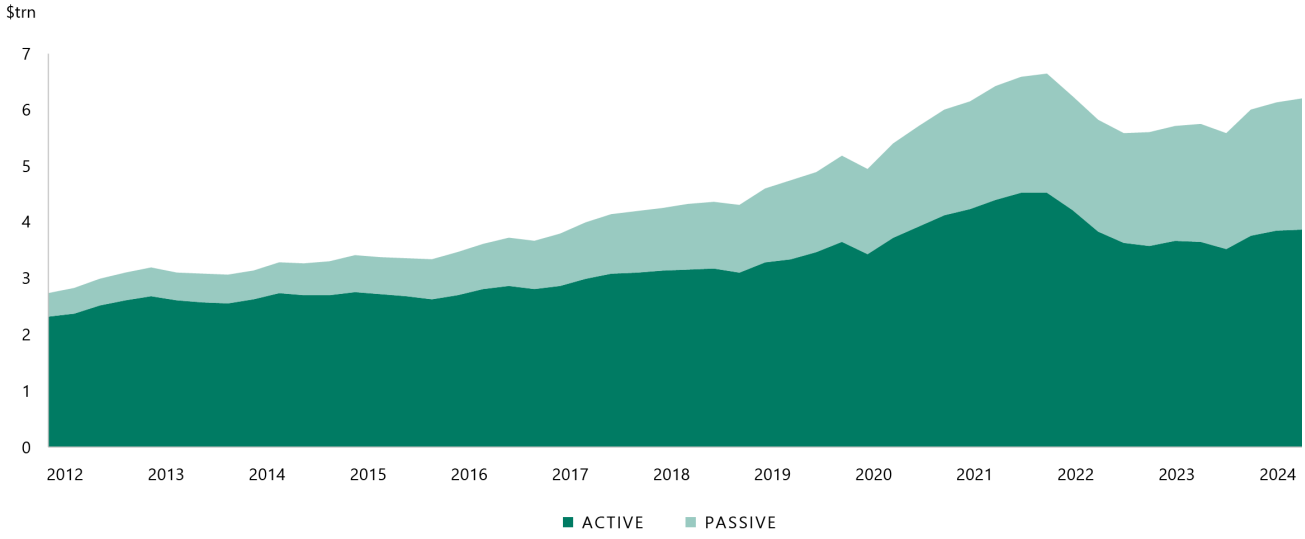
Source: Bloomberg, Apollo Chief Economist

Exhibit 6: The rate of flows into passive fixed income is growing much faster



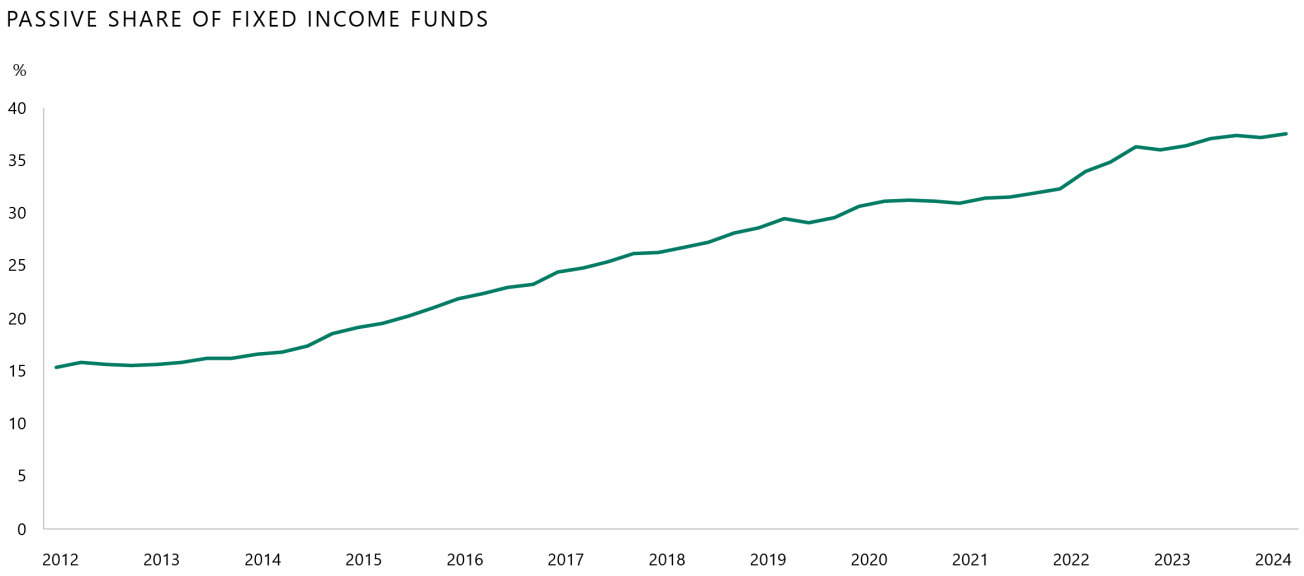
Source: Bloomberg, Apollo Chief Economist

Exhibit 7: Passive fixed income AUM is growing relative to active



Source: Bloomberg, Apollo Chief Economist

Exhibit 8: Passive fixed income represents nearly 40% of the market

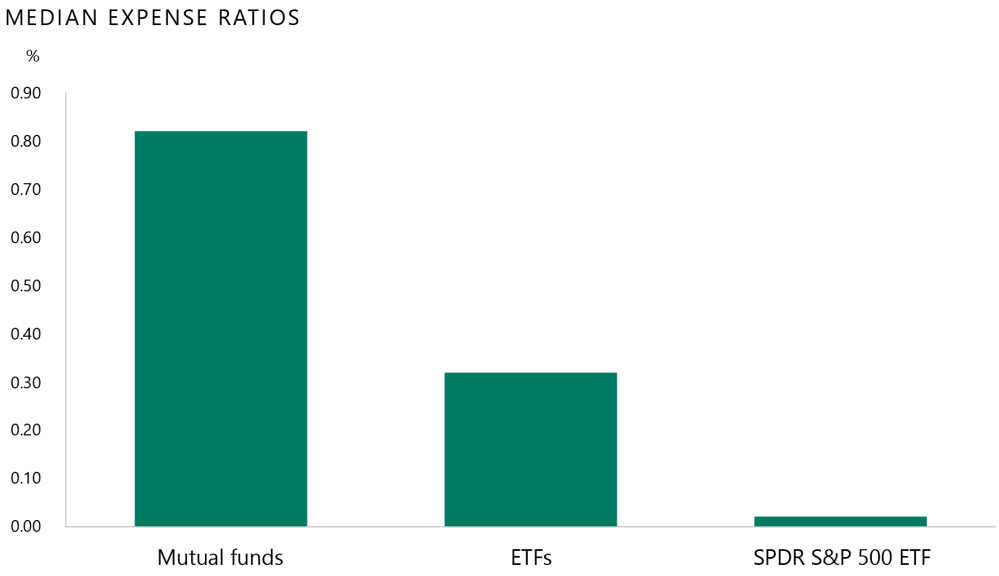


Source: Bloomberg, Apollo Chief Economist

Sources of Growth in Passive Investing

One source of growth in passive investing is lower costs, in particular the introduction of US ETFs in 1993. Comparing expense ratios across mutual funds and ETFs shows that ETFs have significantly lower administrative costs than mutual funds (Exhibit 9).

Exhibit 9: Expense ratios for passive ETFs are comparatively very low



Source: State Street Global Advisors, Apollo Chief Economist

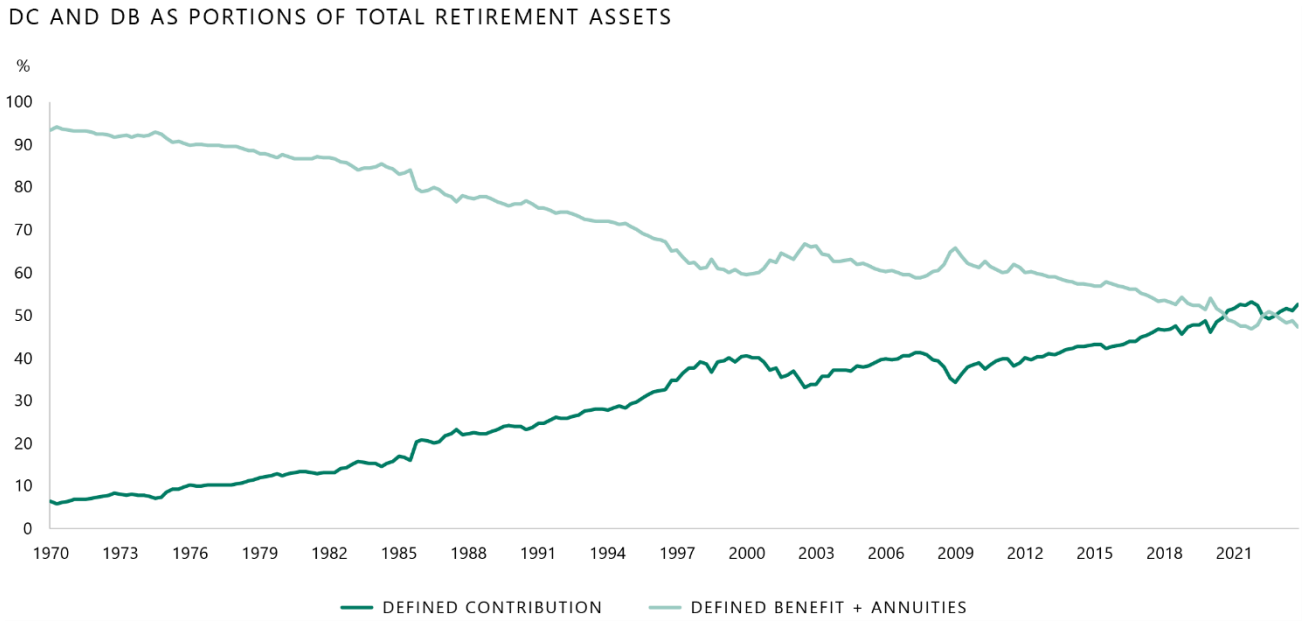
A second source of growth in passive investing is the Pension Protection Act of 2006, which catalyzed the shift of retirement assets from defined benefit plans to defined contribution plans, the former favoring active management and the latter favoring passive management.

Defined benefit (DB) plans are managed by organizations and designed to guarantee fixed pension payments in the future. Defined benefit fund managers have historically favored active management as potential excess returns can help increase the funded status of the pension plan. Additionally, potential excess returns can help offset the plans' administrative costs.

On the other hand, defined contribution (DC) plans, such as 401(k)s, are tax-deferred accounts funded by the employee with a contribution from the employer. The employee typically chooses among investment strategies that are provided by the employer. Traditionally, 401(k) plans offer an investment roster that includes both active and passive strategies. But employees have historically gravitated towards passive because those strategies, as previously shown, are less costly.

The Pension Protection Act allowed employers to cut funding for defined benefit plans, improved the tax efficiency of 401(k) plans, made it easier to enroll employees in 401(k) plans, mandated automatic enrollment of employees into 401(k) plans (if on offer), and established the criteria for an investment to be considered a "Qualified Default Investment Alternative" (QDIA). This further contributed to the growth of DC plans and the decline of DB plans, which was already under way due to defined benefit plans' high administrative costs (Exhibit 10).

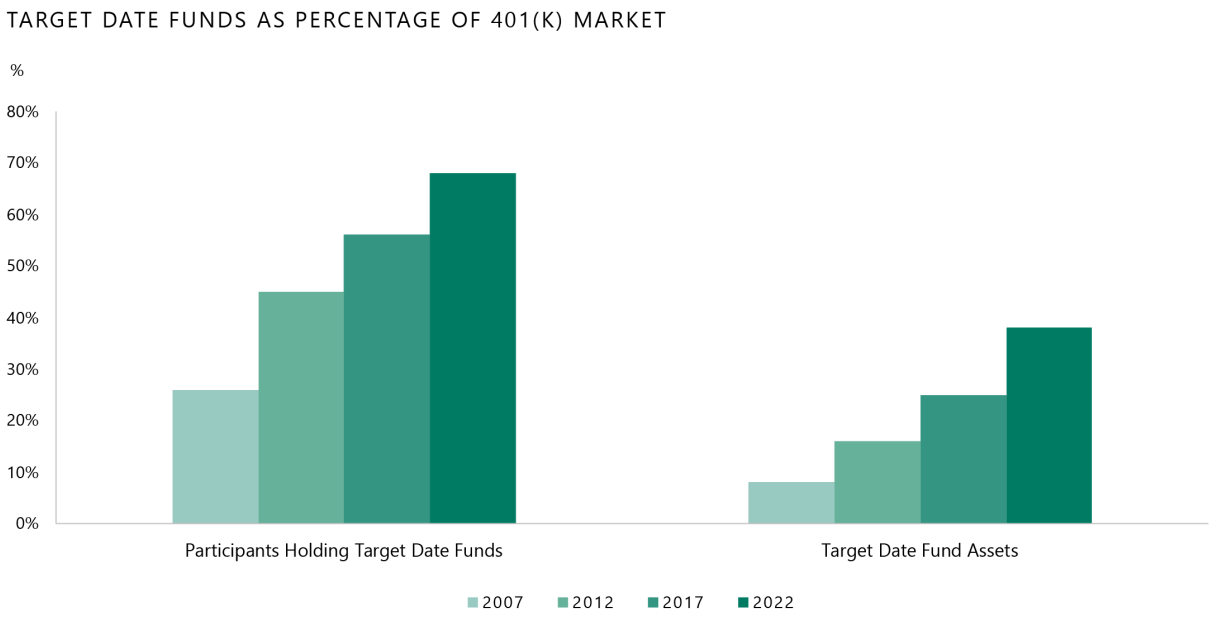
Exhibit 10: Rising prevalence of DC plans has aided the shift to passive



Source: Federal Reserve Bank of St Louis, Apollo Chief Economist

If an employee puts funds into his or her defined contribution account without specifying how it should be invested, employers can allocate the money to a QDIA without risking liability. The vast majority of these QDIAs are made up of passive target date funds, which allocate capital to passive equity funds and passive fixed income funds automatically. The balance between equities and fixed income is determined by the target date of retirement: a person who plans to retire in thirty years will be weighted more heavily toward equities. Target Date funds are growing fast, and their growth contributes to the rise of passive investing (Exhibit 11). According to Vanguard, 64% of total retirement contributions in the US went into target date funds in 2023, up from 59% in 2022.

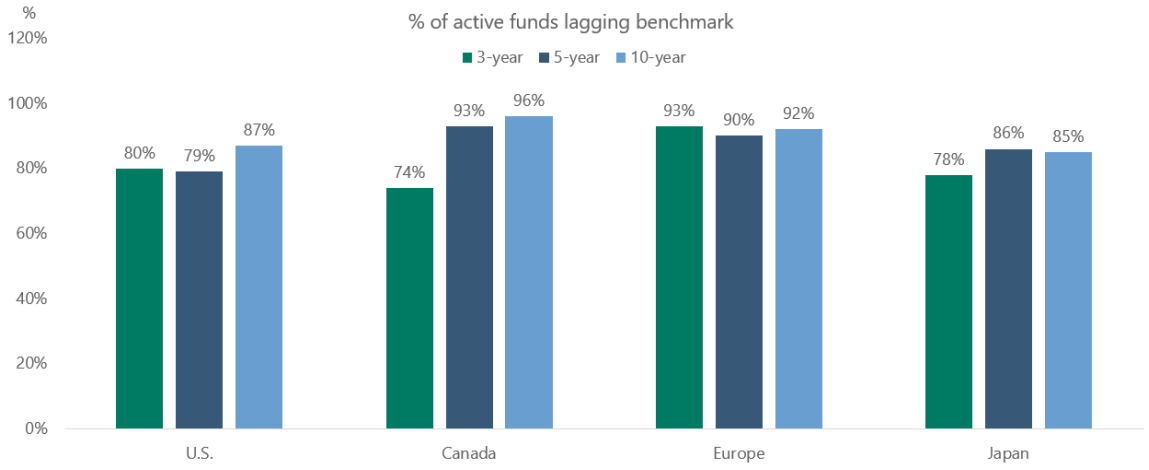
Exhibit 11: Target Date fund growth enables growth of passive investing



Source: Employee Benefit Research Institute, Apollo Chief Economist

A third source of growth is the historical underperformance of active investing in public markets. Comparing performance of active versus passive managers shows that active managers have consistently underperformed their benchmarks. Performance over a three-, five-, and ten-year period shows that ~90% of active managers underperform their benchmark in the US, Europe, Japan, and Asia (Exhibit 12).

Exhibit 12: Active funds have lagged respective benchmarks



Source: Morningstar, Apollo Chief Economist

Morningstar publishes average fee-adjusted returns for passive funds and active funds within different investing categories on a regular basis.[9] For example, a large-cap blend equity active fund will be compared to S&P 500-tracking index funds and a small-cap blend equity active fund will be compared to Russell 2000-tracking index funds.

[9] https://www.morningstar.com/lp/active-passive-barometer

The Morningstar data shows that active funds underperform passive funds. For equities, the 10-year success rate at beating their passive counterparts is very low for active funds. Active fixed income funds have a slightly better track record, but still underperform relative to passive funds.

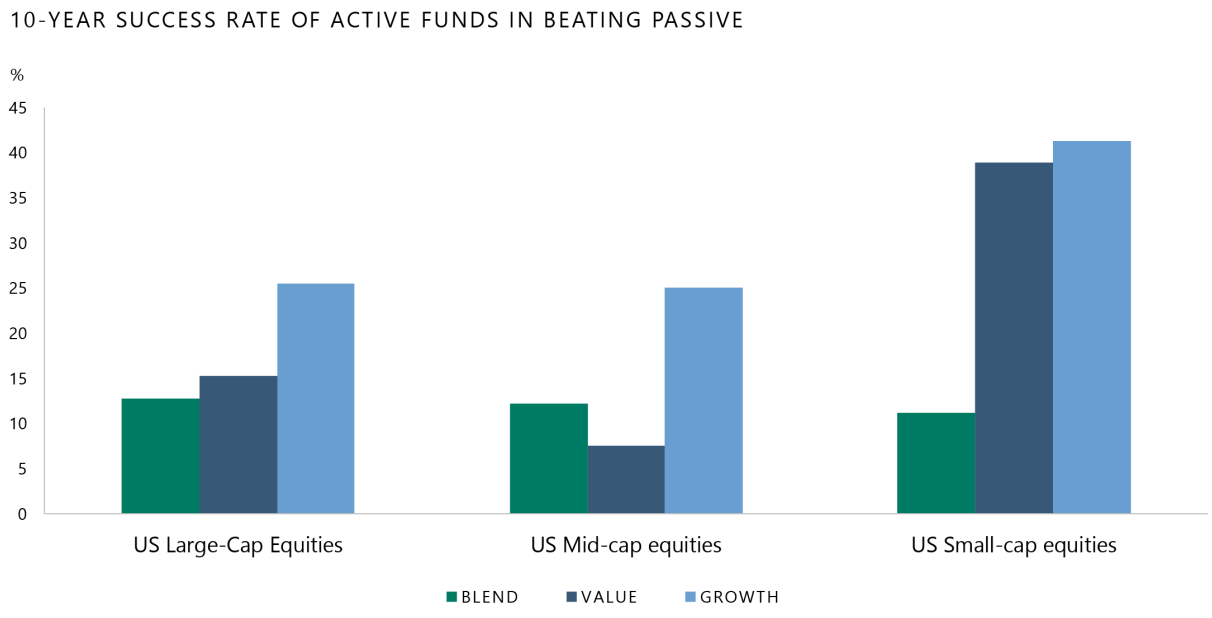
Poor Active Performance in Public Equities

In his paper from 1991 *The Arithmetic of Active Management*, William Sharpe presents two simple conclusions: (1) the return of the average actively managed dollar equals the return of the average passively managed dollar before costs, and (2) the return of the average actively managed dollar is less than the return of the average passively managed dollar after costs. This result holds because he defines passive investors as holding the market portfolio. Therefore, the aggregate of active investors must also hold the market portfolio, and so their returns will equal those of passive investors before fees.

This result becomes approximate when changes to the market portfolio (due to share issuance, buy-backs, or IPOs) and index reconstitution are considered (Pedersen, 2018). US index funds in fact lose $3.9 billion a year to active arbitrageurs when making reconstitution trades (Li, 2021). It is also important to note that Sharpe groups professional active managers together with retail investors.

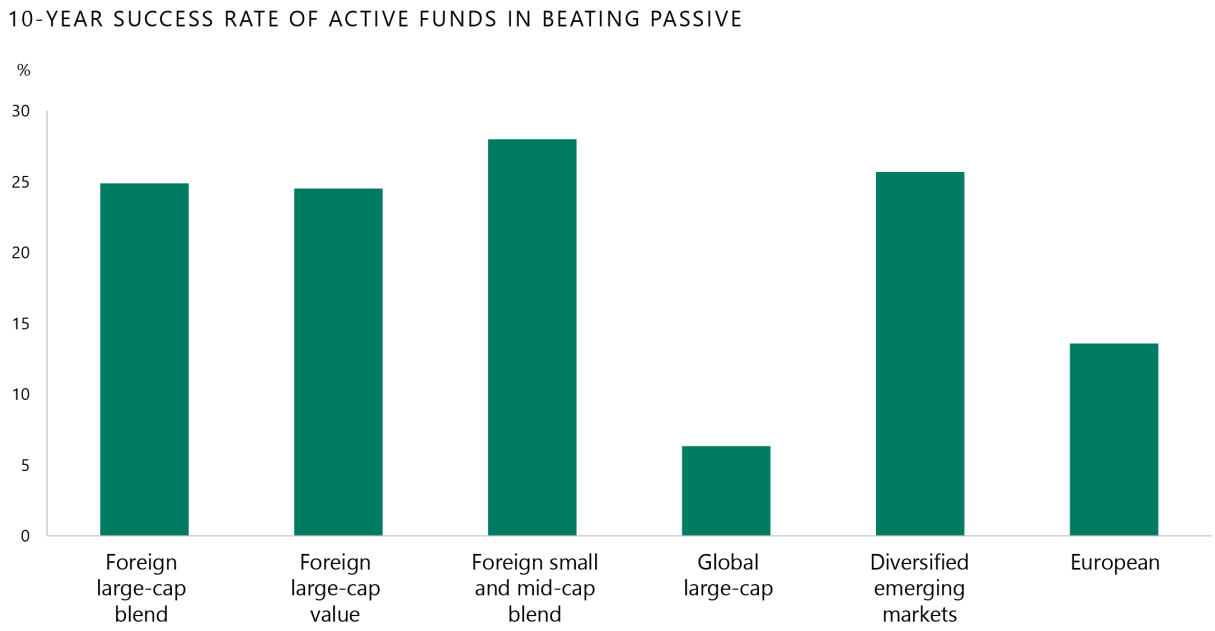
Therefore, the difference in returns between active and passive investors (Exhibit 13) stems from a combination of lower passive expense ratios and the growth of the largest stocks, in which passive funds are in the aggregate overweight compared to professional active managers. This dynamic also holds outside of the US, where active strategies have struggled to keep up with passive strategies (Exhibit 14). The fee gap may close slightly as ETFs, which are more tax efficient than mutual funds, grow as a proportion of active management.

Exhibit 13: The 10-year active public equity fund performance is poor across the board



Source: Morningstar, Apollo Chief Economist

Exhibit 14: Active strategies outside the US have also underperformed



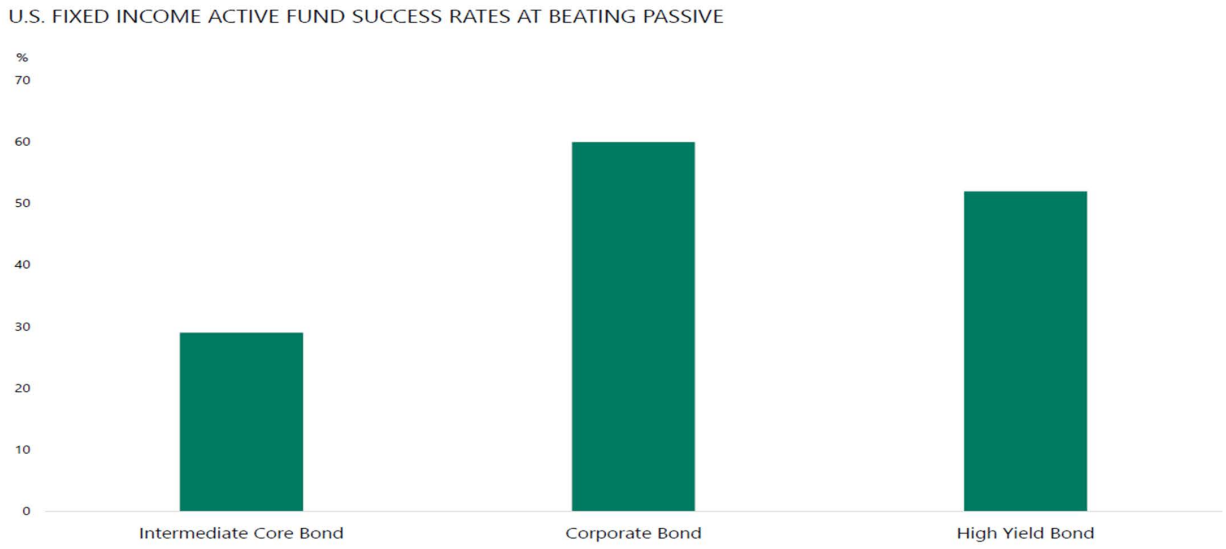
Source: Morningstar, Apollo Chief Economist

Active Public Fixed Income Is also Underperforming

Fixed income is less suited to passive investing than equities because fixed income securities are as an asset class more heterogenous than equity securities. For example, there is one Apple stock, but Apple has more than 60 different corporate bonds outstanding.

Using the Morningstar data to compare active versus passive fixed income performance shows that only 29% of active intermediate core bond funds that existed in 2008 beat their average passive peer through 2Q 2024 (Exhibit 15).

Exhibit 15: Active fixed income funds have mixed results



For the period 2008 – 2Q 2024.
Source: Morningstar, Apollo Chief Economist

Effects of Passive Investing on the Market

There are two models that are helpful for thinking about the mechanism by which passive investing affects markets, and we will look at each in turn. The conclusion is that passive ownership can increase volatility, reduce liquidity, and increase market concentration in large-cap stocks. These findings are based on both theoretical and empirical studies.

Model 1: Price elasticity and investor competition

Haddad, Huebner, and Loualiche (2021) build a model of asset pricing where investors have heterogenous underlying demands and price elasticities of demand (PEDs) for an asset. The PED of an individual investor ε_i is a function of their baseline elasticity $\bar{\varepsilon}_i$ and the aggregate market PED ε_{agg} such that:

$$\varepsilon_i = \bar{\varepsilon}_i - \chi \times \varepsilon_{agg}$$

χ is a measure of the degree of strategic response for the aggregate market, which they assume is homogenous. If some investors become less aggressive in their trading (i.e., the absolute value of their PEDs become lower), other investors benefit from trading more aggressively and will thus respond strategically and become more elastic.

A perfectly efficient market is one where $|\varepsilon_{agg}| \to \infty$: any deviation in price from the fundamental value of an asset is immediately traded away. In a market where any investor's change in strategy is compensated for completely by other investors (ε_{agg} is fixed), $\chi \to \infty$. The equation shown below gives the 'passthrough' of an initial change in ε_{agg}, where $|Active_k|$ is the share of asset k owned by active investors.

Passthrough = $\frac{1}{1+\chi|Active_k|}$

HHL estimate the degree of strategic response to be $\chi = 2.97$ in the US stock market, which is far from the hypothesis that changes in the passive share are fully reacted away (which would happen at $\chi \to \infty$. This means that, if the absolute value of the aggregate PED were to be reduced by 1, the PED of an individual investor will increase by 2.97. Combining this with the average share of the stock market owned by active investors between 2000 and 2020, measured at 68%, we get a pass-through of 33%. A 30% decrease in ε_{agg} will lead to an overall 10% decrease in ε_{agg} after strategic response.

Using their elasticity-based measure of the passive share HHL finds that, between 2000 and 2020, the share of passive strategies has grown from 19% to 41%. This would correspond to an initial 32% drop in the aggregate PED, translating to a change of 11% after strategic responses are considered and a new equilibrium is reached.

A more inelastic PED has consequences for volatility, efficiency, and liquidity. Demand being less reactive to prices leads to greater spikes and dips in price, and less aggressive trading means mispricing can be greater and last longer. Illiquidity also increases, as inelastic investors are less willing to provide liquidity.

Model 2: Stambaugh's equilibrium model in the stock market

In Stambaugh's 2014 model there are four types of agents in the stock market: active managers, investors, noise traders, and intermediaries. The goal of active managers is to maximize their information ratio. Investors hold a portfolio consisting of a combination of active funds and index funds, with the goal of maximizing their overall Sharpe ratio. Noise traders are individuals who buy stocks directly, and do not invest in active funds or passive funds. Intermediaries are market makers.

The capital allocation in the rational portfolio depends on the cost of active management and the degree of mispricing in the market. This model can therefore explain part of the decline in active management: the share of the US stock market owned directly by retail investors ("noise traders") has declined significantly. This has led to alpha decreasing and becoming harder to obtain for active managers as mispricing has decreased in the stock market.

Stambaugh's model predicts a positive alpha at equilibrium for active managers, coming at the expense of a negative alpha for noise traders. This follows from Sharpe's proof/tautological statement that the net alpha of all non-passive

investors must approximately be equal to zero. As we've seen, this is not true. Active has been underperforming passive for a long time. Stambaugh explains this difference by arguing that investors are behaving irrationally over-allocating wealth to active managers.

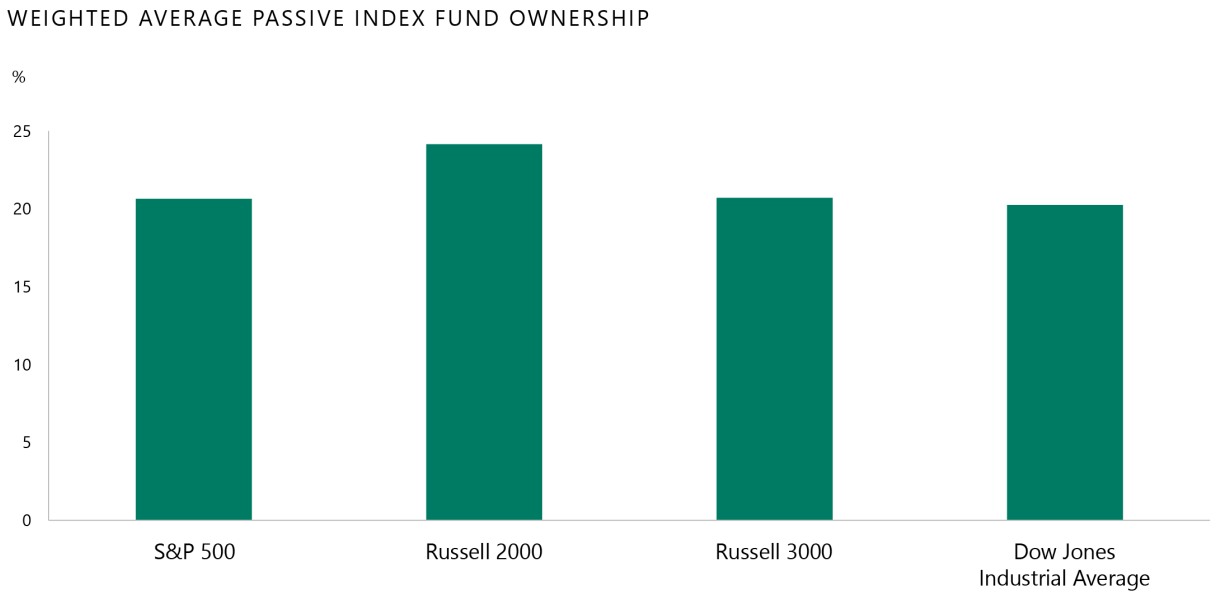
Alpha for active managers has an inverse relationship with the amount of money under active management, as individual managers face decreasing returns to scale with more wealth under management. This is because the degree of mispricing decreases with more active management. In another paper, Stambaugh provides empirical evidence for decreasing returns to scale in the active management industry for both fund size and industry size (Pástor *et al.*, 2022). At equilibrium, the share of wealth under active management will be lower such that alpha is positive again and Sharpe ratios for investors are maximized.

Stambaugh's model highlights the role of declining retail investing as a share of the US equity market in the growth of passive investing. It explains the recent underperformance of active funds as a product of irrationally high capital allocation to active managers in public markets. It also reveals a risk for active management: investors will probably become rational and cause a decline in the assets allocated to active management. This would inevitably come with a decline in price efficiency.

The Effects of Passive Ownership on Market Concentration

With passive index fund ownership at high levels (Exhibit 16), we dissect the impact of passive investing on market concentration. What is the intuition behind more passive investors boosting the Magnificent Seven?

Exhibit 16: The share of major indices owned by index-tracking ETFs and mutual funds



Source: Bloomberg, Apollo Chief Economist

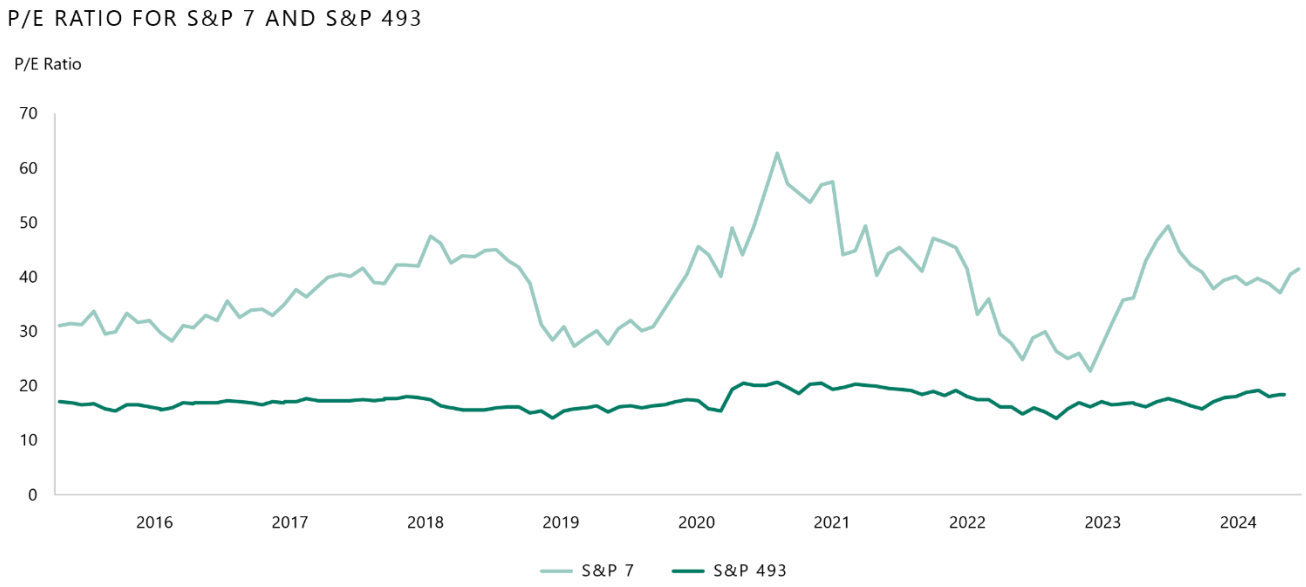
Imagine a market with two types of investors, active and passive who can invest in an index that has small cap stocks and large cap stocks. Active investors have idiosyncratic views on each stock, and some active investors will be long, and some will be short. Passive investors are always long.

If more active investors turn passive, then there will be fewer investors who are short. As a result, shorts will more easily be "squeezed out," which again will increase the volatility of large cap stocks. Because large cap stocks have a bigger proportional impact on portfolios, the higher volatility of large cap stocks will put upward pressure on large cap stock prices. Hence, more passive flows into larger stocks makes it more unattractive and more risky to be short, which again means more upward momentum in the price of large stocks. In short, when active investors turn passive, large cap stocks

will benefit disporportionately. This dynamic can be observed in the price-to-earnings (P/E) ratios of large- and mega-cap stocks, which have been consistently high and growing, especially for the Magnificent Seven (Exhibit 17).

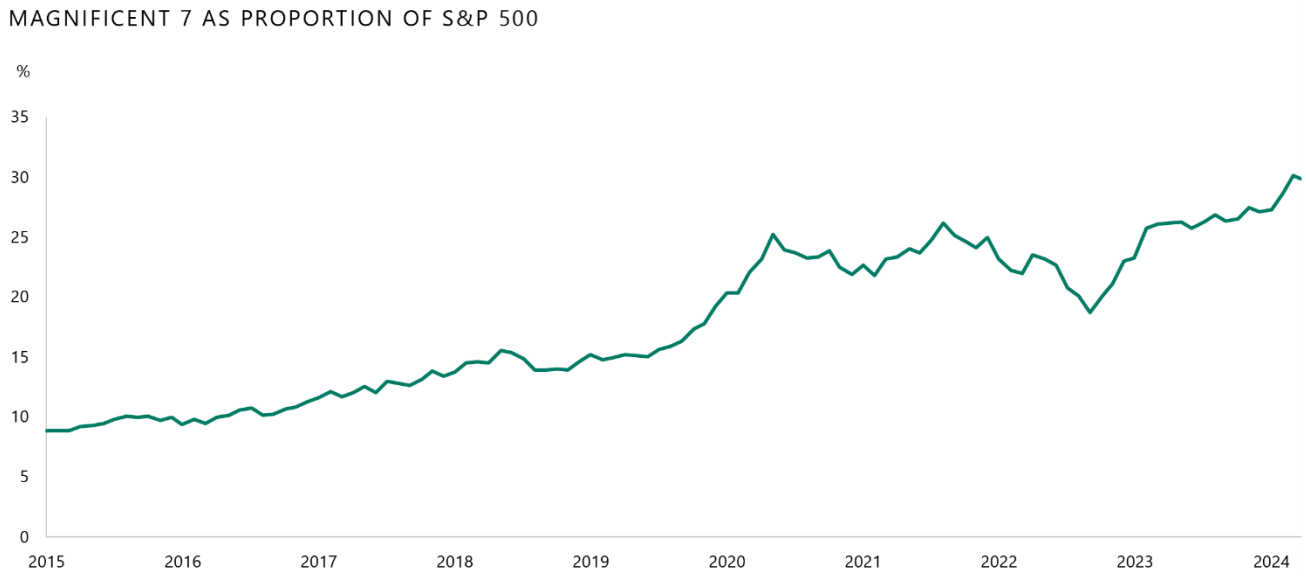
The empirical evidence of passive increasing market concentration is clear in the data for the Magnificent Seven (Exhibit 18) and the S&P 500's growing percentage of the total stock market (Exhibit 19).

Exhibit 17: P/E ratios have been consistently high and growing, especially for the Mag 7



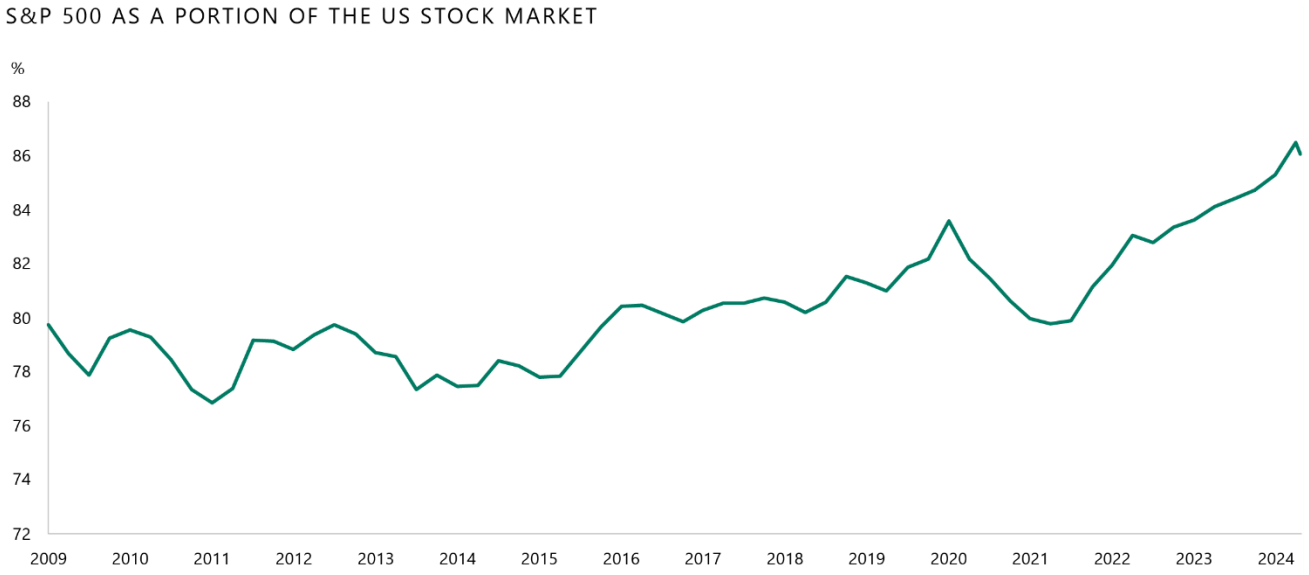
Source: Bloomberg, Apollo Chief Economist

Exhibit 18: Passive investing has helped increase S&P 500 Index concentration



Source: Bloomberg, Apollo Chief Economist

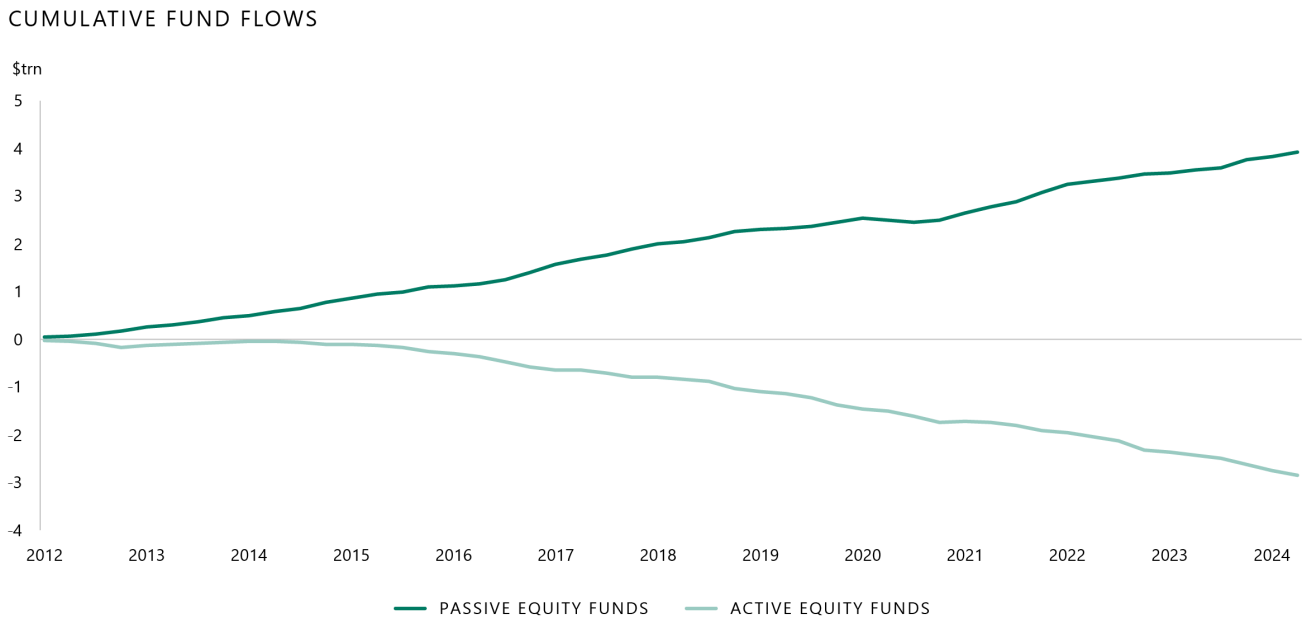
Exhibit 19: The S&P 500 is growing as portion of the total stock market



Source: Bloomberg, Apollo Chief Economist

From an empirical perspective, most flows into passive are intra-equity flows from active managers. The remaining sources of passive flows are split between retail equity investors and new money coming into the equity market. The net effect is cumulative fund flows increasing for passive strategies and decreasing for active (Exhibit 20). With strong upward momentum in large-cap stock prices, passive flows are therefore likely magnifying the upward pressure on demand for large and mega-cap stocks, and decreasing demand for small-cap stocks.

Exhibit 20: Fund flows shifting from active to passive in public equity markets



Source: Bloomberg, Apollo Chief Economist

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