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The Impact of Managed Accounts on Participant Savings and Investment Decisions

Morningstar Research
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David Blanchett, PhD, CFA, CFP®
Head of Retirement Research
Morningstar Investment Management LLC
david.blanchett@morningstar.com

Executive Summary

There has been significant growth in internet and other online solutions over the past 15-plus years, providing a key source of information for saving and investment decisions. Managed accounts, one type of automated solution, or robo-advisor, has been available to participants in defined contribution (DC) retirement plans for more than a decade. In this paper, we explore the impact of Morningstar Investment Management LLC's managed accounts platform (called Morningstar® Retirement Manager℠) on savings and investment behaviors for 60,825 DC participants from January 2007 to June 2018.

We consider two domains, investing and saving, and divide participants into two groups. For investing, participants are classified as either "self-directors," or those building their own portfolios before entering managed accounts (71% of participants), and "allocation-fund users," or those using a prepackaged multi-asset allocation strategy, such as a target-date fund (29% of participants). For savings, participants are classified as either those forecast to be "not-on-track" to retire successfully[1] (74% of participants) and those who were "on-track" to retire successfully (26% of participants). While past research has explored the potential value of managed account across savings and investing decisions, this is the first paper to differentiate among participants within those domains.

We found that not-on-track self-directors in our study tend to realize the largest benefit from managed accounts, on average, while on-track allocation-fund users realized the smallest benefit, on average. Even after incorporating a common fee for managed accounts (40 basis points, or 0.4%), the average participant might still be expected to have more wealth at retirement in each cohort than if participants did not use the service. For example, the average 30-year-old participant had $5,548 more annual income during retirement, which is a 56% increase.

This analysis focuses only on two potential domains where managed accounts can provide value: saving and investing. It does not consider other potential services, such as retirement-age guidance, Social Security benefits planning, retirement withdrawal strategies, tax-efficient investment solutions, and so on, that would likely add additional (significant in some cases) value for managed accounts users. Overall, the analysis strongly suggests that managed accounts has the potential to improve retirement outcomes for DC participants, while the potential benefit will vary by participant attributes and product fees.

1 The specific definition of retirement success is the ability to maintain the same after-tax level of income during retirement as immediately preceding retirement.

Key Findings

Investing Impact of Managed Accounts

- *More-Efficient Portfolios:* The change in median (average) expected annual geometric return for participant portfolios after entering managed accounts was +27 basis points (+86 basis points) for self-directors and +4 basis points (-16 basis points) for allocation-fund users. On a risk-adjusted basis, the median (average) differences were +19 basis points (+23 basis points) for self-directors and +12 basis points (+12 basis points) for allocation-fund users.
- *More-Appropriate Portfolios:* Managed accounts resulted in portfolio risk levels that were more appropriate for investors, based on Morningstar's portfolio assignment methodology. We can quantify the impact of the more-appropriate portfolios using utility theory and note a median (average) implied "alpha" benefit of +13 basis points (+34 basis points) for self-directors and +5 basis points (+16 basis points) for allocation-fund users.
- *Higher Quality Funds:* Using the Morningstar Quantitative Analyst Rating™ as a metric for fund quality, we find that managed accounts resulted in portfolios with higher quality funds, especially among self-directors. Applying other research on the forward-looking impact of different ratings, the differences in fund quality could be expected to result in a median (average) expected improvement in returns of +10 basis points (+10 basis points) for self-directors and +2 basis points (+6 basis points) for allocation-fund users.
- *Improved Future Hypothetical One-Year Performance:* The median (average) return difference in hypothetical future one-year returns was +32 basis points (+50 basis points) for self-directors and +14 basis points (+52 basis points) for allocation-fund users. The median (average) return difference in hypothetical future one-year returns for investors with similar risk levels (before and after managed accounts) was +7 basis points (+20 basis points for self-directors and +4 basis points (+22 basis points) for allocation-fund users.

Savings Rates Impact of Managed Accounts

- *More-Appropriate Savings Recommendations:* Not everyone needs to save more for retirement; therefore, it's important to put the impact of saving advice within the context of who needs it. We find that 71% of not-on-track participants increased deferral rates after entering managed accounts, while only 29% of on-track participants increased deferral rates.
- *Higher Savings Rates for Participants Who Need to Save More:* Deferral rates increased by 2 percentage points (to 8% of income) for not-on-track participants, on average, which is a 33% increase.
- *Higher Use of Employer Match:* The percentage of participants who received the maximum employer match, among those participants in plans that offered an employer match, increased by 12% for not-on-track participants, versus a 1% increase for on-track participants.

Combined Impact of Managed Accounts

- *More Wealth at Retirement:* Not-on-track self-directors had the highest median (average) increase in projected wealth at retirement, assuming no fees, at +22% (+57%), followed by not-on-track allocation-fund users at +21% (+36%), then on-track allocation-fund users at +4% (+7%), and finally on-track self-directors at +2% (+8%).
- *More Wealth at Retirement, Incorporating Fees:* Fees for managed accounts vary by provider, although there is typically some type of fee for the service. An annual assumed 40-basis-points fee changes the expected median (average) difference in wealth at retirement to +15% (+47%) for not-on-track self-directors, +14% (29%) for not-on-track allocation-fund users, +0% (+0%) for on-track allocation-fund users, and -1% (+2%) for on-track self-directors.
- *More Retirement Income :* Higher projected wealth at retirement for managed accounts users should translate into more income during retirement. We find that younger participants are likely to see the largest increase in retirement income due to the benefits of compound growth. Annual retirement income for the average 30-year-old participant using the service would increase by $8,232, on average, assuming no managed fee, and by $5,548 assuming a 40-basis point managed accounts fee. These correspond to percentage increases of 72% and 56%, respectively.

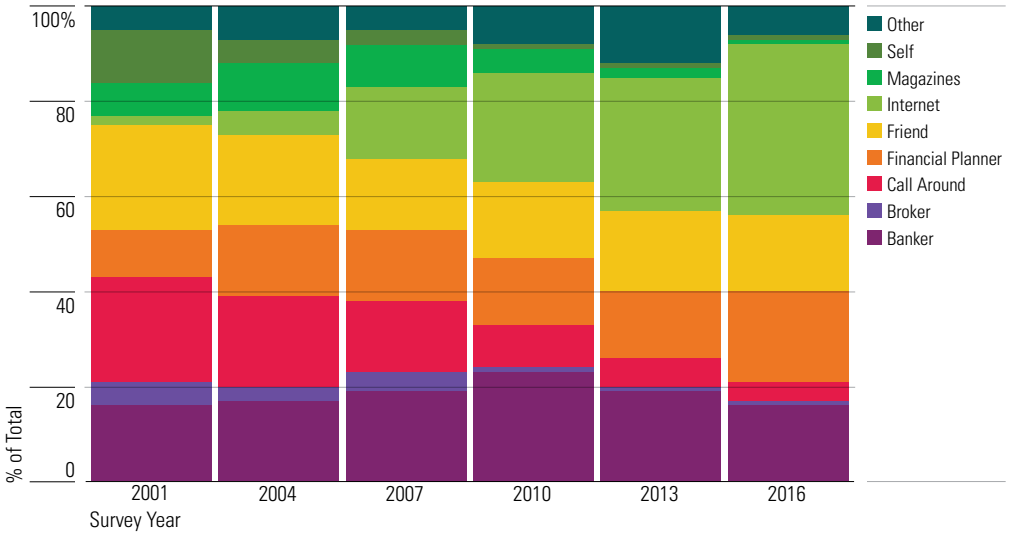
The Internet as a Source of Financial Advice: Rise of the Machines

The information sources individuals (and households) use to make financial planning decisions has increasingly shifted to the Internet and related technologies. The Internet is a resource an individual can use to access to a significant amount of potentially high-quality information relatively quickly, at a low (or zero) cost. Changes in investor behaviors have been noted in responses in the Survey of Consumer Finances (SCF). The SCF is a triennial cross-sectional survey of U.S. families conducted by the Federal Reserve Board. The SCF specifically asks respondents about information sources used when making savings and investment decisions. The exact text of the question is:

> *How do you (and your [spouse/partner]) make decisions about savings and investments? (Do you call around, read newspapers, material you get in the mail, use information from television, radio, an online service, or advertisements? Do you get advice from a friend, relative, lawyer, accountant, banker, broker, or financial planner? Or do you do something else?)*

In Exhibit 1, we provide information about the distribution of responses from SCF surveys from 2001 to 2016, where the first information source noted by the respondent is deemed to be the "primary" source of savings and investment decisions for the respondent/household. Only households with $5,000 in total financial assets and $25,000 in total household income, adjusted to 2016 dollars, are included in the analysis. The analysis includes household weights.

Exhibit 1 Primary Information Source for Savings and Investments Decisions



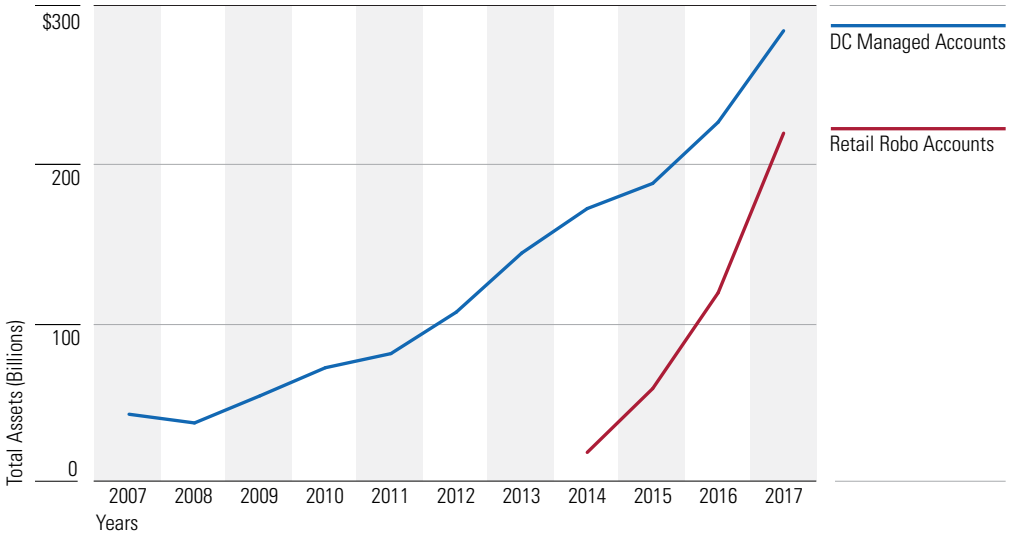
Source: Survey of Consumer Finances

Exhibit 1 demonstrates the growing importance of the Internet as an advice source for American households. For example, while only 2% of households named the Internet their primary information source in 2001, the share increased to 36% by 2016. This is more than the next two advice sources combined (financial planner, 19%, and a friend, 16%).

The growth and adoption of the Internet has been relatively consistent across age groups. If we break households into two groups—those where the respondent is 45 years old and younger and those where the respondent is older than 45—Internet use grew from 2% in 2001 to 39% in 2016 for the younger group versus from 2% to 35% for the older group. In other words, while Internet use was slightly lower for older respondents, the overall growth was effectively the same.

The Internet isn't only an information source—it can also deliver investment advice and solutions. Historically, there were relatively few robo-advisors, especially ones available to the general public. The predominant place to receive robo-advice was inside a DC plan, such as a 401(k), where the service is generally called managed accounts. In Exhibit 2, we contrast the assets in DC managed accounts to assets in retail robo-accounts from the fourth quarter of 2007 to the fourth quarter of 2017. At the end of 2017, total assets in DC managed accounts (Cerulli Associates 2018) likely exceeded total retail robo-accounts (various sources), at $271 billion and $225 billion, respectively. However, given the growth in retail robo-solutions, they should surpass DC managed accounts by the end of 2018.

Exhibit 2 Total Assets in U.S. Robo-Solutions



While combined robo assets of about $500 billion in the U.S. may seem significant, it is only a fraction of the roughly $35 trillion in total invested assets in the U.S.[2] and the $11 trillion total currently managed by wealth management firms.[3]

Robo-advice firms typically cite lower costs as a key differentiator when compared with traditional financial planning services. While the fees associated with robo-advice firms vary by company and the level of services provided (especially whether the investor has access to financial advisor), they can easily cost half of what traditional financial advisor arrangements cost, assuming 50 basis points for the robo-advice versus 100 basis points for traditional in-person financial planning services.

2 https://www2.deloitte.com/content/dam/insights/us/articles/us-generational-wealth-trends/DUP_1371_Future-wealth-in-America_MASTER.pdf
3 https://www.strategyand.pwc.com/media/file/US_Wealth_Management_Survey.pdf

The Value of Financial Advice

There is a growing body of research exploring the potential benefits of financial advice, in particular financial advisors. For example, Blanchett & Kaplan (2013) introduce a metric called gamma to estimate the value of a number of financial planning services, such as a total wealth framework to determine the optimal asset allocation; a dynamic withdrawal strategy; guaranteed income products (such as annuities); tax-efficient decisions; and liability-relative asset-allocation optimization. They find the value of an advisor can result in an increase in the certainty-equivalent retirement income that is equivalent to an increase in the arithmetic annual return of +1.59% (that is, alpha-equivalent gamma). Kinniry et al. (2014) explore the potential value of "Advisor's Alpha," where they quantify the benefit of seven services, noting the value-added of these services is likely to be about 3% of an investor's total assets. Additional research by Envestnet (2015), Jung (2016), and others also demonstrates the potential benefits, which can be significant, investors can receive from working with a financial planner.

It is not clear to what extent research on more traditional financial planning services would extend to robo-advice solutions, and managed accounts in particular. Existing research by Blanchett (2014), Financial Engines & Aon Hewitt (2014), and Pagliaro (2018), and others, though, has typically noted positive effects across savings and investment domains.

With respect to savings, Blanchett (2014) finds that roughly 80% of participants increased savings rates after receiving advice, while Pagliaro (2018) finds that 46% of participants increase savings rates. Financial Engines & Aon Hewitt (2014) compare savings rates across users and note that managed account users tended to have the highest savings rates. With respect to investing, Blanchett (2014) notes significant improvements in portfolio efficiency after adopting managed accounts, and Pagliaro (2018) notes benefits such as better diversification and a reallocation away from company stock. Financial Engines & Aon Hewitt (2014) and Advised Asset Group (2017) both note higher performance for managed accounts participants, even after incorporating fees, compared with participants self-directing their accounts as well as target-date fund users.

This research seeks to build on the research primarily of Blanchett (2014), since this analysis uses a similar dataset, as well as on Pagliaro (2018) and Financial Engines & Aon Hewitt (2014), to provide a more nuanced perspective of the potential value of managed accounts with a specific focus of the impact on savings and investing decisions. Across these two domains (savings and investing), we sort participants into two groups, based on those who are building portfolios themselves or using a professionally managed investment solution (for investing) and those who are on track for retirement success and those who aren't (for savings).

Data Set

The data for this analysis comes from recordkeepers of participants using Morningstar Investment Management's Morningstar Retirement Manager managed account (i.e., robo-advice) service from January 5, 2007, to June 4, 2018. Participants have access to the managed accounts solution through an employer-sponsored DC plan, most often a 401(k) plan. For those unfamiliar with managed accounts, it is a service provided by a registered investment advisor that provides ongoing discretionary asset allocation and typically retirement advice for participants. Savings and investment recommendations can be implemented within a managed accounts solution, which is different from other robo-solutions that may provide only guidance on optimal investor actions. Portfolio allocations are customized based on information about the participant, which is provided by the recordkeeper or the participant. The cost of the Morningstar Retirement Manager service varies by provider and is assessed based on assets.

Seven filters are applied to the initial available data. First, there must be data available on the age, compensation, savings rate (both before and after receiving robo-advice), and income for the participant. Second, the participant must have a minimum annual compensation of $10,000 (in June 2018 dollars). Third, the individual must have a deferral rate greater than zero before and after the robo-advice session. Fourth, the change in deferral rates cannot be greater than 25 percentage points (positive or negative[4]). Fifth, the individual must be provided with an opportunity to change both the deferral rate and investment allocation as part of the managed accounts enrollment process. Sixth, data must be available on the portfolio allocations before and after the managed account session. Seventh, only participants who opted in to the service are included (i.e., this analysis excludes participants who were defaulted). These filters resulted in a dataset of 60,825 participants.

Exhibit 3 includes descriptive statistics for the variables included in the analysis. Salary and balance variables have been converted to June 2018 dollars.

4 For example, a participant that increases the savings rate from 5% to 35% would be excluded.

Exhibit 3 Descriptive Statistics

	Percentile						
	5th	25th	Median	75th	75th	Average	Std Dev
Age	24.00	31.00	40.00	50.00	61.00	41.14	11.72
Salary	$24,934	$42,218	$62,224	$91,967	$165,724	$77,900	$107,147
Balance	$329	$5,232	$22,936	$76,883	$301,436	$71,362	$143,716
Deferral Rate—Before Managed Accounts	2.00	5.00	6.00	10.00	16.00	7.67	6.04
Deferral Rate—After Managed Accounts	3.86	6.00	8.00	12.00	20.00	9.45	6.27
Deferral Rate Change	0.00	0.00	2.00	2.00	7.00	1.77	3.07
Total Savings Rate—Before Managed Accounts	3.00	7.00	10.00	13.50	22.00	10.97	7.04
Total Savings Rate—After Managed Accounts	5.00	9.00	12.00	16.00	25.00	13.01	7.16
Total Savings Rate Change	0.00	0.00	2.00	2.00	8.50	2.03	3.54
Probability of Retirement Success	0.00	0.80	23.40	82.20	100.00	39.44	39.40
On Track for Retirement Success? (Before)	0.00	0.00	0.00	1.00	1.00	0.26	0.47
Equity %—Before Managed Accounts	1.59	64.62	82.56	90.94	98.02	73.09	26.57
Equity %—After Managed Accounts	44.36	67.23	83.05	91.09	94.80	77.17	17.68
Allocation-Fund User? (Before)	0.00	0.00	0.00	1.00	1.00	0.29	0.46

The median age for the participants in the data is similar to average U.S. workforce demographics. For example, the Bureau of Labor Statistics noted a median age of 42.0[5] while the median age for the participant data is 40. The median participant age in this dataset is lower than the median age among Vanguard's 4.6 million DC participants, which is 45 (Vanguard 2018). The median and average balances of the participants are lower than those noted by Vanguard (2018) at $26,331 and $103,866, respectively.

The individuals in this analysis have higher incomes than the average American but are generally consistent with participants in Vanguard's DC plans. The median income in this data set falls at approximately the 70th percentile among personal incomes in the U.S. among those making at least $10,000 (i.e., working approximately full-time) in 2016 based on the data from the U.S. Census Bureau.[6] The median income is relatively consistent with individuals participating in Vanguard's DC plan, which is $67,000. According to Vanguard (2018), DC participants tend to have significantly higher wages than both all eligible employees (at $59,000) and all nonparticipating employees (at $34,000). Savings rates for these participants were also consistent with those noted by Vanguard (2015), which notes a median deferral rate of 6.0%. Overall, the demographics of the individuals included in this data set appear to be reasonably consistent with investors participating in DC plans, based on comparisons to data available from Vanguard (2018); however, these individuals appear to be quite different from the average American (for example, incomes are significantly higher, as are things like savings). Therefore, this analysis should be viewed within the context of the average DC investor rather than the average American.

5 https://www.bls.gov/emp/ep_table_306.htm
6 https://www.census.gov/data/tables/time-series/demo/income-poverty/cps-pinc/pinc-11.html

Test Groups

This analysis focuses on changes in participant behaviors after enrolling in managed accounts by comparing participant decisions before managed accounts (for example, savings rate and portfolio allocation) against behaviors after implementation. Changes across two key domains, investing and saving, are considered. For each of these two domains, participants are sorted into two groups.

For the investing analysis, participants are sorted based on whether they were building their own portfolio (i.e., were "self-directors") or were using a prepackaged multi-asset strategy, such as a target-date fund (i.e., were "allocation-fund users"). More precisely, a participant is classified as a self-director if less than 90% of the portfolio was allocated to an "allocation" fund, while an allocation-fund user is defined as having of 90% or more to an allocation fund. Morningstar, Inc. uses a broad asset classification group for investments called "allocation," which includes multi-asset strategies such as balanced funds and target-date funds. This classification approach would not catch plans using a custom target-date fund, built from the plan's underlying investments, although these are relatively rare among the plans considered. Within the context of this analysis, participants using allocation funds would predominately be using TDFs, since TDFs are the most popular default in DC plans today (Callan Associates 2018), although some participants are using balanced funds as well.

Classifying participants by who is effectively responsible for making asset allocation decisions is important when attempting to understand the "quality" of the investing decisions made by the participant (i.e., portfolio efficiency). DC participants are generally considered to be relatively unsophisticated investors on average; therefore, we would expect the portfolios constructed by "do-it-yourself" investors (i.e., self-directors) to be different from the portfolios built by professional investment managers (for example, TDFs).

Among participants studied, 71% were classified as self-directors versus 29% as allocation-fund users, although the distribution evolved over the test period. The percentage of allocation-fund users (i.e., participants who were using prepackaged investment products before entering managed accounts) increased over the test period, to 40% by 2018 from approximately 20% in 2007. This change is consistent with the general growth in interest and usage of TDFs across DC plans over the period.

For the savings analysis, participants are estimated to be "not-on-track" or "on-track" for retirement success. A participant forecast to be on track has a 70% or higher probability of maintaining the same level of income during retirement as the year prior to retirement. This estimate, a Monte Carlo simulation performed by Morningstar Retirement Manager's engine, would incorporate additional information provided by the participants about outside assets or savings at the time of enrollment.

Segmenting participants based on whether they're on track for retirement is important because not all participants need to save more for retirement. Participants using Morningstar Retirement Manager's managed accounts who are not on track will be recommended to increase savings rates, while those who are on track may not need to make any changes to savings (so long as they are receiving the maximum employer match). On-track participants tended to be younger, with lower salaries, higher balances, and higher deferral rates.

Investment Impact Analysis

The impact of managed accounts on investor portfolios is viewed through a variety of lenses, including:

- *Portfolio Risk Level:* How did the risk level of a portfolio, defined as its allocation to equities, change after the participant enrolled in managed accounts?
- *Efficiency of Portfolio:* How did the efficiency of the portfolios differ before and after managed accounts?
- *Risk Appropriateness:* How consistent was the risk level of the portfolio before managed accounts with the target allocation?
- *Fund Quality:* How did the quality of the portfolio change, defined by using the Morningstar Quantitative Analyst Rating for the portfolio's underlying funds, before and after managed accounts?
- *Future Hypothetical Performance:* How would the portfolios have performed one year following enrollment in managed accounts, on a risk-adjusted basis?

The target equity allocation for each investor is determined using Morningstar Investment Management's managed accounts engine, which uses a total wealth methodology. Using this total wealth approach, a participant's DC assets are viewed as a "completion portfolio" that is invested so as to help the investor achieve the overall desired target risk level across all of their financial and nonfinancial assets. Investors with riskier financial assets (for example, an IRA invested heavily in stocks) or nonfinancial assets (such as, human capital) would get a more conservative recommendation, holding everything else constant. Similarly, investors with more conservative assets outside the DC plan portfolio would get a more aggressive recommendation for their DC plan assets. The methodology is described in greater detail in Appendix 1.

The style exposures of portfolios are determined using a returns-based style analysis. RBSA was introduced by Sharpe (1988) as a low-cost solution to analyzing mutual funds compared with holdings-based style analysis (HBSA). The concept behind RBSA is best paraphrased by the folk saying (used by Sharpe in his original research paper), "If it acts like a duck, assume it's a duck." RBSA uses constrained optimization to classify an investment by comparing the performance of an investment with a number of passive benchmark indexes. RBSA searches for some combination of index returns that best mimics the portfolio performance over the test period, by minimizing the variance of the residuals. RBSA is useful when underlying holdings data are not available for many of the investments, which is the case for our data set.

The index proxies included in the RBSA are noted in Appendix 2. The RBSA is performed at the portfolio level (not the individual fund level) using historical returns for the 36 months prior to receiving advice as of the last month-end. For example, for a participant who entered managed

accounts on March 12, 2015, the RBSA would use returns from March 1, 2012 to February 28, 2015. Aggregate portfolio returns are created using the underlying weights to the individual funds held by the participant, where the portfolio is assumed to be rebalanced monthly. For those investments that did not have available historical returns for the entire period, the Morningstar Category Average value is used as the return for that investment. There were 3,917 unique investments held across the participants.

The RBSA is run for portfolio allocations before and after entering managed accounts. Given the resulting asset class weights, a variety of metrics are estimated. The first is the equity allocation of the respective portfolios, which is the sum of the weights to all noncash and nonbond asset classes—i.e., the equity weight includes an allocation to commodities. Next, the expected risk/reward characteristics of the portfolios are estimated using the capital market assumptions noted in Appendix 3. These are the approximate average historical 20-year capital market assumptions used by Morningstar Investment Management over the historical period of the analysis.

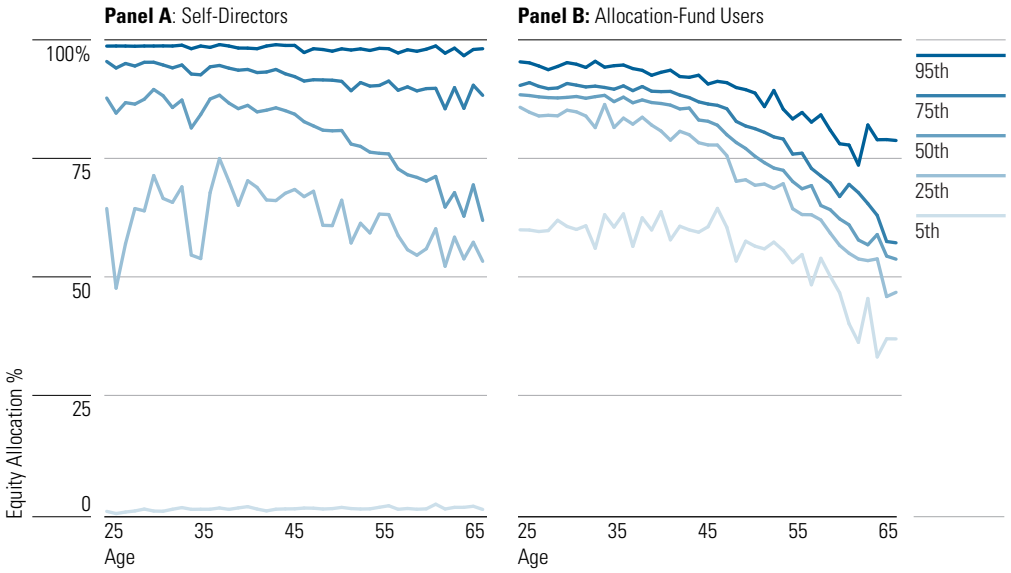
We also estimate the "quality" of the underlying investments using their Morningstar Quantitative Analyst Ratings, as well as future hypothetical performance one year after enrolling in managed accounts.[7] Additional information about these tests is included in the respective subsection.

7 This analysis is described as being "hypothetical" because we do not know what the actual portfolio decisions would have been for the investor over the year following entering advice, or how the portfolio might have changed after entering managed accounts.

Portfolio Risk Level

For our first test, we estimate the equity allocations for portfolios before and after the participant enrolled in managed accounts. The median (average) equity allocation for all users before managed accounts was 83% (73%) versus 83% (77%) after managed accounts. Self-directors had slightly more conservative allocations before using managed accounts, with a median (average) equity allocation of 82% (71%) versus 84% (79%) for allocation-fund users. In Exhibit 4, we provide information about how the equity allocations differed by age before entering managed accounts for self-directors and allocation-fund users, in Panels A and B, respectively.

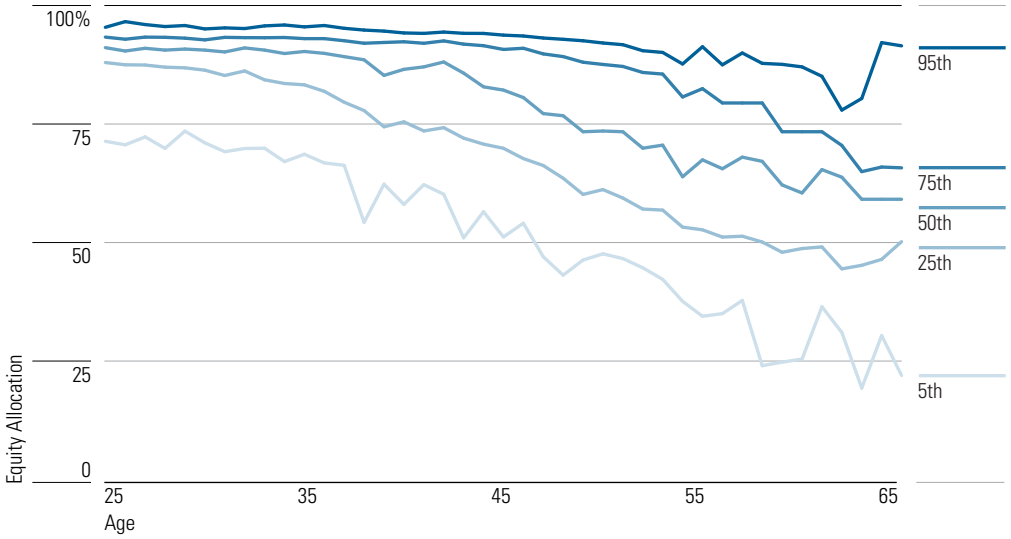
Exhibit 4 Equity Allocations Before Enrollment in Managed Accounts



The median equity allocations for self-directors (Exhibit 4, Panel A) and allocation-fund users (Exhibit 4, Panel B), before managed accounts, were relatively similar. This suggests the "average" participant had a similar level of risk before managed accounts across the two types. However, while the most conservative 1 in 20 (i.e., 5th percentile) allocation-fund user still had a relatively aggressive portfolio, the most conservative 1 in 20 self-director had a very conservative portfolio (effectively 100% fixed income). This suggests focusing on the median participant may yield a different conclusion than considering all participants (i.e., the entire distribution).

In Exhibit 5, we include the participant equity allocations after managed accounts. We do not break these out by participant type (i.e., by self-director or allocation-fund user) because it doesn't affect the recommended portfolio allocation and thus the distributions for the two groups are effectively the same.

Exhibit 5 Equity Allocations After Enrollment in Managed Accounts

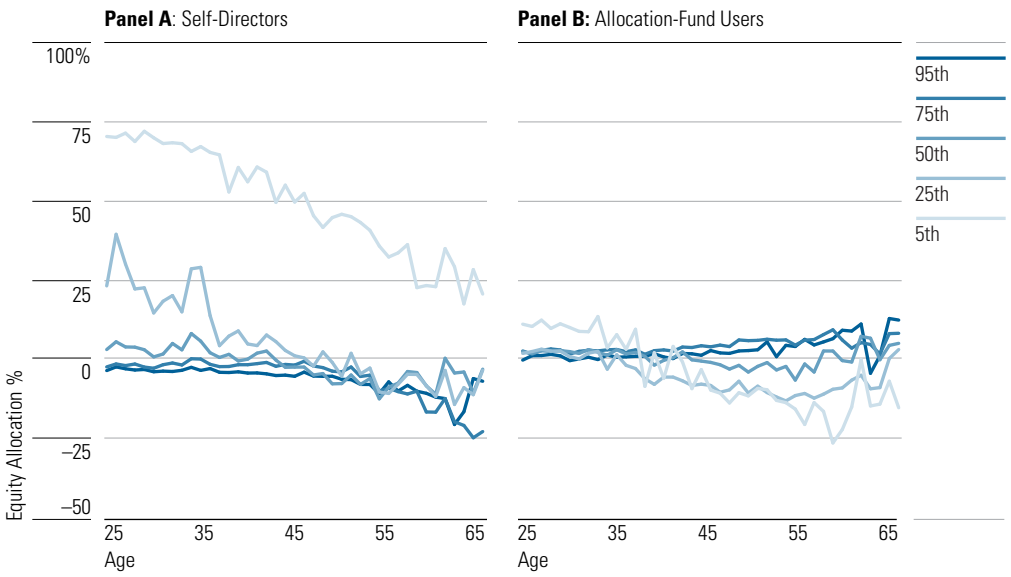


The distribution of participant equity allocations for participants after entering managed accounts looks different from the pre-managed-accounts distributions of both self-directors and allocation-fund users. Overall, the equity allocations after entering managed accounts widen as participants age, with the difference between the 95th percentile and 5th percentile being relatively narrow at age 25 (24 percentage points) and increasing significantly by age 65 (to 70 percentage points).

Equity allocations increasingly diverge for older participants for a variety of reasons, but a key driver is the increasingly diverse circumstances of participants at older ages. Participants also increasingly have other outside assets that could significantly affect the equity recommendation for a managed accounts user. For example, if a 60-year-old participant has a large IRA invested conservatively and relatively small DC balance, the DC account may be invested aggressively (for example, 97% equities) in an attempt to get the investor's overall risk level more in line with the total wealth target.

In Exhibit 6, we provide some insight into how equity allocations changed after enrolling in managed accounts for self-directors and allocation-fund users, in Panels A and B, respectively. This is effectively the difference in Exhibits 5 and 4 for the respective groups.

Exhibit 6 Change in Equity Allocations After Enrollment in Managed Accounts



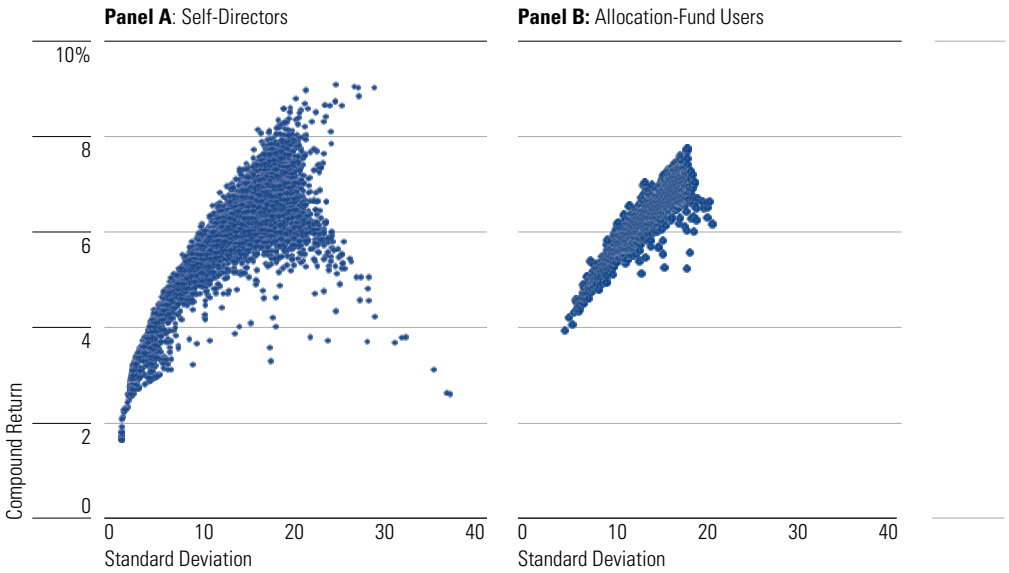
The distribution of equity allocation changes is relatively compressed across most percentiles (especially the median); however, there were considerable changes in risk levels for some participants, in particular a subset of self-directors who were invested primarily (or entirely) in fixed income before entering managed accounts. These participants were generally invested too conservatively and had significant increase in their equity allocations after entering managed accounts.

A significant number of participants, especially older participants, ended up in more conservative portfolios after entering managed accounts. Assuming a positive risk premium, these participants may end up with less wealth at retirement in their DC plan owing to the more conservative allocation (depending on portfolio efficiency, fund quality, and so on). While less wealth may seem like a worse outcome, virtually every target-date mutual fund derisks as it approaches retirement. The key, therefore, is ensuring the risk level for a portfolio is appropriate given the participant's (or investor's) situation, especially given the risk of assets outside the DC plan. We quantify the potential benefit of more-appropriate portfolios in a later section of this paper.

Portfolio Efficiency

The next analysis explores the efficiency, which is the expected risk-adjusted returns of the respective portfolios, before and after enrollment in managed accounts. As noted previously, to estimate the portfolio risk exposures, we perform a returns-based style analysis using the indexes listed in Appendix 2. We then estimate the risk and return for portfolios using the asset-class weightings obtained from the RBSA and the capital market assumptions included in Appendix 3. We do this for the allocations both before and after enrollment in managed accounts. Exhibit 7 offers a scatterplot of the standard deviation and compounded (i.e., geometric) returns for the self-director and allocation-fund user portfolios, in Panels A and B, respectively, before enrolling in managed accounts.

Exhibit 7 Portfolio Efficiency Before Enrolling in Managed Accounts, by Investor-Type

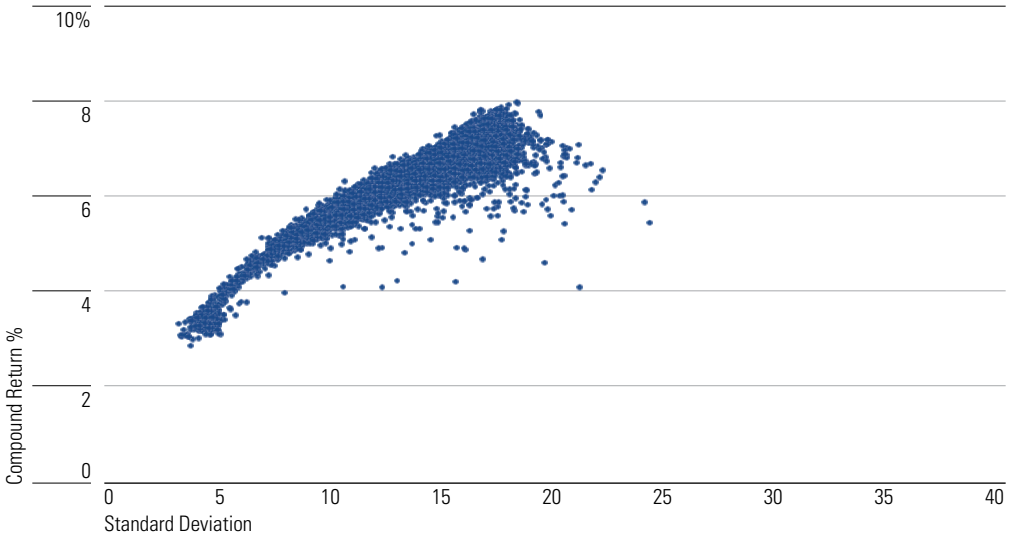


The dispersion of portfolios is significantly greater for the self-directors (Panel A) compared to the allocation-fund users (Panel B). This is consistent with our expectations. Research has consistently documented that individual investors often build inefficient portfolios and end up with lower risk-adjusted returns compared with professionally managed portfolios. We would expect professionally constructed portfolios (such as, target-date funds) to be relatively efficient and have similar risk/reward attributes across providers.

One notable difference in the risk/reward profiles for the self-directors and allocation-fund users is the right tail in the distribution for self-directors. This right tail is attributable to allocations to employer stocks. Beyond the human capital risk implications associated with holding employer securities, individual stocks are much riskier than diversified portfolios and generally deemed as not

appropriate for investors in DC plans. This topic has been covered by Blanchett (2012), among others. Information on portfolio efficiency for portfolios after enrolling in managed accounts is included in Exhibit 8.

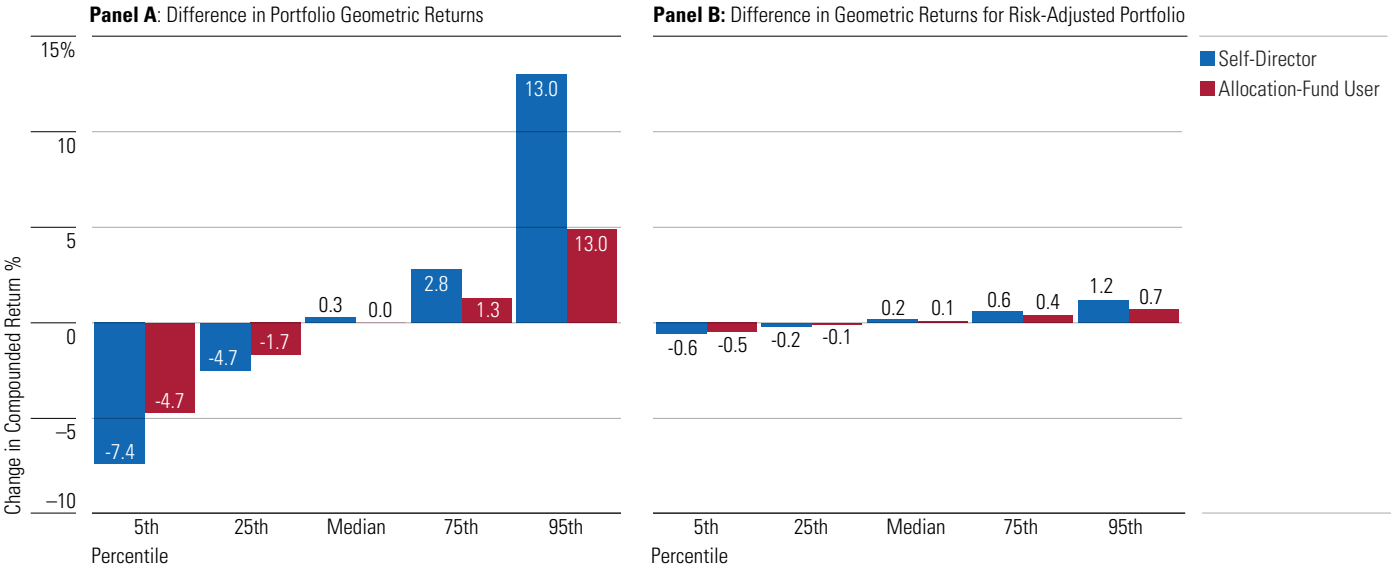
Exhibit 8 Portfolio Efficiency After Enrollment in Managed Accounts



The efficiency of the portfolios after enrolling in managed accounts is certainly better for self-directors, but not as good for allocation-fund users. A key reason for this is that some participants can continue holding some employer stock after enrolling in managed accounts. Participants do not always sell out of employer securities completely after enrolling in managed accounts and may instead enter a sell-off plan.

Next, we compare the expected compound returns for participant portfolios before and after enrolling in managed accounts. We compare pure returns in Panel A of Exhibit 9 and do so on a risk-adjusted basis in Panel B of Exhibit 9. For the risk-adjusted calculation, we compare the performance of each portfolio with a risk-adjusted benchmark and compare these respective differences with each other. The risk-adjusted calculation is explained in detail in Appendix 4.

Exhibit 9 Change in Expected Return



The differences in pure performance before and after managed accounts (Panel A) are significantly greater than the risk-adjusted differences (Panel B). This should not be surprising. For example, a participant who has an allocation of all cash before enrolling in managed accounts, and then gets invested in a relatively aggressive portfolio, would have a significant change (i.e., increase) in return (Panel A). However, the difference in the risk-adjusted efficiency is unlikely to be nearly as significant (Panel B), assuming both portfolios were reasonably efficient.

Looking at the results of Panel A, the change (or difference) in return is positive for the median participant. For example, the median (average) change in expected compounded returns for self-directors was +27 basis points (+86 basis points) and +4 basis points (-16 basis points) for allocation-fund users. The average is so much higher than the median among self-directors because of those participants that went from very conservative portfolios to allocations with greater risk. On a risk-adjusted basis, the median (average) change in expected compounded returns was +19 basis points (+23 basis points) for self-directors and +12 basis points (+12 basis points) for allocation-fund users.

Overall, the findings in this section suggest participants who were self-directing their portfolios are likely to realize a significantly greater efficiency benefit for enrolling in managed accounts than participants using professionally managed investment products (for example, TDFs), consistent with our expectations.

Risk Appropriateness

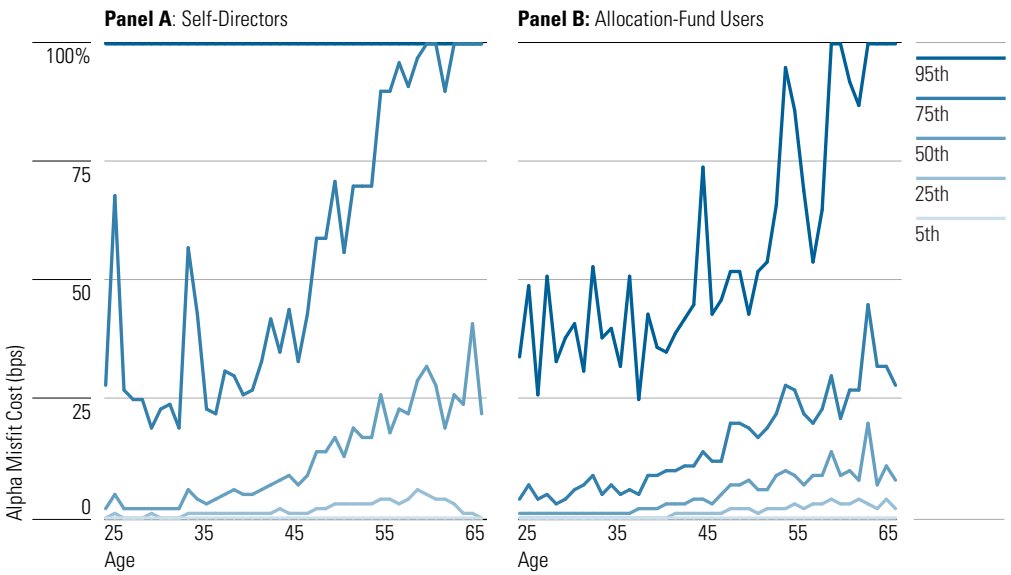
An important component of financial advice is helping ensure an investor has a portfolio with a risk level appropriate for the investor's facts and circumstances. Each participant in managed accounts receives a personalized portfolio recommendation that could be significantly different than the portfolio the individual selected for him- or herself before enrolling in managed accounts, even if the investor was using a TDF. For example, while TDFs would be expected to have risk levels appropriate for the average participant, they are, by definition, a one-size-fits-all investment that can result in situations where the risk level (i.e., glide path) is not appropriate for certain participants given their facts and circumstances. For example, if the participant has a large IRA that is invested aggressively (conservatively), the DC monies may need to be invested relatively conservatively (aggressively) to ensure consistency with the target risk level of the participant's total wealth. A TDF is unable to incorporate outside assets or other information about the participant into the portfolio assignment process.

For this analysis, we attempt to estimate the "cost" of being invested in a portfolio that is not consistent with the ideal risk level for the investor. We do so by first assuming the recommended equity allocation for managed accounts is the optimal target risk level for the investor. This allocation is determined using all information provided by the investor as part of the managed accounts enrollment process. Next, we compare this target equity allocation to the investor's pre-managed accounts portfolio. We use utility theory to quantify the cost associated with being invested sub-optimally (assuming the equity allocations before and after managed accounts differ).

This approach allows us to estimate the additional return (i.e., alpha) that would be required to compensate an investor to be indifferent between being invested in the managed accounts portfolio compared with their previous portfolio, which may have had a different risk level. The further the risk level of the portfolio before enrolling in managed accounts is from the target risk level, the larger the cost associated with being invested sub-optimally. These costs are noted in "alpha" terms for ease of reference purposes. Additional details on the exact calculations are included in Appendix 5.

The distribution of the estimated alpha misfit costs, by age, for self-directors and allocation-fund users are noted in Panel A and Panel B of Exhibit 10, respectively.

Exhibit 10 Alpha Implied Cost of Suboptimal Risk Portfolio Level



As a reminder, the "alpha misfit costs" noted in Exhibit 10 quantify the "cost" associated with being invested sub-optimally (as defined by utility theory), when comparing the risk level of the portfolio before enrolling in managed accounts against the target risk level recommended for the managed accounts solution. These values provide some context as to what the potential value of receiving personalized advice or guidance on portfolio assignment would be, versus investors making these decisions themselves. Personalization usually comes with an additional cost; therefore, the values in Exhibit 10 provide an estimate of the value managed accounts can provide by focusing only on helping participants to be invested more appropriately. This assessment is independent from other potential gains, such as more-efficient portfolios (noted previously) or higher-quality portfolios (discussed next). For example, it's possible for a participant to be invested in an efficient portfolio, but one that is inappropriate given that investor's facts and circumstances.

Overall, the analysis suggests the median (average) benefit associated with more-approximate portfolios is 13 basis points (34 basis points) for self-directors and 5 basis points (16 basis points) for allocation-fund users. The impact clearly differed by ages, though, where the benefit of a more-appropriate portfolio increases at older ages (where more benefit equals a higher implied alpha misfit cost). These age differences reflect, to some extent, how the target equity allocations diverged for managed accounts participants at older ages (see Exhibit 5).

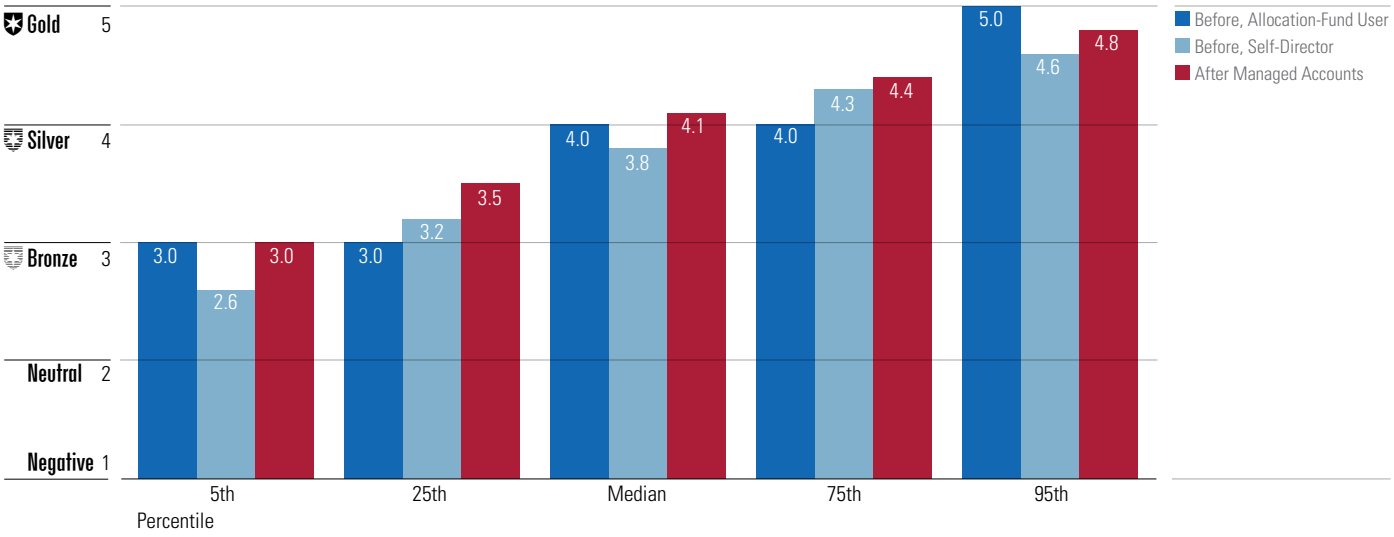
Fund Quality

The next investing test focuses on the quality of respective investment vehicles used in the portfolios before and after managed accounts. Measuring the quality of an investment is obviously a subjective exercise, where the expense ratio is likely to be a key driver in future performance (as noted by Cahart 1997, among others). Quality decisions are also somewhat unique in DC plans, for example, compared to an IRA, since the participant typically only has access to a limited number of investments (i.e., core menu), which is determined by the plan sponsor.

Morningstar Quantitative Analyst Ratings are used as the proxy for fund quality for the analysis. The Morningstar Quantitative Analyst Rating is a metric created to replicate the Morningstar Analyst Rating, when it is not available (i.e., when an analyst is not covering the fund and therefore unable to provide a rating). Morningstar launched its analyst ratings in 2011. Analyst ratings are a forward-looking assessment of a fund's ability to outperform its peer group or a relevant benchmark over a market cycle, after accounting for risk and expenses. Funds are assigned an analyst rating of Gold, Silver, Bronze, Neutral, or Negative. The higher the rating (for example, Gold versus Silver versus Neutral) the higher the analyst's conviction in a fund's ability to outperform. While the number of funds that receive analyst ratings has increased over time, analyst ratings are not available for the entire period of analysis (which begins in 2007) or for many funds considered as part of this study. Therefore Morningstar Quantitative Analyst Ratings are used for consistency across funds.

For the analysis, we assign a value to each rating: 5 for Gold-rated funds, 4 for Silver-rated funds, 3 for Bronze-rated funds, 2 for Neutral, and 1 for Negative. Given these weightings, we can then estimate the weighted average "quality" of portfolios. To be included in this analysis, ratings for all funds held by the investor before and after enrolling in managed accounts must be available. The distribution of these weighted average scores is included in Exhibit 11.

Exhibit 11 Distribution of Quantitative Analyst Ratings



The average fund quality score for allocation-fund users was 3.8 versus 3.7 for self-directors. The average score after managed accounts was 3.9. It is not surprising that the average score was higher for allocation-fund users. Participants using allocation funds will typically invest primarily or entirely in TDFs. TDFs receive significant attention from plan sponsors given high use among participants in DC plans; therefore, we would expect plan sponsors to generally select a TDF of reasonably high quality. The results of the analysis suggest plan sponsors typically select a TDF that is approximately Silver-rated, consistent with our expectations.

Among self-directors, we would expect the fund quality to be relatively high, since plan sponsors are responsible for selecting the fund available to participants (i.e., the core menu), but more of a range across participants. Our hypothesis was generally consistent with the results of the analysis.

There is a potential return benefit associated with higher quality funds. Ptak (2017) notes a relatively monotonic relation between future outperformance, using a variety of metrics, and Morningstar Analyst Ratings, where, for example, Gold-rated funds tend to outperform their peers by the most on a risk-adjusted basis, followed by Silver-rated funds, Bronze-rated funds, and so on.

In an attempt to quantify the potential benefit associated with higher quality funds and future outperformance, we generalize the findings of Ptak (2017). Using the same numeric approach to estimating the weighted average portfolio quality scores, where Gold- Silver-, Bronze-, Neutral- and Negative-rated funds receive scores of 5, 4, 3, 2, and 1, respectively, we assume an intercept of -1 and slope of 0.4 with respect to future risk-adjusted outperformance by quality rating. These

coefficients are determined using the annualized Fama-MacBeth regression statistics and the 12-month annual capital asset pricing model alpha versus Category Index results. We assume the portfolio is 75% equities and 25% fixed income, which is consistent with the approximate average participant equity allocation before and after enrolling in managed accounts. The coefficients would imply future risk-adjusted performance for a Gold-rated fund of +100 basis points, versus +60 basis points, +20 basis points, -20 basis points, and -60 basis points, for Silver-, Bronze-, Neutral- and Negative-rated funds, respectively. These values collectively imply the average fund (rated Bronze) will outperform, which obviously isn't possible; however, we are only really concerned with the relative differences across quality metrics (i.e., the slope).

If we apply these generalized coefficients to the average difference in fund quality metrics before and after entering managed accounts, which are 0.24 for self-directors and 0.14 for allocation-fund users, we would expect the selected funds after entering managed accounts to result in outperformance of 10 and 6 basis points, for self-directors and allocation-fund users, respectively, versus what the participant was holding before enrolling in managed accounts.

The extent to which these values are realized will obviously depend on a number of factors, in particular the funds selected by the plan sponsor. For example, if the TDF is relatively low quality, but the core menu is relatively high quality, we would expect a larger difference for allocation-fund users than the relation noted here. Alternatively, if the TDF is high quality, but the core menu funds are low quality, it's possible the quality impact of managed accounts could be negative. Therefore, the true impact of fund quality is likely to differ significantly across plans given the options available to participants.

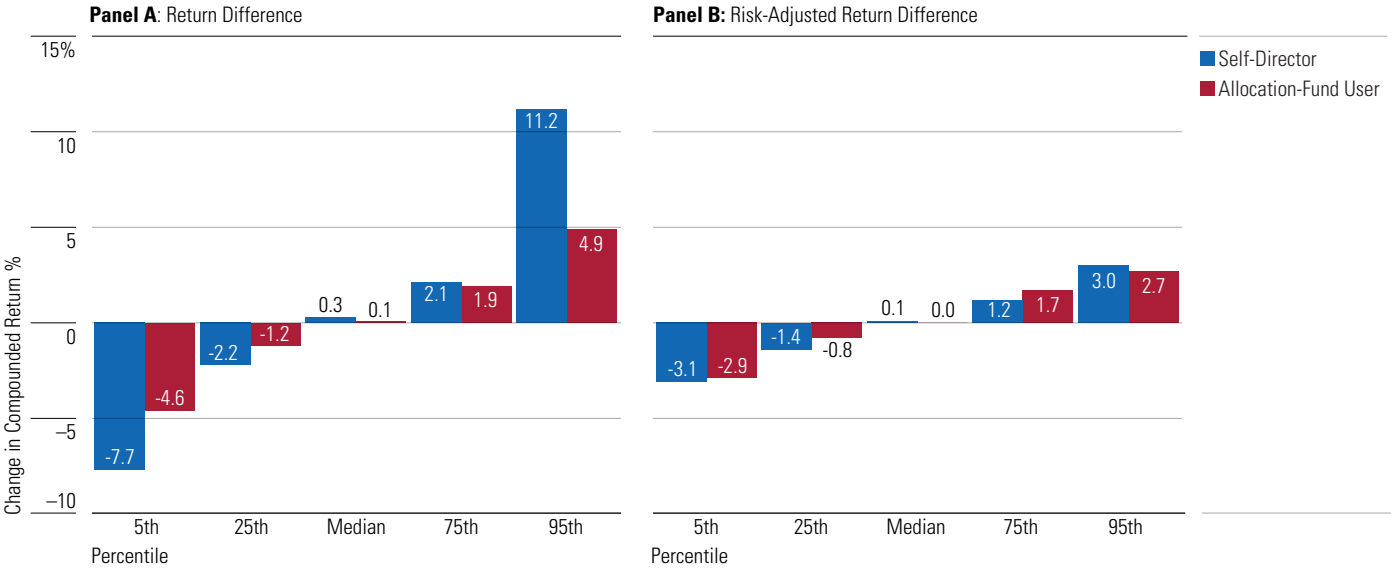
Future Hypothetical Performance

We previously noted differences in the relative efficiency and underlying fund quality of participant portfolios before and after enrolling in managed accounts. Given these differences, where managed accounts portfolios were both more efficient and contained higher quality funds than the portfolios participants were using before entering managed accounts, we would expect that the portfolios implemented in managed accounts would have outperformed participant portfolios historically. To test this hypothesis, we compare the one-year performance following the month-end enrollment date of managed accounts, for the allocations before and after enrolling in managed accounts. Note, this analysis is hypothetical in nature, because we do not know what the participant portfolio would have been one year following the managed accounts enrollment date, nor what the actual portfolio was for the managed accounts investor for the previous year.

Our analysis considers comparing both the actual portfolios and risk-adjusted portfolios. For the risk-adjusted performance, we limit the comparison to participants that had an equity allocation within 10 percentage points of the equity allocation of the portfolio before managed accounts (for example, if the implemented portfolio after managed accounts was 70% equities, the equity allocation before managed accounts would need to be between 60% and 80% equities). We cannot use the same risk-adjusted approach for the efficiency tests (detailed in Appendix 5) because the returns vary by test period. This risk-adjusted comparison allows us to try to isolate the overall risk level on the outperformance analysis.

We include only participants where we have future one-year performance information for 100% of the investments for both the before and after managed accounts portfolios. This comparison uses net returns for investments, which include the underlying expense ratio for the respective investments. The raw return differences are included in Panel A of Exhibit 12, and the risk-adjusted results are included in Panel B.

Exhibit 12 Future Hypothetical 1-Year Performance Difference Before and After Enrolling in Managed Accounts



While the distribution of potential returns were both positive and negative, the overall expected impact was postive. For example, the median (average) return difference in hypothetical future one-year returns, as seen in Panel A, was +32 basis points (+50 basis points) for self-directors and +14 basis points (+52 basis points) for allocation-fund users. The median (average) return difference in hypothetical future one-year returns, based on similar risk levels (Panel B) was +7 basis points (+20 basis points) for self-directors and +4 basis points (+22 basis points) for allocation-fund users. The range of return differences compresses after controlling for risk. This is not surprising; however, there are still notable differences even when controlling for risk. Overall, this analysis suggests managed accounts would have resulted in higher returns, although the actual participant impact differed significantly.

Savings Impact Analysis

In this section, we explore how savings rates changed for participants after entering managed accounts. The savings rate analysis is more straightforward than the investment analysis since there are fewer domains to consider.

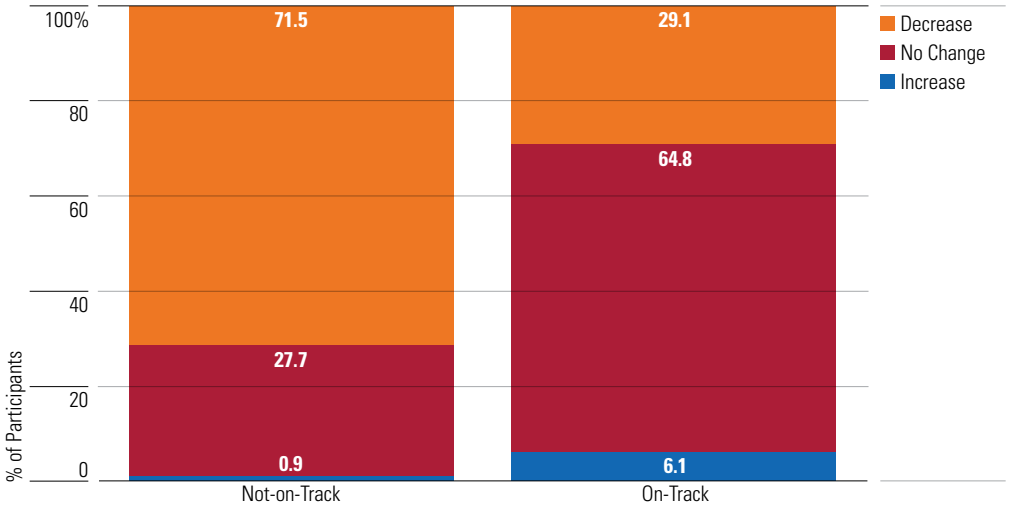
As noted previously, for the savings-rate analysis participants are segmented into two groups, based on whether the participant was forecast to be on track for retirement success. This calculation includes additional information provided about the participant's situation, which would include information about outside savings and investments.

Overall, 74% of participants were forecast to be not on track, while 26% were on track. This distribution is relatively consistent with consensus research on aggregate U.S. forecast retirement readiness, where most Americans are not expected to achieve the same level of income in retirement.

Segmenting participants by whether they were on track to retire successfully is an important distinction because savings rate recommendations will differ based on the participant's situation. Participants using Morningstar Retirement Manager managed accounts who are forecast to not be on track for retirement success will be urged to increase their savings rates, while those who are on track would only receive a recommendation to increase savings rates if the participant was not fully realizing the employer match.

We expect the differences in this messaging to have a significant impact on the resulting potential changes in savings behaviors after enrolling in managed accounts. The differences in savings rate changes for the two groups are included in Exhibit 13, where the changes are grouped into whether the change in savings rate is positive (i.e., increases), negative (i.e., decreases), or does not change.

Exhibit 13 Changes in Savings Rates Based on Whether the Participant is On Track for Retirement Success



Savings-rate behaviors were significantly different based on whether the participant was forecast to retire successfully. The majority of participants who were not on track decided to increase savings rates (71.5%) while the majority of participants who were on track did not change savings rates (64.8%). These differences are notable because the savings impact of managed accounts is likely to vary significantly based on the retirement readiness of the participant population. For example, a plan with participants that are well-funded for retirement (for example, with a generous defined benefit plan) will be less likely to realize savings-rate increases compared with a plan where participants are poorly funded (for example, in a plan with no employer match).

In Exhibit 14, we provide some perspective on the distribution of changes in savings levels. We include information on both deferral rate and total savings rate. Total savings rates include employer matching contributions. If for some reason an employer matching contribution is not available for a plan, we assume the match rate is 50% on the first 6% of deferrals.

Exhibit 14 Distribution of Changes in Participant Savings Levels

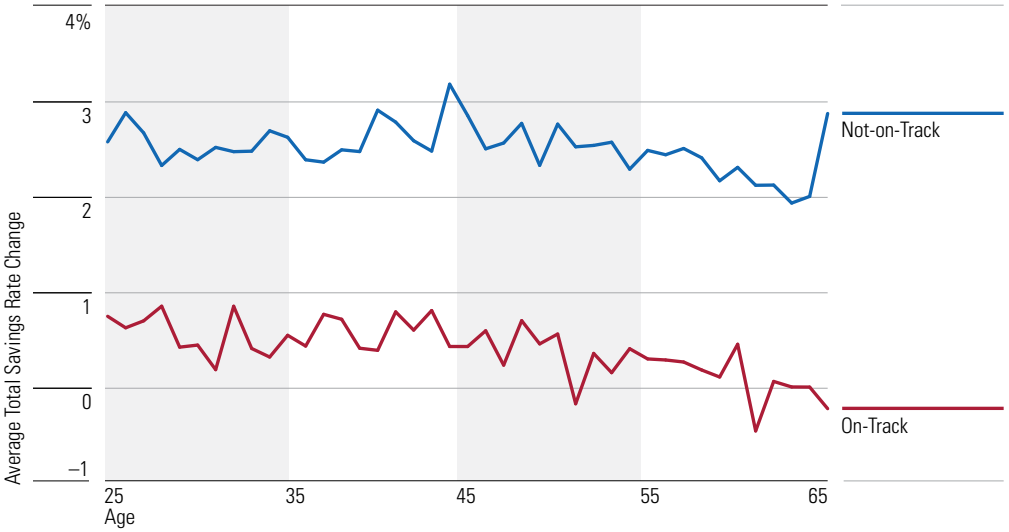
	Not-on-Track				On-Track			
	Before	After	Absolute Change	Relative Change	Before	After	Absolute Change	Relative Change
Deferral Rates								
5th	2.0	3.0	1.0	50.0	4.0	4.0	0.0	0.0
25th	4.0	6.0	2.0	50.0	6.0	7.0	1.0	16.7
Median	6.0	8.0	2.0	33.3	10.0	10.0	0.0	0.0
75th	8.0	10.0	2.0	25.0	14.0	15.0	1.0	7.1
95th	13.0	17.0	4.0	30.8	23.0	22.0	-1.0	-4.3
Average	6.5	8.7	2.2	34.0	10.9	11.4	0.5	4.1
Total Savings Rates								
5th	3.0	4.5	1.5	50.0	6.0	6.0	0.0	0.0
25th	6.0	8.3	2.3	38.7	10.0	10.5	0.5	5.0
Median	9.0	11.0	2.0	22.2	13.5	14.0	0.5	3.7
75th	12.0	14.5	2.5	20.8	19.0	19.1	0.1	0.3
95th	19.0	23.0	4.0	21.1	29.0	29.0	0.0	0.0
Average	9.5	12.0	2.5	26.8	15.1	15.6	0.5	3.2

Consistent with the results in Exhibit 13, there were notable differences in the impact of managed accounts on savings behaviors depending on the retirement readiness status of participants. The median (average) absolute change in deferral rates for those who were not on track was +2 percentage points (+2.2 percentage points) with a relative change of +33.3% (+34%). The change in deferral rate is consistent with the base recommendation used by Morningstar Retirement Manager's managed accounts if the participant was estimated to not be on track to retire successfully, which is to increase deferral rates by 2 percentage points. It is not clear to what extent a higher savings rate recommendation increase would have resulted in higher increases in savings. This is likely worth focusing on in future research.

The median (average) absolute change in deferral rates for those who were on track was +0 percentage points (+0.5 percentage points) with a relative change of +0% (+4.1%). The differences in total savings rates were higher than the changes in deferrals on an absolute basis, because total savings rates include employer matching contributions, but lower on a relative basis, because the total savings rates were higher.

Changes in savings rates were not constant across ages. In Exhibit 15, we provide information about average changes in total savings rates by age.

Exhibit 15 Average Change in Total Savings Rates by Age

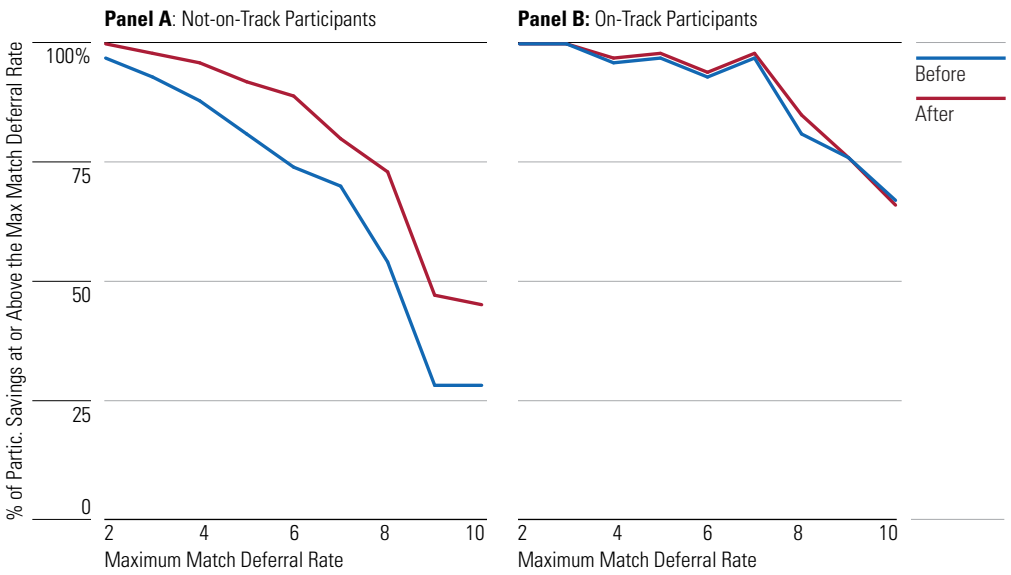


Average changes in savings rates were larger for younger participants. These were participants who, on average, were saving less for retirement before enrolling in managed accounts. This is important as higher savings rates are going to have a greater impact on retirement outcomes for younger participants, given the longer time period available for the wealth to compound (compared with older participants).

Total savings rates increased more than deferral rates because the managed accounts savings rate recommendation used by Morningstar Retirement Manager's managed accounts always considered whether the participant was achieving the maximum employer match (and total savings rates include employer contributions). Even if the participant were forecast to be on track for retirement success, the participant would receive a recommendation to increase savings up to the match since the employer match is effectively "free money."

In Exhibit 16, we provide some perspective on participants saving up to the maximum employer match limit, for different match limit levels, before and after enrolling in managed accounts, for not-on-track and on-track participants, in Panels A and B, respectively. We include only plans that offered an employer match in this analysis.

Exhibit 16 Participants Receiving the Maximum Employer Match Before and After Enrolling in Managed Accounts



On average, 12% more participants received the maximum match, when a match was available, among not-on-track participants, versus 1% among on-track participants. The fact the improvement among on-track participants wasn't as strong is not surprising, because savings rates for on-track participants were so much higher on average; therefore, they were more likely to already be receiving the maximum employer match. Participants who are older, with lower savings rates, lower salaries, and lower balances are more likely to increase savings levels.

Combined Savings and Investment Impact

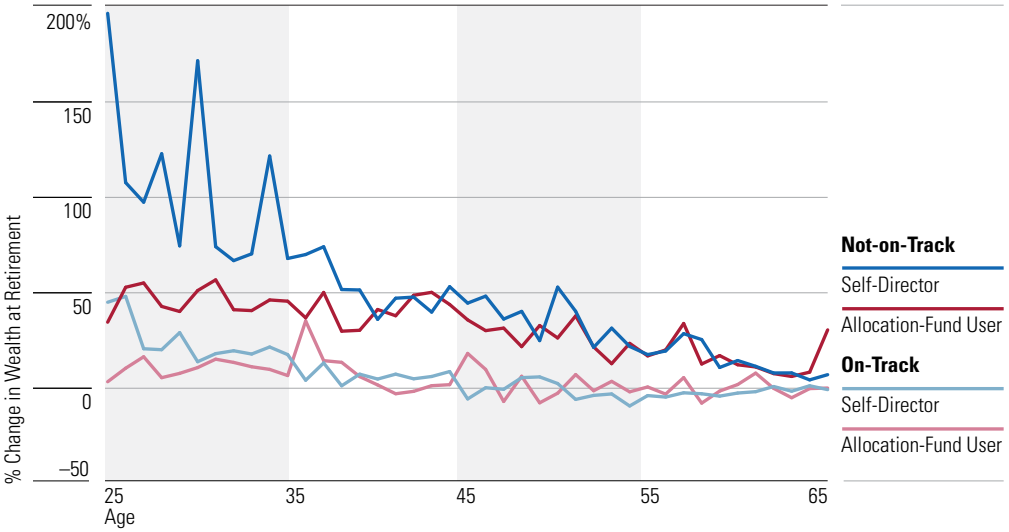
The analysis conducted so far suggests that participants who enroll in managed accounts are likely to experience higher returns and save more for retirement, on average, although the likely impact varies based on participant attributes (for example, whether the participant is on track to retire successfully). In order to determine the combined impact of these changes, we analyze expected wealth at retirement. The analysis uses a time value of money (i.e., future value) calculation, using as inputs the years to retirement at age 65, the expected geometric return of the portfolio, the total savings amount (which is the total savings rate times the income level), and the current balance. We estimate these values for participants both before enrolling in managed accounts (for example, the pre-managed accounts savings amounts and geometric returns) and after managed accounts, and focus on the difference between the two values.

This analysis effectively assumes that the income, savings rate (or amounts), and portfolio risk level remain constant until retirement. In reality, these would each likely change over time. For example, income and savings rates would generally be expected to increase with age, while portfolio risk levels would generally be expected to decrease. These changes would likely differ by individual participants and assuming these values remain constant until retirement is obviously a simplifying assumption; however, it's not clear to what extent a more complex approach would improve the projection.

For the combined analysis, participants are segmented into one of four groups, based on whether the participant is self-directing his or her portfolio and whether the participant is on track for retirement success. If we average the groups by age, so that each age has the same impact on the overall results, the largest group of participants was not-on-track self-directors (50.6%), followed by not-on-track allocation-fund users (29.1%), on-track self-directors (14.6%), and on-track allocation-fund users (5.7%).

The average estimated difference in wealth at retirement for each of the four groups, by age, is included in Exhibit 17. The results in Exhibit 17 do not include any type of assumed fee for managed accounts. The impact of fees will be addressed in future projections.

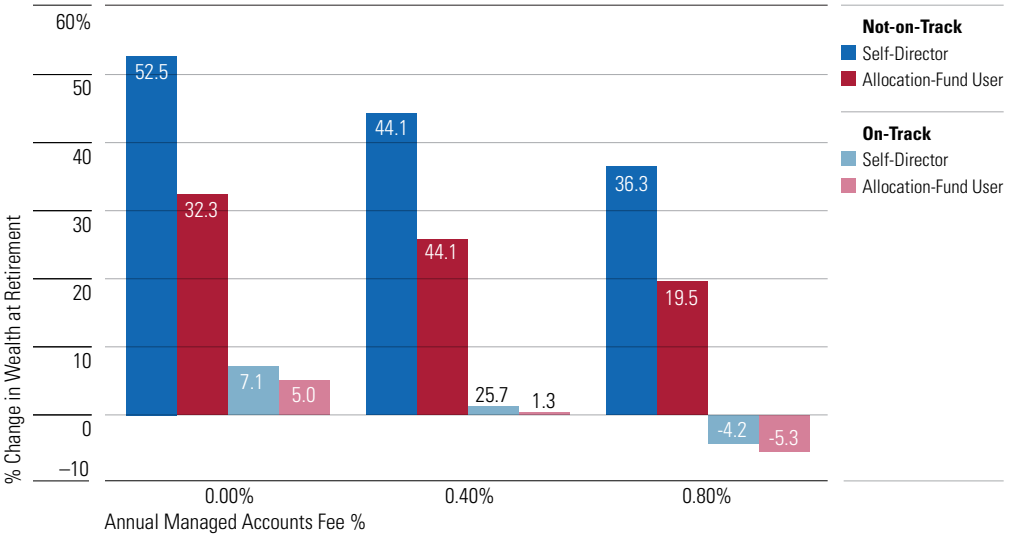
Exhibit 17 Average Change in Retirement Wealth by Participant Age (No Fee)



Younger participants would be expected to realize the greatest benefit from managed accounts, although the impact clearly varied by participant group. Not-on-track self-directors had the highest median (average) increase in projected wealth at retirement (assuming no fees) at +22% (+57%), followed by not-on-track allocation-fund users at +21% (+36%), then on-track allocation-fund users at +4% (+7%), and finally on-track self-directors at +2% (+8%).

Fees are an important aspect to consider when attempting to estimate the value of any type of advice solution. There are typically fees associated with managed account solutions, so it's important to understand how the potential value changes for different fee levels. To better understand this, we redo the analysis for Exhibit 17, but include two additional fee levels for managed accounts: 40 basis points and 80 basis points. While fees vary significantly by provider, 40 basis points is a reasonable proxy for the average fee assessed by managed accounts providers today. All fees for the analysis are assumed to be assessed annually against the DC balance (each year) until retirement. These results are included in Exhibit 18.

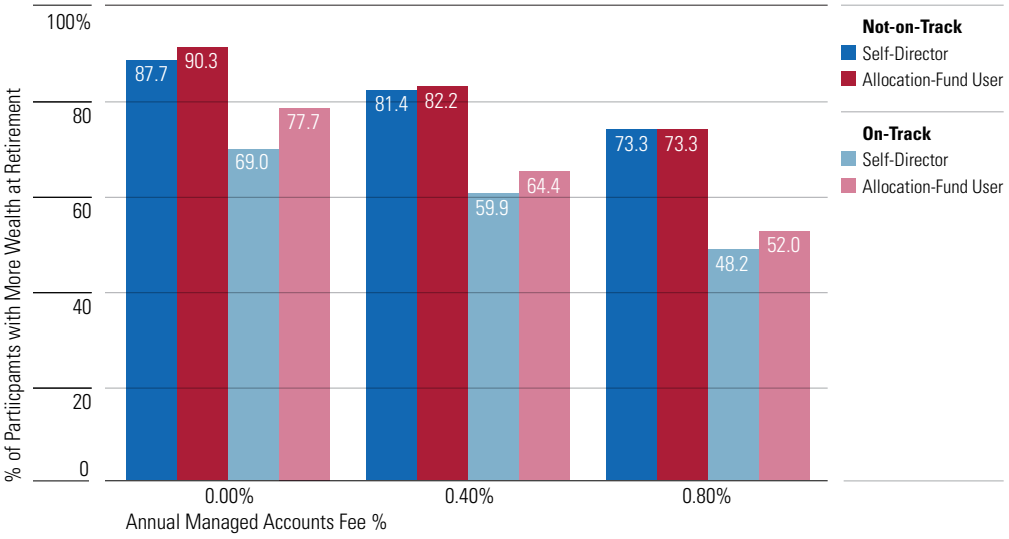
Exhibit 18 Average Change in Retirement Wealth by Managed Accounts Fee



A 40-basis-point fee, which is a reasonable approximation of the average fee today assessed for managed accounts services, results in a decrease in the estimated wealth at retirement, although the average wealth was even or positive for each of the four groups. The expected median (average) change in wealth at retirement fell to +15% (+47%) for not-on-track self-directors, +14% (29%) for not-on-track allocation-fund users, +0% (+0%) for on-track allocation-fund users, and -1% (+2%) for on-track self-directors.

In Exhibit 19, we estimate the percentage of participants who had more wealth at retirement for different fee levels.

Exhibit 19 Percentage of Participants with More Wealth at Retirement



We find that most participants would be expected to have more wealth at retirement, especially participants who were not on track for retirement success. This is primarily attributable to the increases in savings levels noted among participants who were not on track for retirement success when entering managed accounts. Not surprisingly, the percentage of participants who are better off declines at higher assumed fee levels.

More wealth at retirement should result in more retirement income. To provide some perspective on the potential impact of managed accounts on retirement income, we convert the expected wealth differences into income values. For this calculation, we simply divide the difference in wealth at retirement by 25 and assume that is the difference in income the participant would receive during retirement. This factor (25) is effectively assumes that the participant takes a 4% initial withdrawal from the portfolio at retirement, where that amount is increased annually for inflation. While the 4% rule may be less prudent today, given lower expected returns compared with historical long-term averages (Blanchett 2017b), it is a reasonable simplifying income assumption for the purposes of this analysis.

The average impact of managed accounts on annual retirement income is estimated for various age groups and fee levels for the four participant groups noted previously, and the results are included in Exhibit 20.

Exhibit 20 Annual Retirement Income Impact of Managed Accounts

	Not-on-Track		On-Track		
Managed Accounts Fee / Age Group	Self-Director ($)	Allocation-Fund User ($)	Self-Director ($)	Allocation-Fund User ($)	All Participants ($)
No Fee					
25–34	10,964	5,230	7,774	2,135	8,232
35–44	5,687	3,400	–292	732	4,153
45–54	2,148	1,243	–1,797	–444	1,346
55–65	325	266	–851	–232	90
40 bps Fee					
25–34	8,212	3,279	3,418	–496	5,548
35–44	4,033	2,288	–2,916	–747	2,566
45–54	1,483	795	–2,884	–1,202	690
55–65	181	171	–1,138	–391	–66
80 bps Fee					
25–34	5,726	1,516	–506	–2,870	3,126
35–44	2,502	1,256	–5,337	–2,115	1,096
45–54	849	367	–3,917	–1,922	66
55–65	40	79	–1,419	–547	–219

Consistent with the results in Exhibit 17, younger participants are likely to realize more annual income in retirement from managed accounts than older participants. If we focus on the youngest age group (25 to 34), we could generally assume that the average 30-year-old participant using a managed accounts service would increase his or her retirement income by $8,232, on average, assuming no managed fee, and $5,548 assuming a 40-basis-point managed accounts fee. These correspond to percentage increases of 72% and 56%, respectively.

Conclusions

We find strong evidence that managed accounts can better prepare more defined-contribution participants for retirement success through higher savings rates and more-efficient portfolios. However, the realized benefit will vary by participant and the fee charged for the service. The participants most likely to benefit from managed accounts include those self-directing their investments who are not on track to retire successfully, while those least likely to benefit include those invested in an allocation fund (like a target-date fund) who are on track to retire successfully.

This analysis considered two potential domains where managed accounts can add value: saving and investing. However, managed accounts can help participants achieve better outcomes in numerous other areas, such as guidance on when to retire, when to claim Social Security, how to efficiently withdrawal money to fund retirement, how to invest when considering taxes, and so forth. While this research suggests a positive impact to the average managed accounts user, when considered alongside other benefits, the true value of managed accounts may be significantly greater.

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Appendices

Appendix 1: Portfolio Assignment Approach

The approach to determining the appropriate risk level for an investor's optimal portfolio allocation (i.e., portfolio assignment) is based on taking a holistic view of an investor's assets. This approach incorporates the total value and risk attributes of assets that are often overlooked, such as human capital and pension wealth, and uses the financial assets in the DC plan as the "completion portfolio" to ensure diversification of the individual's total wealth.

A fundamental part of the total wealth process is modeling and understanding how an individual's wealth changes over the lifecycle. For younger individuals, human capital is typically the dominant household asset. Human capital can be thought of as the mortality-weighted net present value of an individual's future wage income. As individuals age, they tend to save money for retirement, thereby accumulating financial assets (both inside the DC as well as potentially outside it), along with accruing benefits in pension plans (such as Social Security). In other words, over time investors convert a portion of their salary (i.e., human capital) into financial capital by saving and accruing pension benefits, both of which can be used to fund retirement.

Research by Blanchett & Straehl (2015), among others, has noted that human capital is generally a relatively bond-like asset—it usually pays a steady "coupon" in the form of a paycheck, but its risk varies considerably across business cycles, by job skills, as well as the specific occupation and industry of the worker. Because human capital is bond-like and untradeable, a younger investor's financial assets should be invested more aggressively to achieve a more balanced risk level from a total wealth perspective. As the relative value of human capital (as a percentage of total wealth) declines as the individual ages, financial capital should be invested more conservatively to ensure the risk of the total wealth remains balanced throughout the lifecycle. This is the economic rationale underpinning the shape of many glide paths today.

The final two considerations when determining the optimal risk level for a participant's portfolio. The first is how "on track" that individual/household is for retirement. Within the portfolio assignment process, individuals who are better funded (i.e., have higher funded ratios) can potentially take on more risk in their portfolio based on their target risk level using the total wealth approach. Second, other nonadviseable portfolios (for example, an IRA or really any monies outside the DC plan) must be considered. For example, if an investor has a large IRA that is invested very aggressively, yet the overall total wealth target risk level is more balanced, the monies in DC plan should be invested more conservatively (and vice versa).

Appendix 2

Exhibit 21 RBSA Index Proxies

RBSA Index Proxies	Index Proxy
Cash	IA SBBI US 30 Day TBill
Short Bond	BBgBarc US Govt/Credit 1-3 Yr
Long Bond	BBgBarc US Govt/Credit Long
TIPS	BBgBarc Gbl Agg Ex USD
High Yield Bond	BBgBarc Gbl Infl Linked US TIPS
NonUS Bond	BBgBarc US Corporate High Yield
Large Growth	Russell 1000 Growth
Large Value	Russell 1000 Value
Small Growth	Russell 2000 Growth
Small Value	Russell 2000 Value
International Equity	MSCI EAFE GR
Emerging Markets	MSCI EM GR
Real Estate	FTSE EPRA/NAREIT Developed
Commodities	Bloomberg Commodity

Appendix 3

Exhibit 22 Capital Market Assumptions

			Asset Class #														
# Asset Class	Return	Std Dev	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Cash	1.00	0.40	1.00	0.40	0.02	-0.01	0.04	0.09	-0.03	0.01	-0.03	0.00	0.01	-0.04	0.01	0.06	-0.01
2 Short Bond	0.40	1.00	0.40	1.00	0.75	0.65	0.28	0.50	-0.06	0.02	-0.02	0.04	0.00	-0.13	0.12	-0.08	-0.02
3 Long Bond	0.02	0.75	0.02	0.75	1.00	0.72	0.34	0.53	0.04	0.10	0.07	0.12	0.10	-0.06	0.20	-0.09	0.07
4 TIPS	-0.01	0.65	-0.01	0.65	0.72	1.00	0.36	0.50	0.03	0.09	0.08	0.13	0.11	0.00	0.22	0.00	0.06
5 High Yield Bond	0.04	0.28	0.04	0.28	0.34	0.36	1.00	0.31	0.46	0.49	0.48	0.51	0.55	0.44	0.55	0.27	0.47
6 NonUS Bond	0.09	0.50	0.09	0.50	0.53	0.50	0.31	1.00	0.16	0.27	0.16	0.24	0.49	0.19	0.37	0.15	0.22
7 Large Growth	-0.03	-0.06	-0.03	-0.06	0.04	0.03	0.46	0.16	1.00	0.82	0.84	0.71	0.78	0.66	0.68	0.25	0.91
8 Large Value	0.01	0.02	0.01	0.02	0.10	0.09	0.49	0.27	0.82	1.00	0.73	0.85	0.82	0.65	0.76	0.28	0.91
9 Small Growth	-0.03	-0.02	-0.03	-0.02	0.07	0.08	0.48	0.16	0.84	0.73	1.00	0.84	0.72	0.64	0.68	0.24	0.79
10 Small Value	0.00	0.04	0.00	0.04	0.12	0.13	0.51	0.24	0.71	0.85	0.84	1.00	0.73	0.62	0.73	0.24	0.78
11 International Equity	0.01	0.00	0.01	0.00	0.10	0.11	0.55	0.49	0.78	0.82	0.72	0.73	1.00	0.74	0.79	0.35	0.80
12 Emerging Markets	-0.04	-0.13	-0.04	-0.13	-0.06	0.00	0.44	0.19	0.66	0.65	0.64	0.62	0.74	1.00	0.70	0.36	0.65
13 Real Estate	0.01	0.12	0.01	0.12	0.20	0.22	0.55	0.37	0.68	0.76	0.68	0.73	0.79	0.70	1.00	0.26	0.72
14 Commodities	0.06	-0.08	0.06	-0.08	-0.09	0.00	0.27	0.15	0.25	0.28	0.24	0.24	0.35	0.36	0.26	1.00	0.26
15 Company Stock	-0.01	-0.02	-0.01	-0.02	0.07	0.06	0.47	0.22	0.91	0.91	0.79	0.78	0.80	0.65	0.72	0.26	1.00

Source: Morningstar Investment Management LLC

Appendix 4: Risk-Adjusted Portfolio Efficiency

To estimate the risk-adjusted portfolio efficiency we for each portfolio we use the estimated risk and return values for each portfolio and compare those values to a risk-adjusted benchmark. The benchmark is a two-asset portfolio, consisting of a safe and risky asset. The safe asset is assumed to be 100% Cash, which has an expected return of 1.6% and a standard deviation of 1.7%. For the risky asset, we assume an allocation that is 20% large growth, 20% large value, 10% small growth, 10% small value, 25% international equity, and 15% emerging market (i.e., a well-diversified portfolio of risky securities). The risk asset has an expected return of 9.3% and a standard deviation of 18.8%. The correlation between the risky and safe asset is assumed to be zero.

We determine the arithmetic return $R_{p,a}$ and standard deviation σ_p for each combination between the safe and risk asset from 0% to 100% in 1% increments. For each increment we estimate the geometric return $R_{p,g}$using equation 4.1)

$$R_{p,g} = e^{\left(\ln\left(1+R_{p,a}\right)-.5\ln\left(1+\frac{\sigma_p}{\left(1+R_{p,a}\right)^2}\right)\right)} - 1 \qquad [\,4.1\,]$$

Next, we determine the compounded returns for each increment between the safe and risky asset from 0% to 100% in 1% increments. This gives us target compounded return for each portfolio standard deviation. We determine the portfolio efficiency by subtracting the actual portfolio geometric return to the target compounded return based on the participant portfolios standard deviation.

For example, if the standard deviation of a portfolio σ_p was 10% (based on the underlying sub-asset class exposures), the return target R_t would be 5.32%. If the expected return of the portfolio was only 5.00%, the portfolio efficiency would be –.32%. This calculation is performed for both the allocation before and after entering managed accounts.

Appendix 5: Risk Appropriateness

Harry Markowitz (1952) established the mean-variance optimization framework, which requires three sets of inputs: returns, standard deviations, and pair-wise correlations for the assets in question. When seeking the optimal mix (the utility maximizing mix) for a specific investor, the mean-variance optimization framework can be determined using equation 5.1, where U is the investor's utility for the asset allocation, R_p is the return of the asset allocation, λ is the investor's risk aversion coefficient, and σ_p^2 is the expected variance of return of the asset allocation.

$$U = E(R_p) - .5\lambda\sigma_p^2 \qquad [5.1]$$

In a two-asset portfolio, we can determine the target risk aversion level for a portfolio using equation 5.2

$$\lambda = \frac{R_e - R_b}{(\sigma_e^2 + \sigma_b^2 - 2\sigma_{e,b}) * (wt_e - \sigma_{e,b} - \sigma_b^2)} \qquad [5.2]$$

The two-asset portfolio is assumed to consist of a safe and risky asset. We use the same assumptions for the safe and risky asset as those used for the risk-adjusted efficiency test, as noted in Appendix 4.

For this test, the ideal equity allocation is assumed to be the managed accounts recommended portfolios. This ideal allocation would be assumed to result in zero utility loss, since it represents the utility-maximizing asset allocation. We can use this target equity allocation, which is assumed to be target allocation to the risky asset, in conjunction with equation 5.2 to estimate the implied target risk-aversion λ_t coefficient that would make the recommended stock/bond asset allocation the utility-maximizing mix. Unless the asset allocation of both the recommended and existing allocations are identical, there is a potential loss associated with being invested sub-optimally.

Next, given the risk of the target equity allocation σ_t^2 and the participant's portfolio before managed accounts σ_c^2 we can determine the "utility cost" for being invested sub-optimally, using equation 5.3

$$Utility\ Cost = (E(R_t) - .5\lambda_t\sigma_t^2) - (E(R_c) - .5\lambda_t\sigma_c^2) \qquad [5.3]$$

For readers interested in learning more about this model, we recommend Blanchett (2017a) or Idzorek, Blanchett, & Bruns (2018).

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