Separate Account vs Mutual Fund Investors: Manager Selection and Performance

Howard Jones, Jose Vicente Martinez, and Alexander Montag*

ABSTRACT

Separate account investors outperform category-matched mutual fund investors yearly by 14─24 bps gross and 50─75 bps net. This outperformance is entirely explained by structural and reporting differences between the vehicles and by size differences between investments. Controlling for the average outperformance of separate accounts over their mutual fund twins, separate account investors perform at the same level as mutual fund investors, gross of fees, and slightly below them, net. Separate account investors choose products that, once adjusted, are more expensive than those chosen by mutual fund investors. Their fixed income picks do better whereas their equity picks do worse.

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* Howard Jones (howard.jones@sbs.ox.ac.uk) is with the Saïd Business School, University of Oxford; Jose Vicente Martinez (jose.v.martinez@uconn.edu) is with the University of Connecticut, School of Business; Alexander Montag (montaga@iu.edu) is with Indiana University. We are grateful to Vikas Agarwal, Markus Broman, Egemen Genç, Jaejin Lee, and participants at the 34th Australasian Finance & Banking Conference and the 2023 Financial Management Association Conference for comments and suggestions. Financial support from INQUIRE-Europe is gratefully acknowledged.

I. INTRODUCTION

Separate (or 'segregated') accounts are the main means by which large institutional investors delegate the management of portfolios to asset managers. Their performance is closely scrutinized by practitioners and, increasingly, researchers. In the most comprehensive study to date, Gerakos, Linnainmaa, and Morse (2021) show that investments in actively managed portfolios, which are predominantly separate accounts, significantly outperform strategy benchmarks as well as investments in mutual funds.[1] This outperformance is consistent with the predictions of Gârleanu and Pedersen (2018) that separate account investors, being larger and more sophisticated, are better equipped to select managers than mutual fund investors. This interpretation, however, implicitly assumes that reported returns for separate account and mutual fund vehicles are directly comparable.

In this study, we question this assumption and provide empirical evidence for an alternative explanation for the outperformance of separate account investors over mutual fund investors: structural differences between the vehicles in terms of liquidity provision, customization, and reporting practices coupled with significant differences in investment size. These differences combine to create a wedge between the reported performance of even near-identical separate account and mutual fund portfolios and fully explain the aggregate performance differences between the two groups of investors. In aggregate, therefore, investors in separate accounts seem no more skilled at selecting managers than investors in mutual funds.

[1] Evidence about mutual funds' ability to beat benchmarks or generate alpha is less straightforward. While the early literature on the topic tends to find no evidence of mutual fund outperformance (see Jensen, 1968, and Carhart, 1997), a more recent study by Berk and van Binsbergen (2015) provides evidence to the contrary, but returns do not seem as big as those of separate accounts and, after fees, are not higher than benchmarks.

The open-ended structure of mutual funds exposes them to unscheduled investments and redemptions, forcing them to provide liquidity to their investors and eroding performance.[2] Investments and redemptions are also costly for separate account investors, but separate account performance measures usually do not capture such costs. Separate account composites can exclude at least some of the costs of investment and divestment under the reporting rules that allow them temporarily to leave an account out of a composite index if that account experiences significant cashflows in or out. This exclusion is even clearer when asset owners use specialized managers (transition managers) to invest or liquidate separate account holdings. In addition to differences in the way mutual funds and separate accounts deal with flows and report performance, these two structures also differ in terms of the services they provide and charge investors for. Mutual funds bundle together a broader set of services, including custody and set-up, which separate account investors pay for independently. This broader coverage, coupled with the generally smaller size of individual investments, tends to result in larger mutual fund fees and lower (reported) net-of-fees performance. Partially offsetting these differences, separate accounts face a potential drag of their own if they are customized to meet client demands, as this places constraints on the asset manager.

To isolate the effects of structural differences between separate accounts and mutual funds we exploit the fact that investment management companies frequently offer 'twins', that is, near-identical separate account and mutual fund portfolios with the same manager and investment strategy. Our analysis points to a significant performance gap between these twins. Separate accounts have annual gross reported excess returns and alphas on average between 16 bps and 23 bps per year higher than the gross excess returns and alphas reported by their mutual fund twins. This gap increases with the illiquidity of the investment category, consistent with the cost for funds

[2] Redemptions in kind help alleviate, but do not completely eradicate, this problem in mutual funds (see Agarwal, Ren, Shen, and Zhao (2023)).

of facing investor subscriptions and redemptions (or providing liquidity for them) being higher in more illiquid categories. The performance gap widens when fees are included. Headline fees for separate accounts are lower than reported fees for their mutual fund twins – by about 59 bps for a medium-size mandate. Higher mutual fund fees reflect the smaller investments in mutual funds than in separate accounts, the more significant regulatory requirements of mutual funds, and the fact that mutual fund fees cover other costs, such as marketing, custody, and audit costs, which separate account fees generally do not.

We estimate a decomposition of this structural performance gap between mutual-fund and separate-account twins. Of the 80 bps superior net performance reported for a medium-sized institutional investor ($75mn mandate) in a separate account over a mutual fund, 72% reflects the difference in fees and 28% reflects the difference in gross performance. The fee gap of 72% can itself be decomposed into 29% for the difference in coverage, namely that mutual fund fees include some costs that separate account fees exclude, and 43% for differences due to the larger size of separate account investments, with the economies and bargaining power that affords them. As for the gross performance gap of 28% of the total structural difference, we estimate that transition costs, which are generally excluded from reported separate account performance but are included in mutual fund performance, represent around 17%, leaving a residual of 11%. We suggest that this residual reflects the countervailing effects of customization, which potentially harms the reported performance of separate account composites, and exclusion from composites of accounts experiencing large flows, which potentially benefits their reported performance.

The structural performance gap in our subsample of separate account/mutual fund twins matches the overall asset-weighted performance difference between separate account and mutual fund investments in our full sample. Separate account investors outperform category-matched

mutual fund investors by between 14 bps and 24 bps per year, gross of fees, and by between 50 bps and 76 bps per year, net of fees.[3] Controlling for the average outperformance of separate accounts over their mutual fund twins, separate account investors therefore perform at the level of mutual fund investors, gross of fees, and slightly below them, net. Accordingly, the outperformance of separate account investors can be attributed entirely to structural and reporting differences between these vehicles and the greater size of investments in separate accounts and consequently lower fees, with no evidence that separate account investors choose better managers.

More refined calculations of the gap (by investment category or liquidity-based) do not alter this basic result. Neither does restricting the analysis to the asset-weighted subsample of separate accounts/mutual funds with twins. Separate account investors choose products that, once adjusted for structural differences, offer about the same underlying performance as those chosen by mutual fund investors. Their fixed income choices are better while their equity choices are marginally worse. Structural differences aside, their chosen products are, if anything, more expensive, so that in net terms their choices seem worse than those of mutual fund investors, especially in equities.

The failure of separate account investors to outperform mutual fund investors may come as a surprise. After all, separate account investors (being mostly institutional) are typically larger and more sophisticated than mutual fund investors and, as pointed out by Gârleanu and Pedersen (2018), we should expect such investors to have an advantage in manager search and selection. A possible explanation for this result may relate to a problem highlighted by Lakonishok, Shleifer and Vishny (1992), that pension funds (which, by their sheer size, dominate the group of separate

[3] Our estimates are smaller than those obtained by Gerakos, Linnainmaa, and Morse (2021) but equally significant. If we restrict the sample to match Gerakos, Linnainmaa, and Morse's (2021) sample period the difference goes up, but so does the gap between twins.

account investors) are characterized by multiple layers of agents, some of whom provide services which have more to do with justifying decisions than with enhancing performance (see also Jones and Martinez (2017), Hochberg and Rauh (2013), and Andonov, Hochberg, and Rauh (2018)).

Our paper is related to a growing number of studies looking at, or using, separate account composites. Most notable among them are Busse, Goyal, and Wahal (2010), the first large-scale study of performance persistence in separate accounts; Elton, Gruber, and Blake (2014), a comparison of separate accounts and mutual funds as investment vehicles; Gerakos, Linnainmaa, and Morse (2021), the most comprehensive performance study to date; Jenkinson, Jones, and Martinez (2016), a study using separate account composites to investigate investment consultants; or Huang et al. (2024), which argues that separate account assets should be included in scale measures of their mutual fund twins. Since our identification strategy involves separate-account/mutual-fund twins, our paper is related to other work on twinned portfolios, notably Evans and Fahlenbrach (2012), which shows that retail mutual funds with an institutional twin outperform, and studies of mutual fund/separate account twins by Chen et al. (2017) and Rohleder et al. (2023). Our paper differs from these studies in that we utilize separate account/mutual fund twins to isolate and quantify the impact of structural, reporting, and size differences between these two vehicle types. This, in turn, allows us to distinguish between the relative performance of the vehicles (separate account wrapper vs. mutual fund wrapper) and the relative performance of the investors who choose from among each group.

More indirectly, our paper relates to the work of Edelen (1999), which argues that fund managers provide a great deal of liquidity to investors and thus engage in a material volume of uninformed, liquidity-motivated trading, which likely harms fund returns. Owing to the commingling of assets and the net asset value rule, investors who redeem their mutual fund shares

impose externalities on those who do not. Chen, Goldstein, and Jiang (2010) and Goldstein, Jiang, and Ng (2017) show that these externalities increase the incentive for each individual investor to withdraw and amplifies the damage to the fund, particularly in illiquid funds.

The rest of the article is organized as follows. Section II provides institutional details about separate accounts and mutual funds. Section III explains the sample construction and shows descriptive statistics. Section IV compares separate account composites and mutual funds aggregate performance. Section V explores the baseline differences between these two vehicles. Section VI looks at the selection performance of separate account and mutual fund investors, and section VII concludes.

II. SEPARATE ACCOUNTS AND MUTUAL FUNDS

Mutual funds pool assets for multiple investors, who each own shares (or 'units') in the fund rather than having a direct holding in the fund's underlying assets, and they are open-ended, meaning that the number of shares in the fund can increase (decrease) as investors purchase (redeem) them. In the US, purchases and redemptions generally take place at a single price per share set at the end of each day at the net asset value per share of the fund (the 'NAV rule').[4] Separate accounts, by contrast, are each managed for a single investor, who owns the underlying assets directly, typically through a custodian. Among practitioners, separate accounts are also called 'segregated accounts'. In the academic literature, although some studies include separate accounts in their analysis (e.g. Evans and Fahlenbrach, 2012), most tend to combine institutional portfolios that are not mutual funds under blanket names such as 'funds' (Lakonishok, Shleifer, and Vishny, 1992), 'products'

[4] Since November 2018, 'swing pricing', whereby a fund can adjust its net asset value per share for subscriptions and redemptions to reflect the costs to the fund of accommodating them (see Jin et al., 2021), has been permitted in the US, but the practice is extremely rare.

(Busse, Goyal, and Wahal, 2010), or 'asset manager funds' (Gerakos, Linnainma, and Morse, 2021).

Both mutual funds and separate accounts typically charge investors a management fee as a percentage of the value of the investment. In mutual funds this fee covers marketing costs, which separate accounts do not incur, as well as costs which are common to both types of vehicle but generally not included in separate account fees – notably custody costs.[5] Mutual funds charge the same fees to all investors in the same share class, while separate account fees are negotiable.[6] In both mutual funds and separate accounts, brokerage and other transaction costs incurred by the portfolio are passed onto investors through the performance of the portfolio rather than directly. When investors in mutual funds purchase or redeem shares, they usually do so in cash at the net asset value (under the NAV rule), although mutual funds may reserve the right to satisfy large redemptions in kind (or *in specie*), that is, by transferring a basket of the underlying assets to investors. Since the threshold to do so in the US is $250,000 or 1% of the net asset value of the fund (see Agarwal et al., 2023), redemptions in kind typically apply only to institutional investors.

In their reporting, managers of separate accounts adhere to the Global Investment Performance Standards (GIPS; for the latest edition, see CFA Institute, 2020). These require managers of several portfolios with a similar investment strategy to represent their performance in a single composite index, which gives the weighted average of the performance of its constituents. Investment managers are permitted temporarily to exclude an account from a composite index if that account experiences significant cashflows in or out. This would occur if, for example, an

[5] Management and custody fees are ongoing fees and do not include initial costs. Some mutual funds charge a 'front-end load' on the initial subscription (and sometimes a 'back-end load' on redemption). The costs of setting up a separate account typically include the fees of lawyers, auditors and, for foreign investments, tax consultants.

[6] Many mutual funds have only one single share class. When an asset manager offers retail and institutional twins, the creation of more than one share class allows them to charge different fees to each (see Evans and Fahlenbrach, 2012).

account had received a cash subscription so large that the fund manager would need considerable time before investing the cash according to the fund's strategy. Practitioners report that such exclusions are not common because most inflows large enough to trigger an exclusion tend to come from institutional investors who use transition managers to ensure that inflows are already in the form stipulated by the fund manager (e.g. a portfolio of equities exactly matching the model strategy of the new manager) rather than cash.[7] Mutual fund performance data, on the other hand, are available at a more granular level (fund and share class) and at that level no exclusions are possible.[8]

Given their ability to scale, mutual funds allow small investors to achieve lower transaction costs and greater diversification than separate portfolios while also providing their customers with valuable liquidity services (see Chordia, 1996; and Chernenko and Doan, 2022). On the other hand, the commingling of assets and the NAV rule mean that mutual fund investors who redeem shares impose negative externalities on those who do not (see Edelen, 1999). There are various reasons for these externalities. First, to the extent that investors going into or out of mutual funds are guaranteed a price equivalent to the net asset value of their shares under the NAV rule, they do not bear the transaction costs incurred by the fund in adjusting the underlying portfolio, but bequeath them to continuing investors in the fund.[9] Secondly, to accommodate in- and outflows at short notice, the composition of a mutual fund portfolio is likely to deviate from that of the model

[7] When institutional investors use a transition manager to switch portfolios, the transition manager transfers in kind the assets common to both portfolios (this part of the transition is called 'retention') and liquidates the balance, investing the proceeds to create the target portfolio requested by the new manager. The costs of the transition are covered by the asset owner.

[8] Mutual fund performance data are available from various sources, with the Center for Research in Security Prices (CRSP) and Morningstar databases among the most widely used in the academic literature. On separate account composites, in addition to Morningstar, databases compiled by eVestment, Mercer, and Informa Financial Intelligence have been used for academic research.

[9] Mutual funds can pass these transaction costs onto those subscribing or redeeming shares in the fund by swing pricing (Jin et al., 2021), and they can discourage redemptions by temporarily prohibiting them ('gating') or by charging redemption fees (Cipriani et al., 2014).

portfolio, at least temporarily. Finally, to cater for unpredictable outflows, mutual funds may hold a high level of cash, which can act as a drag on performance (for details, see Alexander, Cici, and Gibson, 2007, and Rakowski, 2010). These externalities can increase the incentive for each investor to redeem their shares in mutual funds (see Chen, Goldstein, and Jiang, 2010). This incentive is larger, and the costs associated with redemptions greater, in illiquid funds (Goldstein, Jiang and Ng, 2017). All these effects are likely to harm the performance of mutual funds.

Separate accounts do not offer small investors the scale benefits of mutual funds. On the other hand, being neither commingled nor subject to the NAV rule, they do not suffer the negative externalities mentioned above. Moreover, being separately managed, they can be customized along various dimensions, notably asset mix, style, tax structure, or (in the case of fixed income portfolios) duration. Separate accounts can also be structured to reflect an asset owner's individual environmental, social, and governance (ESG) preferences.[10] Reflecting the relative advantages of mutual funds and separate accounts, the former are predominantly retail products: at the end of 2020, 89% of the US mutual fund assets were held by households, with the remainder owned by institutional investors (IC 2021). By contrast, separate accounts are largely, if not exclusively, aimed at institutional investors. There are, however, occasions when institutional investors opt for mutual funds rather than separate accounts, notably when the convenience of a mutual fund outweighs the benefits of customization. Mutual funds spare investors the frictional costs of setting up an account, e.g. dealing with custodians, lawyers, auditors, and, for foreign investments, market authorities, tax consultants, and regulators; a small institutional investor may find these frictional costs too great and invest only in mutual funds. But institutions of any size seeking to invest in a complex mix of assets and markets, especially if they wish to do so quickly, are likely to find

[10] When a particular customization results in a significantly different product or when that customization becomes common (e.g., to accommodate ESG preferences) it usually results in the creation of a separate composite.

mutual funds attractive because here the costs, delays, and risks of setting up a separate account themselves are often prohibitive. This is especially the case in emerging markets where local knowledge is paramount.

In the present paper we are interested in the impact of structural differences, whether in terms of liquidity provision, customization, or size, on the relative performance of mutual funds and separate accounts, and we use 'twin' products to measure it. According to asset managers, a twin product is typically created when a mutual fund or separate account has performed well and the manager creates a near-replica to appeal to a different clientele; for example, a mutual fund might be replicated from a separate account that has consistently outperformed.[11] Not all twins comprise one mutual fund and one separate account: there are also mutual fund twins targeted at distinct retail and institutional clienteles. According to practitioners, deviations in performance between twins are small, reflecting the fact that they have the same portfolio manager and strategy and that there is a potential legal liability for performance differences (see Evans and Fahlenbach, 2012). At the same time, practitioners report that identical performance is in practice impossible. Some portfolio managers are prepared to accept short-term differences in portfolio composition between twins if this will improve the performance of one of the twins without harming that of the other. For example, a manager may refrain from acting immediately on every small flow into or out of a mutual fund but wait until cumulative net flows make it economical to trade in the fund's underlying securities. And even if some portfolio managers delegate to a dedicated implementation team the task of achieving maximum replication between twin products, the different flows experienced by one twin compared with the other make short-term performance gaps unavoidable.

[11] The fractions of separate accounts and mutual funds that are set up first in our twins sample are of similar magnitude, with 43% for separate accounts and 34% for mutual funds. For the other 23% of twins, both vehicles are set up at the same time.

III. DATA DESCRIPTION

We draw our data on mutual funds and separate accounts for the period 2000–2019 from Morningstar. For mutual funds, Morningstar collects general information from public sources such as regulatory filings and fund company documents. For performance-related information (including total returns, net asset values, dividends, and capital gains) and for details on underlying portfolio holdings, Morningstar receives daily updates from individual fund companies, transfer agents, and custodians.

Morningstar's separate account database requires more specialized information, which is gathered by surveys of fund management companies. The reporting unit for performance data is the "composite" of similarly managed separate portfolios. Investors in the same separate account composite may have slightly different portfolio holdings if different investors have customized account needs, tax considerations, and security preferences. Separate account managers calculate and report composite returns for each investment strategy they offer. Although separate accounts are not regulated and there is some discretion about when and how their data are reported, 90% of the separate accounts in Morningstar's database come from firms that are compliant with the Association for Investment Management and Research (AIMR), which requires consistent and standardized reporting.

Like other separate account data providers, Morningstar presents performance information gross of fees. To calculate net returns we merge Morningstar gross return data with data on separate account fees from eVestment, another data provider. The eVestment fees data contain a sliding fee schedule for each separate account composite, with fees in basis points for different mandate sizes from $10 million to $500 million; this allows us to calculate fees and net returns for mandates of different sizes. We match separate accounts in Morningstar and eVestment using a hierarchical

algorithm. First, we require asset management company names to match (supervised fuzzy matching). Secondly, conditional on this match, we use an ad hoc loss function algorithm that matches products based on historical returns, asset class, and (fuzzily matched) product name. We match 64% of the separate accounts in Morningstar with eVestment, which corresponds to a match of 76% of the (separate account–quarter) observations in our panel dataset.[12] For unmatched observations, we use asset-weighted average fees from the same Morningstar category–quarter. In contrast to mutual funds, in which all investors in a given fund pay the same fee, separate account fees are negotiated between asset manager and investor (sometimes mediated by a separate account program sponsor and/or advisor), so they may vary from one investor to another.

In this study we compare separate accounts and mutual funds on two Morningstar levels, the 'strategy' and 'investment category' levels. With rare exceptions, separate account strategies, sometimes also referred to as 'funds' or 'products' in the literature, are coterminous with separate account composites, as required by GIPS reporting standards.[13] Among mutual funds, a Morningstar strategy comprises one or more funds offering substantially identical pools of assets (often branded differently) sub-advised by the same manager.[14] Morningstar identifies separate accounts and mutual funds following the same strategy by surveying asset management companies, as well as by performing quantitative and qualitative analysis. In doing so, Morningstar considers a wide range of factors, notably portfolio management team, investment objective, investment decision-making process, primary benchmark, portfolio characteristics, management approach, investment analysis process, and security allocation approach, in addition to asset-class-

[12] As a sanity check we compare eVestment's fees with implied fees (the difference between gross and net returns) in the Morningstar data. For matched observations, the median implied annualized Morningstar fee of 68 bps is within the eVestment fee schedule that ranges from 49 bps for a $500 million mandate size to 70 bps for a $10 million mandate size.

[13] See sections 3.A.1 to 3.A.5 in GIPS (2020). The few exceptions involve asset managers who do not follow GIPS.

[14] If there is more than one share class within a mutual fund (e.g., one for retail and one for institutional investors), we aggregate share class information by averaging share class performance variables within each fund.

specific factors, such as, for equity strategies, size, style, sector, and region. We use Morningstar Strategy IDs to identify separate account-mutual fund twins, that is, near-identical separate account and mutual fund portfolios with the same manager and investment strategy. Reflecting the precision of Morningstar Strategy IDs, the mean (median) return correlation between the separate account and mutual fund twins in our sample is 98.68% (99.88%).[15]

At a broader level, Morningstar classifies separate accounts and mutual funds by investment category (abbreviated to 'category') based on their underlying portfolio holdings and other statistics for the previous three years. Categories are not specific to asset management companies whereas strategies are. For example, the category 'US Muni National Long' includes 98 different strategies in our dataset, each branded with the name of an asset management company. In this study we use the term 'strategy' to identify portfolios or funds managed by a given portfolio management team and following identical investment strategies and the term 'category' to identify strategies managed by various portfolio management teams with similar investment objectives and principal investment features. Following Gerakos, Linnainmaa, and Morse (2021), we restrict the sample to equity and fixed income composites/mutual funds that are offered in the US, and we exclude passive products.[16]

We use Morningstar returns (gross and, after deducting eVestment fees, net) as the basis for the computation of three different performance measures: excess returns over Morningstar category benchmarks, alphas with respect to Morningstar category benchmarks, and alphas with respect to a set of Vanguard index funds. For each category, we use the S&P Dow Jones benchmark

[15] 1,775 (94%) of the twins have a return correlation greater than 95%, the lower bound for twin status in Evans and Fahlenbrach (2012). Our results are virtually unchanged if we exclude twins with return correlations lower than 95% from the sample.

[16] The terms '(investment) category' and '(investment) strategy' are not always defined in the same way in the literature. For example, the term 'strategy' in Gerakos, Linnainmaa, and Morse (2021) corresponds to our (and Morningstar's) 'category'.

listed in Morningstar for that category. If Morningstar does not list an S&P Dow Jones benchmark for a category, we use the most common prospectus benchmark among the mutual funds belonging to that category. The Internet Appendix lists all Morningstar categories in our sample, and, for each category, the number of mutual funds and separate account composites as well as the benchmark we use. It also lists the set of Vanguard index funds that we use as Vanguard benchmarks. Performance and benchmark data are at the quarterly frequency (until recently the standard reporting frequency for separate accounts).

The overall sample comprises 11,153 separate account composites and 10,786 mutual funds. Of these, 97% of separate account composites and 99% of mutual funds have AUM information. Separate account composites represent 10,953 strategies in 70 different Morningstar categories, while mutual funds represent 5,706 strategies in 79 different Morningstar categories. There are 1,861 asset managers operating in the separate account segment and 1,139 asset managers operating in the mutual fund segment, many of these operating in both. These numbers illustrate the structure of the data. At the product level (the basic unit of analysis) we have separate account composites and mutual funds, the latter sometimes with multiple share classes. Among separate accounts, composites and strategies tend to match one to one (as required by GIPS standards), but asset management companies may offer more than one mutual fund following a given strategy (sometimes branded differently). Reflecting the fact that many companies manage multiple strategies in a given Morningstar category, we have an average of 156 separate account strategies per category and of 72 mutual fund strategies per category.

In Table 1 we present descriptive statistics for the overall sample of separate accounts and mutual funds by year. Mean annual average and aggregate assets under management (AUM) are, respectively, 13% and 29% higher for separate accounts than for mutual funds. Over the sample

period, mutual funds experienced a larger relative increase in the number of strategies represented and in mean annual average AUM. By the end of our sample period, assets under management in actively managed separate accounts offered in the US totaled $11 trillion and in mutual funds $10 trillion. Table 2 shows descriptive statistics for the overall sample by asset class. For both separate accounts and mutual funds, the split between equity and fixed income is roughly two-to-one both in the average number of composites/funds per year and in the average total AUM per year. Whilst average annual AUM per composite/fund are similar for equity vehicles, fixed income separate account composites tend to be larger than mutual funds.

IV. AGGREGATE PERFORMANCE OF SEPARATE ACCOUNT AND MUTUAL FUND INVESTORS

We compare the aggregate performance of separate account investors with that of category-matched mutual fund investors on three measures: excess returns over Morningstar category benchmarks, one-factor alphas with respect to those benchmarks, and alphas with respect to a set of Vanguard index funds as in Berk and van Binsbergen (2015). We report gross-of-fee and net-of-fee aggregate performance differences separately. For the net-of fee excess returns, our calculation of excess returns and alphas is based on three investor sizes: small investors ($10 million mandate), medium investors ($75 million mandate), and large investors ($500 million mandate).

To calculate excess returns over benchmarks, Morningstar category benchmark returns are subtracted from separate account composite or mutual fund returns. We calculate both alpha variables by following the same estimation procedure but using different benchmark sets. We regress composite/fund excess returns (over the risk-free rate) on benchmark excess returns (over the risk-free rate), running a separate regression for each composite/fund. We collect the intercepts

and residuals from these regressions and calculate quarterly alphas by adding the residual to the intercept for each composite/fund in each quarter. We use Morningstar category benchmark returns to calculate category benchmark alphas. We follow Berk and van Binsbergen (2015) and estimate Vanguard benchmark alphas by using two sets of seven benchmarks, one set for equity and the other for fixed income composites/funds.[17] The Internet Appendix lists the set of Vanguard index funds used for Vanguard alpha computations.

We aggregate excess returns and alphas of separate accounts and mutual funds in the following way. First, we compute asset-weighted excess returns and alphas at the Morningstar category-quarter level. We do this separately for separate accounts and mutual funds, using gross-of-fee and net-of-fee versions of the three performance measures mentioned above and assets invested in each vehicle type. For each investment category and quarter, we thus compute asset-weighted quarterly excess returns and alpha differences between separate accounts and mutual funds as follows:

$$\sum_{i=1}^{N} w_i^S \alpha_i^S - \sum_{i=1}^{N} w_i^M \alpha_i^M \qquad (1)$$

where w_i^S is the percentage of separate account assets in the investment category invested in strategy i, α_i^S is the separate account excess return or alpha (gross or net) of strategy i, w_i^M is the percentage of mutual fund assets in the investment category invested in strategy i, and α_i^M is the mutual fund excess return or alpha (gross or net) of strategy i.[18] Next, we calculate quarterly asset-weighted excess returns and alphas by using investment category separate account assets under

[17] We follow the procedure described in Berk and van Binsbergen's (2015) appendix to account for the fact that some of the fixed income benchmarks do not go all the way back to the beginning of our sample period. We use a representative but smaller set of benchmarks because our time series is shorter and returns are measured at the quarterly frequency.

[18] We describe the process using strategy notation, but we could equivalently do it using composite-fund notation (as all composites/funds within a strategy are asset weighted).

management as category weights, for both separate accounts and mutual funds. This results in a time series of quarterly separate account excess returns and alphas and a category-matched time series of quarterly mutual fund excess returns and alphas. As in Gerakos, Linnainmaa, and Morse (2021), this ensures that we are not comparing investments in different categories.

Table 3 shows differences in aggregate performance of separate account investments and category-matched mutual fund investments. We find some evidence of separate account investors obtaining higher gross-of-fees risk-adjusted returns than mutual fund investors, with annualized differences ranging from 14 to 24.4 bps. However, only the difference in gross alphas with respect to Vanguard benchmarks is statistically significant. When using net-of-fees risk-adjusted returns, we find strong evidence of separate account investors obtaining higher risk-adjusted returns than mutual fund investors. In this case, all differences are statistically significant, and annualized estimates range from 50.4 to 76.4 bps per year. Our risk-adjusted return differences are of comparable, albeit smaller, magnitudes to those reported by Gerakos, Linnainmaa, and Morse (2021) for their sample. Differences are higher for larger separate account investors, who typically pay lower fees (the difference between the net performance of large and small investors is in the order of 16 bps per year).[19]

V. BASELINE DIFFERENCES BETWEEN VEHICLES

To explore the impact on reported performance of structural differences between separate accounts and mutual funds we next compare the excess returns and alphas of separate account and mutual fund twins. We exploit the fact that many investment management companies manage mutual

[19] Because of composite reporting practices, separate account composites may also include some mutual fund investments. To the extent that this is the case, the differences reported here would be a lower bound for the difference between pure separate account investments and mutual fund investments.

funds and offer equivalent investment pools in other vehicles as well, notably separate accounts. These variants on one product have the same target portfolio but experience short-term deviations to accommodate different levels of customer flows or small differences reflecting the customization requests of separate account investors (see Section II). By directly comparing separate account and mutual fund versions of the same product (twins), we can estimate the impact on performance of the greater liquidity demands faced by mutual fund structures, the customization demands affecting separate accounts, and differences in fees.

We can then decompose asset-weighted quarterly differences in excess returns and alphas between separate accounts and mutual funds into two parts: (i) the average structural outperformance or underperformance of separate accounts and (ii) a selection component. That is, within each investment category and quarter we decompose (1) as follows:

$$\underbrace{\sum_{i=1}^{N}\frac{1}{N}\alpha_i^S-\sum_{i=1}^{N}\frac{1}{N}\alpha_i^M}_{Structural\ component}$$

$$+$$

$$\underbrace{\sum_{i=1}^{N}\left(w_i^S-\frac{1}{N}\right)\alpha_i^S-\sum_{i=1}^{N}\left(w_i^M-\frac{1}{N}\right)\alpha_i^M}_{Selection\ component} \qquad (2)$$

where variables are defined as in Equation (1).

The equal-weighted difference among twins measures the structural gap in performance between vehicles, independently of whether investors take advantage of this gap. The fund selection component indicates the extent to which differences in (1) reflect superior (or inferior) selection by the users of separate accounts, who are for the most part large institutional investors.

5.1 Structural differences between separate accounts and mutual funds

To analyze the structural component of the decomposition we construct a sample of separate account-mutual fund twins with the same investment strategy. We use Morningstar Strategy IDs to identify these twinned pools of assets. Within each strategy and vehicle type, we average performance variables, if necessary. This results in quarterly performance time series for separate accounts and mutual funds for each strategy ID. We restrict the sample to those strategies and quarters that have both separate accounts and mutual fund versions (twins) and we compute equal-weighted excess returns and alphas at the quarter level for each vehicle. By abstracting from investors' choices and keeping the underlying portfolio holdings of separate accounts and mutual funds constant (except for the small deviations to satisfy client triggered flows and customization requests), we isolate structural differences between these vehicles.

Table 4 presents descriptive statistics for the sample of twins. This sample shows patterns similar to those in the full sample: a higher fraction of strategies and higher average total assets in equities than in fixed income, and a larger difference in average annual AUM between separate accounts and mutual funds in fixed income than in equities. The twins sample comprises 1,893 distinct strategies in 63 different Morningstar categories. These represent 17% (33%) of strategies and 90% (80%) of Morningstar categories for separate accounts (mutual funds) in the full sample. Average annual total AUM in the twins sample are 49% and 41%, respectively, of the full sample totals for separate accounts and mutual funds, which means that some 45% of assets are invested in products that have a twin. Overall, the twins sample is therefore a sizeable subsample of the whole.

From this sample we obtain average performance gap estimates between separate accounts and their mutual funds twins, which we report in Table 5, using the same performance measures as in Table 3. When looking at gross excess returns and alphas, we find a statistically significant

performance gap for all three performance measures, with annualized estimates ranging from 16.4 to 22.8 bps. These gaps are similar in magnitude to those in Table 3 and consistent with those reported by Chen et al. (2017) for their sample. All net-of-fees performance gaps are also statistically significant, and annualized gaps range from 73.6 to 93.2 bps. The net performance gaps in the twins sample are similar to (or even larger than) those in Table 3. These results provide evidence of separate accounts outperforming their mutual fund twins. This structural outperformance may be the result of the different levels of customer flows experienced by separate accounts and mutual funds (or the way they deal with them), fee differences (for reasons of scale and range of services covered), or other reasons.[20]

The performance gap between separate account composites and their mutual fund twins likely varies across investment categories. If the performance gap reflects client flows and the different ways in which these two vehicles deal with them, the liquidity of the underlying investment category would be expected to affect the magnitude of the gap. In particular, if mutual funds are subject to larger and more volatile customer flows than separate accounts, notably because in the latter, customer flows are usually handled by transition managers, we might expect that underperformance by mutual funds to be larger in more illiquid investment categories.

We explore this possibility by relating the performance gap between separate accounts and mutual funds to the liquidity of the underlying investment category. We proxy for the liquidity of the underlying investment category by using the lagged average turnover of the Morningstar investment category of the separate account-mutual fund twins.[21] The results of this analysis,

[20] Another potential factor contributing to differences in performance between separate accounts and their mutual fund twins is favoritism. Favoritism, if any, would also be captured by the structural component of the decomposition. However, the evidence on favoritism in the context of separate accounts and mutual funds is scarce (Chen et al., 2017, find some evidence of favoritism while Del Guercio, Genç, and Tran, 2018, do not) and the dearth of performance fees in separate accounts make it less likely than in other settings (e.g., hedge funds).

[21] This measure, called latent liquidity, is advocated by Mahanti, Nashikkar, Subrahmanyam, Chacko, and Mallik (2008) for situations where data of the underlying holdings are scarce, as is the case with separate accounts.

collected in Table 6, show that the performance gap between separate accounts and their mutual funds twins, on any of our measures, increases significantly as the liquidity of the investment category decreases.

5.2 Decomposition of structural differences

The net performance difference between mutual funds and separate accounts is considerably greater than the gross difference. This is because, as shown in Table 7, average headline fees for mutual funds are between 52 and 68 bps per year greater than for separate accounts, with the difference increasing in separate account mandate size.

Mutual fund fees are higher for several reasons: their more significant regulatory requirements, the larger amounts usually invested through separate accounts (economies of scale and market power), and the different coverage of fees in each segment (what investors are paying for). For instance, custody fees are typically not included in separate account fees (as assets remain with the asset owner's custodian) but are included in mutual fund fees.[22]

Building on the breakdown between net and gross performance differences as reported in Table 5, we now estimate a finer-grained decomposition of the structural differences between separate account composites and mutual funds. First, we decompose the fee differences into two components, namely differences due to coverage and differences due to scale. Next, we decompose the gross performance gap into a component which can be explained by the fact that transition costs are excluded from separate accounts, and a residual, which reflects other potential differences such as temporary exclusions from separate account composites and customization drags.

[22] Separate account fees are also usually negotiable. Approximately 80% of separate account fees in our sample are labelled as negotiable, so what we have is likely an upper bound for those fees. If actual fees are lower, the fee/expense difference between separate accounts and mutual funds would be higher than our estimates.

As our baseline we use the average net excess return difference, in basis points, between separate accounts and mutual funds following the same strategy (twins) for different mandate sizes from Table 5 as estimate for structural differences. These differences range from 73.6 annualized basis points for a small investor ($10mn mandate) to 89.6 annualized basis points for a large investor ($500mn mandate).

The first constituent component of structural differences we estimate is differences in fees due to coverage. To do this, we compare the headline fees of separate account and mutual fund vehicles that belong to the same twin and have the same mandate size. Conditioning on mandate size is important because it ensures that we do not capture differences in fees due to investor scale, which we measure separately. As a first step, we calculate the average headline fees of institutional mutual funds. We exclude retail vehicles because these typically have smaller mandate sizes and therefore incur larger fees. We then estimate separate account headline fees for a $1 million mandate size by extrapolating the sliding fee schedule in Table 7 using a polynomial regression. We focus on a $1 million mandate size as this should be closer to the average institutional mutual fund mandate than the lowest mandate size ($10 million) for which we have separate account reported fees in the eVestment data. As reported in Table 9, we estimate differences in fees due to coverage to be 23.7 basis points, which explain 32%, 29%, and 26% of the total net excess return gap for small, medium, and large investors, respectively.

Now we calculate differences in fees due to investor scale as the difference between headline fees (from Table 7) and our estimate for differences in fees due to coverage just described. We find that differences in fees due to investor scale are 28.1, 34.9, and 44.0 basis points, explaining 38%, 43%, and 49% of the net excess return gap, for small, medium, and large investors, respectively. Taken together, differences in fees explain between 70% (for small

investors) and 75% (for large investors) of the total net excess return differential of separate account/mutual fund twins.

As the next step, we estimate transition costs borne by separate account investors who move between portfolio managers. These costs are not included in reported returns and may therefore explain a significant part of the difference in gross performance between mutual fund and separate account investors. We estimate a range of average separate account transition costs to reflect the differential costs of transitions with (lower bound) and without (upper bound) portfolio overlap. Specifically, we start with annualized transition costs, in basis points and assuming a six-year portfolio holding period, for transitions within investment categories for each Morningstar category in the twins sample (see Internet Appendix).[23] These transition costs capture the costs incurred by separate account investors who move to another portfolio manager and change their entire holdings (i.e., no portfolio overlap). We also report typical portfolio overlap percentages and the associated transition costs for transitions with portfolio overlap. For example, with an overlap percentage of 25%, the costs for transitions with portfolio overlap are 75% of those for transitions without portfolio overlap. Table 8 lists average transition costs for different asset classes. These costs range from 22.5 basis points for a transition with portfolio overlap between two portfolio managers within the asset class Government – Debt to 200 basis points for a transition without portfolio overlap within Real Estate – Global.[24] To ensure consistency with the calculation of net excess returns reported in Table 5, we then compute equal-weighted transition costs (with and without portfolio overlap) at the quarter level for separate accounts. We use the

[23] Transition costs come from a leading transition manager. We base our assumption of a six-year portfolio holding period on the figures reported in Table 2 of Goyal, Tol, and Wahal (2023). Specifically, we estimate the median of the portfolio holding period distributions in that table for equity and fixed income, assuming holding periods are normally distributed.

[24] We focus on transition costs for transitions within asset classes because transitions across asset classes are rare.

averages of these time series as our upper and lower bound estimates for the transition costs reported in Table 9. The transition cost range is 11.7–15.5 basis points, which explains 16–21%, 14–19%, and 13–17% of the net excess return gap, for small, medium, and large investors, respectively.

Finally, we calculate the residual as the difference between, on the one hand, the total net excess return gap and, on the other, the sum of differences in fees due to coverage, the difference in fees due to investor scale, and transition costs. This residual represents a relatively small fraction of the net excess return gap, ranging from 7–14%. Put differently, we can explain between 86–93% of the gap in reported total net excess returns of separate account/mutual fund twins with the differences in fees and the exclusion of transition costs by separate account managers. Although we cannot be certain of the composition of this residual, we propose that it reflects the way in which separate account performance is reported through composites. These composites group together the performance of separate accounts that meet the composite definition, but some of these may be customized to the requirements of the asset owner in a way that constrains the asset manager and may worsen performance. At the same time, managers of separate accounts are allowed to exclude from the composite the performance of portfolios that experience significant flows in or out. This exclusion is similar to the exclusion of transition costs from the performance of separate accounts, except that it covers flows of part of the portfolio rather than an entire transition. The fact that this small residual is positive suggests that the reported performance of separate accounts benefits more from composite exclusions than it suffers from customization.

VI. SELECTION PERFORMANCE OF SEPARATE ACCOUNT INVESTORS

Results in the previous two sections (reported in Tables 3, 5, and 8) suggest that the apparent outperformance of separate account investors over mutual fund investors is not so much the result

of separate account investors' ability to select better products (or better asset managers), but a consequence of structural differences between these two investment vehicles. To explore this question in more detail, we compare the performance separate account investors would have achieved if they had invested, not in separate accounts, but in their hypothetical mutual fund twins with the performance of mutual fund investors. We also explore whether these results vary across the two main asset classes: equities and fixed income.

Not every separate account has a mutual fund twin, so we compute hypothetical mutual fund twin excess returns and alphas, α_i^{M*}, by subtracting performance gap estimates (from the twins sample), α_i^{Gap}, from separate account excess returns and alphas in the full sample.[25] Within each investment category, we then compute asset-weighted quarterly performance differences between the hypothetical mutual fund choices of separate account investors and the actual mutual fund choices of mutual fund investors as follows:

$$\sum_{i=1}^{N} w_i^S \alpha_i^{M*} - \sum_{i=1}^{N} w_i^M \alpha_i^M \qquad (3)$$

where $\alpha_i^{M*} = \alpha_i^S - \alpha_i^{Gap}$.[26]

In computing hypothetical mutual fund excess returns and alphas we make three alternative assumptions about the performance gap: i) the performance gap is constant across investment categories, ii) the performance gap is a linear function of investment category lagged liquidity, and iii) the performance gap is specific to the investment category. For the constant gap calculations, we subtract the performance gap estimates in Table 5 from separate account excess returns and

[25] Thus, we assume that any mutual fund product would be available in separate account form, and vice versa, if there were demand for it.

[26] When $\alpha_i^{Gap} = \bar{\alpha}_i^S - \bar{\alpha}_i^M$, with $\bar{\alpha}_i^S = \sum_{i=1}^{N} \frac{1}{N} \alpha_i^S$ and $\bar{\alpha}_i^M = \sum_{i=1}^{N} \frac{1}{N} \alpha_i^M$, this is effectively the selection component of Equation (2).

alphas in the full sample to compute counterfactual excess returns and alphas. Under this assumption, estimates of (3) must equal the difference between the overall performance difference between separate account and mutual fund investors in Table 3 and the baseline performance difference between separate account and mutual fund vehicles in Table 5. For the liquidity gap calculation, we use the performance gap and liquidity estimates from Table 6 to adjust separate account excess returns and alphas. We do so by subtracting from separate account excess returns or alphas, $\alpha_{i,q}^{S}$, the sum $a + b * Lagged\ Latent\ Liquidity_{i,q}$, where a and b are the constant and slope coefficients, respectively, estimated in Table 6 and q is the quarter in question.[27] For the category gap calculations, we re-run the average performance gap analysis in the twins sample for each Morningstar category separately and store the performance gap estimates. We then use these category specific gaps to adjust separate account excess returns and alphas.

Finally, we aggregate adjusted separate account and non-adjusted mutual fund returns following the same steps described in Section IV when computing aggregate performance differences. We do this for gross and net versions of all three performance measures.

The results from this counterfactual performance analysis, collected in Table 10, indicate that if we remove the average or expected outperformance of separate accounts over their mutual fund twins, separate account investors perform at the level of mutual fund investors gross of fees and slightly below them net of fees. These results hold under any of the three adjustment approaches and imply that, on average, separate account investors choose products that, once adjusted, are slightly more expensive than those chosen by mutual fund investors, for the same underlying gross performance.[28] These results also hold if we restrict the analysis to the set of

[27] For products with missing values of lagged latent liquidity, we use the constant performance gap instead.
[28] This conclusion holds even if separate account composites include some mutual fund investments (i.e., even if they are a weighted average of pure separate account and mutual fund investments). In that case, the actual difference

strategies (and quarters) that have both separate accounts and mutual fund versions (the twins subsample). In this subsample, which comprises some 45% of the assets of the full sample and that should be free of potential concerns that separate accounts and mutual funds without a twin are fundamentally different from those with twins, the counterfactual performance of separate accounts investors is not higher, and if anything is lower, than that of mutual fund investors (see Internet Appendix).

We next investigate whether results differ across equity and fixed income asset classes. We therefore repeat the above analysis for equity and fixed income separate accounts and mutual funds separately. Table 11 shows actual (as in Table 3) and counterfactual (as in Table 10) differences in aggregate performance of separate account investors and mutual fund investors in these two asset classes. Consistent with the findings of Gerakos, Linnainmaa, and Morse (2021), the actual outperformance of separate account investors is higher in fixed income products. In their fixed income allocations separate account investors outperform mutual fund investors both gross and net of fees whereas in their equity allocations separate account investors significantly outperform mutual fund investors only on a net-of-fees basis. When removing average performance gaps, equity separate account investments show no significant difference from mutual fund investments gross of fees and significantly underperform net of fees. That is, in equities, separate account investors choose products that perform in line with those chosen by mutual fund investors before fees, but which on average carry larger fees than mutual fund investors' choices. In fixed income, separate account investments perform significantly better than mutual fund investments gross of fees but show no significant difference net of fees. In other words, when it comes to fixed income

between pure separate account investments and mutual fund would be larger than reported before, but so would the structural performance gap between both vehicles.

investments, separate account investors seem to choose better performing products than mutual fund investors, but the greater fees of these products wipe out the outperformance.

To better understand the differences between gross and net performance in equity and fixed income investments, we compare the differences between asset-weighted fees and equal-weighted fees for separate accounts and mutual funds in each investment category and asset class. This shows whether, on aggregate, separate account and mutual fund investors allocate capital to more or less expensive products relative to the average-fee products that are available to them in the same investment category. We compute this fee difference for each quarter and Morningstar category and pool the data. We then weight each observation (category-quarter) based on the share of separate account AUMs in that quarter to ensure that the results are consistent with the time series procedure that we use in the rest of the paper. We do this for separate accounts and mutual funds separately, and for the difference between both vehicle types. The results of this estimation, collected in Table 12, show that separate account investors choose more expensive products (relative to the average-fee products that are available to them) compared to mutual fund investors, and that this difference is larger for equity products.

VII. CONCLUSION

Separate accounts are an important means by which large investors access actively managed strategies. Mutual funds, by contrast, are largely aimed at small investors. A comparison between the performance of separate accounts and mutual funds is difficult because of differences in coverage, scale, and reporting practices between them. However, by studying mutual fund and separate account twins, that is, pairs of products with the same portfolio manager and the same investment strategy, we isolate the effect on performance of structural differences between these

vehicles. We then control for these structural differences to see if there is any evidence of separate account investors outperforming mutual fund investors.

We document a significant performance gap between separate account and their mutual fund twins, with the gross reported excess returns and alphas of separate accounts on average 16 bps to 23 bps per year higher than the gross reported excess returns and alphas of their mutual fund twins. These numbers are likely to represent a close lower bound to the performance gap, since separate account composites sometimes include mutual funds. Importantly, not all this performance gap is real, as separate account reporting excludes some costs that investors in them pay separately (like custody fees and, to some extent, transition costs).

Controlling for this structural gap in (reported) performance, we find that separate account investments perform at the same level as mutual fund investments, gross of fees, and slightly below them, net of fees. In other words, separate account investors choose products that, once adjusted for structural differences, have the same underlying performance as those chosen by mutual fund investors but are marginally more expensive. This lack of underlying outperformance may seem surprising, given that separate account investors are for the most part institutional and typically larger and more sophisticated than mutual fund investors, who are for the most part individuals. However, separate account investors are also a heterogeneous group. Their failure to outperform mutual fund investors at manager selection may reflect the extra layers of agency problems in some of the largest and most important among them, as noted by Lakonishok, Schleifer and Vishny (1992). Those agency problems may neutralize the size and sophistication advantage in manager search and selection highlighted by Gârleanu and Pedersen (2018).

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Table 1

Separate Accounts and Mutual Funds - Descriptive Statistics by Year

This table presents descriptive statistics on the sample of separate accounts and mutual funds used in this study. It shows the number of separate account composites and mutual funds available each year (in the Morningstar database) between January 2000 and December 2019, the number of strategies these composites or funds represent, and the number of management companies running these strategies in each of these two universes. It also shows, for each of those years and universes, the number of composites/funds with assets under management information, the average assets under management for those composites/funds (in millions of US dollars) and the total assets invested in using either vehicle (in millions of US dollars).

	Separate Accounts						Mutual Funds					
	Number of Composites	Number of Strategies	Number of Asset Managers	Number of Composites with Assets Under Management Information	Average Assets Under Management per Composite (in $ millions)	Total Reported Assets Under Management (in $ millions)	Number of Funds	Number of Strategies	Number of Asset Managers	Number of Funds with Assets Under Management Information	Average Assets Under Management per Fund (in $ millions)	Total Reported Assets Under Management (in $ millions)
2000	4,463	4,379	1,104	3,464	1,021	3,538,415	5,456	2,436	567	5,222	739	3,861,481
2001	4,853	4,762	1,169	3,792	906	3,435,732	5,363	2,582	576	5,150	640	3,297,938
2002	5,265	5,167	1,221	4,153	852	3,538,922	5,241	2,681	575	5,079	614	3,118,519
2003	5,692	5,588	1,280	4,524	961	4,345,360	5,274	2,787	568	5,153	664	3,419,706
2004	6,166	6,050	1,336	5,045	1,117	5,632,781	5,260	2,882	569	5,164	799	4,127,948
2005	6,610	6,485	1,370	5,554	1,215	6,747,934	5,334	3,025	571	5,256	882	4,636,843
2006	6,829	6,689	1,373	5,930	1,372	8,135,335	5,553	3,197	579	5,502	980	5,393,958
2007	7,000	6,852	1,355	6,414	1,465	9,399,478	5,679	3,357	592	5,625	1,115	6,274,399
2008	7,092	6,945	1,321	6,606	1,198	7,915,377	5,760	3,541	607	5,714	916	5,235,392
2009	7,068	6,919	1,326	6,614	1,069	7,069,795	5,592	3,661	590	5,552	857	4,758,535
2010	7,180	7,028	1,322	6,743	1,228	8,279,139	5,327	3,802	597	5,290	1,111	5,878,719
2011	7,289	7,133	1,324	6,924	1,297	8,980,085	5,421	4,014	622	5,390	1,177	6,346,495
2012	7,373	7,215	1,313	7,079	1,356	9,595,945	5,441	4,250	639	5,405	1,274	6,885,417
2013	7,382	7,221	1,307	7,098	1,492	10,592,818	5,455	4,449	643	5,419	1,447	7,843,701
2014	7,351	7,182	1,287	7,059	1,609	11,355,531	5,574	4,645	663	5,542	1,570	8,700,533
2015	7,365	7,193	1,273	7,067	1,532	10,824,650	5,710	4,846	688	5,690	1,522	8,662,104
2016	7,292	7,115	1,242	6,934	1,553	10,766,046	5,684	4,966	675	5,666	1,520	8,611,369
2017	7,190	7,006	1,197	6,864	1,640	11,255,161	5,618	5,017	660	5,609	1,710	9,589,541
2018	6,943	6,756	1,115	6,620	1,709	11,311,393	5,526	5,008	648	5,522	1,801	9,946,715
2019	6,650	6,474	1,063	6,229	1,780	11,085,176	5,437	4,933	644	5,430	1,919	10,418,852
Mean	6,653	6,508	1,265	6,036	1,318	8,190,254	5,485	3,804	614	5,419	1,163	6,350,408

Table 2

Separate Accounts and Mutual Funds - Descriptive Statistics by Asset Class

This table shows the asset class distribution of the sample of separate accounts and mutual funds used in this study. For each of the two asset classes and vehicle types covered in our study it shows: the average number of composites/funds offered per year, the average number of Morningstar categories covered by those composites/funds, the average number of composites/funds with assets under management information per year, the average assets under management for those composites/funds (in millions of US dollars) per year, and the average total assets invested in the composites/funds (in millions of US dollars) per year.

	Average Number of Composites/Funds per Year		Average Number of Morningstar Categories Covered per Year		Average Number of Composites/Funds with Assets Under Management Information per Year		Average Assets Under Management per Composite/Fund and Year (in $ millions)		Average Total Reported Assets Under Management per Year (in $ millions)	
	Separate Accounts	Mutual Funds	Separate Accounts	Mutual Funds	Separate Accounts	Mutual Funds	Separate Accounts	Mutual Funds	Separate Accounts	Mutual Funds
Equity	4731	3617	39	41	4,296	3,566	1,231	1,206	5,402,915	4,326,020
Fixed Income	1922	1868	27	35	1,740	1,853	1,533	1,085	2,787,339	2,024,388

Table 3

Separate Accounts and Category Matched Mutual Funds – Asset-Weighted Excess Returns and Alphas

This table compares the performance of separate account investors with the performance of mutual fund investors. Performance is measured using excess returns over category benchmarks, one-factor alphas with respect to those same benchmarks, and alphas with respect to a set of Vanguard index funds as in Berk and van Binsbergen (2015). We compute asset-weighted separate account excess returns and alphas and compare them to asset-weighted mutual fund excess returns and alphas for the same Morningstar investment category. Investment category excess returns and alphas for these two vehicle types are then weighted by separate account assets under management in the category to obtain time series of quarterly separate account excess returns and alphas and a category-matched time series of quarterly mutual fund excess returns and alphas. Panel A reports gross of fee results and Panel B reports net of fee results. We compute three net returns that apply to investors of different sizes: small investors ($10 million mandate), medium investors ($75 million mandate), and large investors ($500 million mandate). The data cover the period from January 2000 through December 2019. *t*-statistics based on standard errors, robust to conditional heteroscedasticity and serial correlation as in Newey and West (1987), are reported in parentheses. Average quarterly differences are annualized by multiplying the quarterly figures times four and reported as basis points. ***, **, * denote statistical significance at 1%, 5%, and 10% levels, respectively.

	Panel A: Gross Performance		
	Gross Excess Returns	Gross Alphas (Category Benchmark)	Gross Alphas (Vanguard Benchmarks)
Separate Accounts	0.251***	0.358***	0.208***
	(2.65)	(4.40)	(4.53)
Matched Mutual Funds	0.215***	0.323***	0.147***
	(2.78)	(4.41)	(3.86)
SA-MF Difference	0.036	0.035	0.061**
	(0.91)	(1.19)	(2.30)
Annualized Difference (bps per year)	14.40	14.00	24.40

	Panel B: Net Performance								
	Net Excess Neturns			Net Alphas (Category Benchmark)			Net Alphas (Vanguard Benchmarks)		
	Small Investor	Medium Investor	Large Investor	Small Investor	Medium Investor	Large Investor	Small Investor	Medium Investor	Large Investor
Separate Accounts	0.102	0.118	0.142	0.210**	0.225***	0.249***	0.059	0.075	0.098**
	(1.08)	(1.24)	(1.49)	(2.58)	(2.76)	(3.05)	(1.29)	(1.63)	(2.14)
Matched Mutual Funds	-0.028	-0.028	-0.028	0.083	0.083	0.083	-0.093**	-0.093**	-0.093**
	(-0.38)	(-0.38)	(-0.38)	(1.15)	(1.15)	(1.15)	(-2.36)	(-2.36)	(-2.36)
SA-MF Difference	0.131***	0.147***	0.170***	0.126***	0.142***	0.166***	0.152***	0.167***	0.191***
	(3.27)	(3.63)	(4.21)	(4.01)	(4.46)	(5.18)	(5.32)	(5.80)	(6.59)
Annualized Difference (bps per year)	52.40	58.80	68.00	50.40	56.80	66.40	60.80	66.80	76.40

Table 4

Separate Account-Mutual Fund Twins Sample - Descriptive Statistics by Asset Class

This table shows the asset class distribution of the sample of separate account and mutual funds twins. For each of the two asset classes covered in our study it shows: the average number of strategies simultaneously offered in separate account and mutual fund form per year, the average number of Morningstar categories covered by those strategies, the average number of strategies with assets under management information for both investment vehicles per year, the average assets under management for those strategies (in millions of US dollars) in each vehicle per year, and the average total assets invested in the strategies (in millions of US dollars) per year using each vehicle.

	Average Number of Strategies per Year	Average Number of Morningstar Categories Covered per Year	Average Number of Strategies with Assets Under Management Information for Both Vehicles per Year	Average Assets Under Management per Strategy and Vehicle (in $ millions)		Average Total Reported Assets Under Management per Vehicle Type and Year (in $ millions)	
				Separate Accounts	Mutual Funds	Separate Accounts	Mutual Funds
Equity	1029	30	997	2,747	1,907	2,857,249	2,004,260
Fixed Income	307	23	298	3,874	2,191	1,248,165	741,003

Table 5

Separate Account-Mutual Fund Twins - Baseline Performance Differences

This table shows the average performance difference between separate accounts and mutual funds following the same strategy (twins). These twins are substantially identical pools of assets that follow the same investment process. Performance differences are equal-weighted and measured using excess returns over category benchmarks, one-factor alphas with respect to those same benchmarks, and alphas with respect to a set of Vanguard index funds as in Berk and van Binsbergen (2015). Panel A reports gross of fee differences and Panel B reports net of fee differences. We compute three net returns that apply to investors of different sizes: small investors ($10 million mandate), medium investors ($75 million mandate), and large investors ($500 million mandate). The data cover the period from January 2000 through December 2019. *t*-statistics based on standard errors, robust to conditional heteroscedasticity and serial correlation as in Newey and West (1987), are reported in parentheses. Average quarterly differences are annualized by multiplying the quarterly figures times four and reported as basis points. ***, **, * denote statistical significance at 1%, 5%, and 10% levels, respectively.

	Panel A: Gross Performance Difference		
	Gross Excess Returns	Gross Alphas (Category Benchmark)	Gross Alphas (Vanguard Benchmarks)
SA-MF Difference	0.041***	0.056***	0.057***
	(2.82)	(4.80)	(5.65)
Annualized Difference (bps per year)	16.40	22.40	22.80

	Panel B: Net Performance Difference								
	Net Excess Neturns			Net Alphas (Category Benchmark)			Net Alphas (Vanguard Benchmarks)		
	Small Investor	Medium Investor	Large Investor	Small Investor	Medium Investor	Large Investor	Small Investor	Medium Investor	Large Investor
SA-MF Difference	0.184***	0.201***	0.224***	0.191***	0.208***	0.231***	0.193***	0.210***	0.233***
	(10.91)	(11.94)	(13.34)	(12.88)	(14.05)	(15.64)	(18.14)	(19.76)	(21.95)
Annualized Difference (bps per year)	73.60	80.40	89.60	76.40	83.20	92.40	77.20	84.00	93.20

Table 6

Separate Account-Mutual Fund Twins Performance Differences as a Function of Liquidity

This table shows the average performance difference between separate account and mutual fund twins as a function of the liquidity of underlying assets. The dependent variable is the difference in quarterly gross (Panel A) or net (Panel B) performance between the separate account and mutual fund vehicles. Quarterly performance differences are measured using excess returns over category benchmarks, one-factor alphas with respect to those same benchmarks, and alphas with respect to a set of Vanguard index funds as in Berk and van Binsbergen (2015). We compute three net returns that apply to investors of different sizes: small investors ($10 million mandate), medium investors ($75 million mandate), and large investors ($500 million mandate). We regress these performance differences on Mahanti, Nashikkar, Subrahmanyam, Chacko, and Mallik's (2008) lagged latent liquidity measure (lagged average turnover of the Morningstar category the fund/product belongs to). The unit of analysis is the pair-quarter. The data cover the period from January 2000 through December 2019. *t*-statistics based on standard errors, robust to conditional heteroscedasticity and cross-sectional and temporal correlation as in Driscoll and Kraay (1998), are reported in parentheses. ***, **, * denote statistical significance at 1%, 5%, and 10% levels, respectively.

	Panel A: Gross Performance Difference		
	Gross Excess Returns	Gross Alphas (Category Benchmark)	Gross Alphas (Vanguard Benchmarks)
Lagged Latent Liquidity	-0.023***	-0.032***	-0.042***
	(-3.40)	(-4.40)	(-5.40)
Constant	0.049***	0.073***	0.087***
	(3.16)	(4.96)	(5.82)

	Panel B: Net Performance Difference								
	Net Excess Neturns			Net Alphas (Category Benchmark)			Net Alphas (Vanguard Benchmarks)		
	Small Investor	Medium Investor	Large Investor	Small Investor	Medium Investor	Large Investor	Small Investor	Medium Investor	Large Investor
Lagged Latent Liquidity	-0.016**	-0.022***	-0.026***	-0.022***	-0.029***	-0.032***	-0.035***	-0.041***	-0.045***
	(-2.04)	(-2.79)	(-3.25)	(-2.80)	(-3.53)	(-3.98)	(-4.09)	(-4.81)	(-5.22)
Constant	0.187***	0.209***	0.235***	0.201***	0.223***	0.249***	0.218***	0.239***	0.266***
	(9.64)	(10.54)	(11.75)	(10.85)	(11.79)	(13.06)	(13.62)	(14.84)	(16.36)

Table 7

Separate Account-Mutual Fund Twins Headline Fees Difference

This table shows the mean and median fee difference for separate accounts and their twin mutual funds. Mean and median headline fees, in basis points, are shown for different investment mandate sizes. *t*-statistics from paired *t*-tests for the differences in mean headline fees between the two vehicle types for each investment mandate size are reported in parenthesis. ***, **, * denote statistical significance at 1%, 5%, and 10% levels, respectively.

	Separate Accounts		Mutual Funds		
Investment Mandate Size (in USD million)	Mean	Median	Mean	Median	Difference of Means
10 USD Million (Small Investor)	69	73	121	121	-52 (-71.65)
25 USD Million	68	70	121	121	-53 (-74.49)
50 USD Million	65	66	121	121	-56 (-78.34)
75 USD Million (Medium Investor)	62	63	121	121	-59 (-81.73)
100 USD Million	61	61	121	121	-60 (-82.98)
200 USD Million	57	56	121	121	-64 (-87.54)
500 USD Million (Large Investor)	53	52	121	121	-68 (-90.32)
N	1,446	1,446	1,446	1,446	1,446

Table 8

Separate Account Transition Costs

This table lists average transition costs incurred by separate account investors changing portfolio managers for different asset classes. For each category, it reports one-time transition costs, in basis points, both for transitions with and without portfolio overlap. It also reports typical portfolio overlap percentages for transitions within investment categories.

Asset Class	Transition Costs without Portfolio Overalp	Portfolio Overlap within Asset Class	Transition Costs with Portfolio Overlap
Equity - Developed Markets	50.00	50%	25.00
Equity - Emerging Markets	100.00	25%	75.00
Debt - Government	25.00	10%	22.50
Debt - Corporate	50.00	25%	37.50
Real Estate - Global	200.00	25%	150.00

Table 9

Separate Account-Mutual Fund Twins - Structural Differences Decomposition

This table decomposes our structural differences estimate into its constituent parts. We use the average net excess return difference, in basis points, between separate accounts and mutual funds following the same strategy (twins) for different investment mandate sizes from Table 5 as an estimate for structural differences. Differences in fees due to coverage come from comparing average institutional mutual fund fees with predicted separate account fees for a $1 million mandate, which we estimate by extrapolating the separate account fees in Table 7 using polynomial regression. Differences in fees due to investor scale are the difference between headline fees in Table 7 and differences in fees due to coverage. We estimate average transition costs incurred by separate account investors changing portfolio managers for transitions with (lower bound) and without (upper bound) portfolio overlap. Table 8 and Internet Appendix Table 3 list transition costs for asset classes and all Morningstar categories in the twins sample, respectively. The residual, which reflects customization costs and arbitrary composite exclusions among other things, is the difference between net excess return differences and the sum of differences in fees due to coverage, differences in fees due to investor scale, and excluded transition costs.

	Small investor		Medium investor		Large investor	
	bps per year	% of total	bps per year	% of total	bps per year	% of total
SA-MF Baseline Performance Difference (Net Excess Rets)	73.60	100	80.40	100	89.60	100
Difference in Fees due to Coverage	23.69	32	23.69	29	23.69	26
Difference in Fees due to Investor Scale	28.11	38	34.91	43	44.01	49
Excluded Transition Costs - Range	11.65 - 15.54	16 - 21	11.65 - 15.54	14 - 19	11.65 - 15.54	13 - 17
Residual (e.g., Customization, Comp. Exclusions) - Range	6.26 - 10.15	9 - 14	6.26 - 10.15	8 - 13	6.26 - 10.15	7 - 11

Table 10

Separate Accounts and Category Matched Mutual Funds - Counterfactual Performance Differences

This table compares the performance separate account investors would have achieved had they invested in hypothetical mutual fund twins with the performance of mutual fund investors. Performance is measured using excess returns over category benchmarks, one-factor alphas with respect to those same benchmarks, and alphas with respect to a set of Vanguard index funds as in Berk and van Binsbergen (2015). Hypothetical mutual fund twins are built by subtracting from separate accounts the average return or alpha difference between separate accounts and their twin mutual funds (in the twin sample), a difference that is a linear function of latent liquidity, or a category-specific average difference. Panel A reports gross of fee results and Panel B reports net of fee results. We compute three net returns that apply to investors of different sizes: small investors ($10 million mandate), medium investors ($75 million mandate), and large investors ($500 million mandate). The data cover the period from January 2000 through December 2019. *t*-statistics based on standard errors, robust to conditional heteroscedasticity and serial correlation as in Newey and West (1987), are reported in parentheses. Average quarterly differences are annualized by multiplying the quarterly figures times four and reported as basis points. ***, **, * denote statistical significance at 1%, 5%, and 10% levels, respectively.

	Panel A: Gross Counterfactual Performance Differences		
	Gross Excess Returns	Gross Alphas (Category Benchmark)	Gross Alphas (Vanguard Benchmarks)
CSA-MF Difference (Constant Gap)	-0.006	-0.020	0.004
	(-0.15)	(-0.68)	(0.15)
Annualized Difference (bps per year)	-2.40	-8.00	1.60
CSA-MF Difference (Liquidity-Based Gap)	0.003	-0.013	0.007
	(0.09)	(-0.43)	(0.26)
Annualized Difference (bps per year)	1.20	-5.20	2.80
CSA-MF Difference (Category-Specific Gap)	-0.021	-0.033	-0.007
	(-0.55)	(-1.13)	(-0.25)
Annualized Difference (bps per year)	-8.40	-13.20	-2.80

	Panel B: Net Counterfatual Performance Differences								
	Net Excess Neturns			Net Alphas (Category Benchmark)			Net Alphas (Vanguard Benchmarks)		
	Small Investor	Medium Investor	Large Investor	Small Investor	Medium Investor	Large Investor	Small Investor	Medium Investor	Large Investor
CSA-MF Difference (Constant Gap)	-0.053	-0.054	-0.054	-0.065**	-0.066**	-0.066**	-0.041	-0.043	-0.042
	(-1.32)	(-1.34)	(-1.33)	(-2.06)	(-2.08)	(-2.06)	(-1.45)	(-1.48)	(-1.46)
Annualized Difference (bps per year)	-21.20	-21.60	-21.60	-26.00	-26.40	-26.40	-16.40	-17.20	-16.80
CSA-MF Difference (Liquidity-Based Gap)	-0.044	-0.045	-0.045	-0.058*	-0.059*	-0.058*	-0.039	-0.040	-0.040
	(-1.11)	(-1.13)	(-1.11)	(-1.82)	(-1.84)	(-1.82)	(-1.35)	(-1.38)	(-1.35)
Annualized Difference (bps per year)	-17.60	-18.00	-18.00	-23.20	-23.60	-23.20	-15.60	-16.00	-16.00
CSA-MF Difference (Category-Specific Gap)	-0.070*	-0.071*	-0.071*	-0.081**	-0.082**	-0.081**	-0.055*	-0.056*	-0.056*
	(-1.77)	(-1.77)	(-1.76)	(-2.60)	(-2.59)	(-2.58)	(-1.97)	(-1.97)	(-1.96)
Annualized Difference (bps per year)	-28.00	-28.40	-28.40	-32.40	-32.80	-32.40	-22.00	-22.40	-22.40

Table 11

Separate Accounts and Category Matched Mutual Funds - Actual and Counterfactual Performance Differences in Equity and Fixed Income

This table compares the actual performance of separate account investors, and the performance separate account investors would have achieved had they invested in hypothetical mutual fund twins, with the performance of mutual fund investors. Performance is measured using excess returns over category benchmarks, one-factor alphas with respect to those same benchmarks, and alphas with respect to a set of Vanguard index funds as in Berk and van Binsbergen (2015). Hypothetical mutual fund twins are built by subtracting from separate accounts the average return or alpha difference between separate accounts and their twin mutual funds (in the twin sample), a difference that is a linear function of latent liquidity, or a category-specific average difference. Results are shown separately for equity and fixed income products. Net of fee results assume a $75 million mandate (medium investors). The data cover the period from January 2000 through December 2019. *t*-statistics based on standard errors, robust to conditional heteroscedasticity and serial correlation as in Newey and West (1987), are reported in parentheses. Average quarterly differences are annualized by multiplying the quarterly figures times four and reported as basis points. ***, **, * denote statistical significance at 1%, 5%, and 10% levels, respectively.

	Panel A: Equity					
	Gross Excess Returns	Gross Alphas (Category Benchmark)	Gross Alphas (Vanguard Benchmarks)	Net Excess Neturns	Net Alphas (Category Benchmark)	Net Alphas (Vanguard Benchmarks)
SA-MF Difference	0.026	0.025	0.053	0.134***	0.128***	0.155***
	(0.57)	(0.72)	(1.55)	(2.80)	(3.37)	(4.19)
Annualized Difference (bps per year)	10.40	10.00	21.20	53.60	51.20	62.00
CSA-MF Difference (Constant Gap)	-0.037	-0.056	-0.027	-0.093*	-0.109***	-0.081**
	(-0.81)	(-1.59)	(-0.79)	(-1.94)	(-2.87)	(-2.18)
Annualized Difference (bps per year)	-14.80	-22.40	-10.80	-37.20	-43.60	-32.40
CSA-MF Difference (Liquidity-Based Gap)	-0.022	-0.044	-0.024	-0.077*	-0.095**	-0.077**
	(-0.50)	(-1.27)	(-0.71)	(-1.68)	(-2.60)	(-2.11)
Annualized Difference (bps per year)	-8.80	-17.60	-9.60	-30.80	-38.00	-30.80
CSA-MF Difference (Category-Specific Gap)	-0.067	-0.084**	-0.050	-0.126**	-0.141***	-0.109***
	(-1.44)	(-2.38)	(-1.49)	(-2.61)	(-3.69)	(-2.95)
Annualized Difference (bps per year)	-26.80	-33.60	-20.00	-50.40	-56.40	-43.60
	Panel B: Fixed Income					
	Gross Excess Returns	Gross Alphas (Category Benchmark)	Gross Alphas (Vanguard Benchmarks)	Net Excess Neturns	Net Alphas (Category Benchmark)	Net Alphas (Vanguard Benchmarks)
SA-MF Difference	0.061	0.063*	0.076**	0.178***	0.177***	0.190***
	(1.40)	(1.71)	(2.00)	(4.07)	(4.83)	(5.10)
Annualized Difference (bps per year)	24.40	25.20	30.40	71.20	70.80	76.00
CSA-MF Difference (Constant Gap)	0.077*	0.076**	0.082**	0.047	0.045	0.053
	(1.76)	(2.07)	(2.15)	(1.07)	(1.23)	(1.42)
Annualized Difference (bps per year)	30.80	30.40	32.80	18.80	18.00	21.20
CSA-MF Difference (Liquidity-Based Gap)	0.078*	0.076**	0.080**	0.049	0.046	0.052
	(1.79)	(2.08)	(2.12)	(1.11)	(1.26)	(1.40)
Annualized Difference (bps per year)	31.20	30.40	32.00	19.60	18.40	20.80
CSA-MF Difference (Category-Specific Gap)	0.085*	0.086**	0.089**	0.057	0.057	0.062*
	(1.92)	(2.28)	(2.32)	(1.30)	(1.54)	(1.67)
Annualized Difference (bps per year)	34.00	34.40	35.60	22.80	22.80	24.80

Table 12

Differences between Asset-Weighted and Equal-Weighted Fees for Separate Account and Mutual Fund Investors

This table shows the average difference between asset-weighted fees and equal weighted fees at the investment category level for separate account and mutual fund investors. We compute the difference between asset-weighted fees and the equal-weighted fees for each quarter and investment category and run a pooled time series-cross section regression with these observations. In these regressions each observation is weighted based on the separate account asset share that quarter so as to replicate the time series procedure used in the rest of the paper. We do this for separate accounts and mutual funds separately as well as for the difference between the two. We compute fees that apply to investors of different sizes: small investors ($10 million mandate), medium investors ($75 million mandate), and large investors ($500 million mandate). Results are separately shown for the full sample as well as for the sample of separate account-mutual fund twins. The data cover the period from January 2000 through December 2019. *t*-statistics based on standard errors clustered at the investment category level are reported in parentheses. ***, **, * denote statistical significance at 1%, 5%, and 10% levels, respectively.

	Full Sample			Twins Sample		
	Small Investor	Medium Investor	Large Investor	Small Investor	Medium Investor	Large Investor
All Asset Classes						
Separate Accounts	-2.224***	-1.302***	-1.968***	-0.425	-0.216	-0.567
	(-4.69)	(-3.30)	(-4.74)	(-0.95)	(-0.58)	(-1.29)
Mutual Funds	-19.560***	-19.560***	-19.560***	-8.376***	-8.376***	-8.376***
	(-9.54)	(-9.54)	(-9.54)	(-4.00)	(-4.00)	(-4.00)
SA-MF Difference	17.335***	18.258***	17.592***	7.951***	8.160***	7.809***
	(9.22)	(9.84)	(9.76)	(4.05)	(3.68)	(3.52)
Equity						
Separate Accounts	-2.540***	-1.615***	-2.486***	-0.149	-0.052	-0.243
	(-4.14)	(-3.24)	(-5.49)	(-0.27)	(-0.11)	(-0.47)
Mutual Funds	-24.239***	-24.239***	-24.239***	-9.685***	-9.685***	-9.685***
	(-22.89)	(-22.89)	(-22.89)	(-3.25)	(-3.25)	(-3.25)
SA-MF Difference	21.699***	22.624***	21.754***	9.536***	9.633***	9.442***
	(20.49)	(23.83)	(23.05)	(3.36)	(2.96)	(2.88)
Fixed Income						
Separate Accounts	-1.418***	-0.461**	-0.703**	-0.969**	-0.575	-1.223**
	(-4.54)	(-2.43)	(-2.47)	(-2.34)	(-1.49)	(-2.54)
Mutual Funds	-8.901***	-8.901***	-8.901***	-6.054**	-6.054**	-6.054**
	(-4.05)	(-4.05)	(-4.05)	(-2.07)	(-2.07)	(-2.07)
SA-MF Difference	7.483***	8.440***	8.198***	5.086*	5.479**	4.832*
	(3.50)	(3.83)	(3.56)	(1.95)	(2.10)	(1.91)

INTERNET APPENDIX

Internet Appendix Table 1

Morningstar Categories and Benchmarks

This table lists all Morningstar categories in our sample. For each category, it reports the number of mutual funds and separate account composites as well as the benchmark chosen for that category.

Morningstar Category	Number of Mutual Funds	Number of Separate Account Composites	Benchmark Name
Equity			
US Fund China Region	36	8	S&P China BMI Total Return
US Fund Communications	21	0	S&P Composite 1500 Telecommunication Services (Sector) TR
US Fund Consumer Cyclical	12	1	S&P 1500 Cons Discretionary TR
US Fund Consumer Defensive	4	1	S&P 1500 Cons Staples TR
US Fund Diversified Emerging Mkts	364	334	S&P Emerging BMI (US Dollar) Total Return
US Fund Diversified Pacific/Asia	25	20	S&P Asia Pacific BMI Total Return
US Fund Energy Limited Partnership	36	63	Dow Jones US Pipelines TSM
US Fund Equity Energy	29	24	S&P 1500 ES Energy Total Return
US Fund Equity Precious Metals	29	4	FTSE Goldmines Total Return
US Fund Europe Stock	71	93	MSCI Europe Net Total Return USD
US Fund Financial	54	17	S&P 1500 ES Financials Total Return
US Fund Foreign Large Blend	357	338	MSCI ACWI ex USA Large Cap Gross Total Return USD
US Fund Foreign Large Growth	201	206	S&P Developed Ex US BMI Growth TR USD
US Fund Foreign Large Value	152	205	S&P Developed Ex US Small Value
US Fund Foreign Small/Mid Blend	45	28	S&P Developed Ex US BMI Mid Cap Total Return
US Fund Foreign Small/Mid Growth	59	68	S&P Developed Ex US BMI Mid Cap Total Return
US Fund Foreign Small/Mid Value	41	48	S&P Developed Ex US SmallCap (US Dollar) Total Return
US Fund Global Real Estate	88	81	S&P Global REIT Total Return
US Fund Health	79	16	S&P 1500 Health Care TR
US Fund India Equity	14	2	FTSE India
US Fund Industrials	10	2	S&P 1500 Industrials TR
US Fund Infrastructure	32	17	Dow Jones Brookfield Global Infrastructure Total Return
US Fund Japan Stock	34	48	S&P Japan BMI Total Return
US Fund Large Blend	906	1,146	S&P 500 Total Return
US Fund Large Growth	926	1,051	Russell 1000 EOD Growth Total Return
US Fund Large Value	721	897	Russell 1000 EOD Value Total Return
US Fund Latin America Stock	22	11	S&P Latin America BMI Total Return
US Fund Mid-Cap Blend	234	329	S&P 400 Total Return
US Fund Mid-Cap Growth	442	528	Russell MidCap Growth EOD Total Return
US Fund Mid-Cap Value	202	260	Russell MidCap Value EOD Total Return
US Fund Miscellaneous Region	18	13	S&P Global BMI TR USD
US Fund Miscellaneous Sector	6	17	S&P 500 TR USD
US Fund Natural Resources	60	24	FTSE All World Basic Materials Total Return USD
US Fund Pacific/Asia ex-Japan Stk	80	44	S&P Asia Pacific Ex Japan BMI Total Return USD
US Fund Real Estate	119	91	FTSE Nareit Equity REIT Total Return
US Fund Small Blend	346	418	Dow Jones US SmallCap Total Stock Market
US Fund Small Growth	440	534	S&P SmallCap 600 Growth Total Return
US Fund Small Value	219	279	MSCI North America Small Cap Cap Gross Total Return USD
US Fund Technology	175	25	Dow Jones US Technology Total Return
US Fund Utilities	26	9	S&P 1500 Utilities Total Return
US Fund World Large Stock	496	661	FTSE All World Total Return

Morningstar Category	Number of Mutual Funds	Number of Separate Account Composites	Benchmark Name
Fixed Income			
US Fund Bank Loan	73	45	S&P LSTA Leveraged Loan Total Return
US Fund Corporate Bond	57	132	S&P 500 Investment Grade Corporate Bond Total Return
US Fund Emerging Markets Bond	113	112	Bloomberg Barclays Emerging Market USD Aggregate Total Return
US Fund High Yield Bond	320	280	S&P 500 High Yield Corporate Bond
US Fund High Yield Muni	58	10	S&P Municipal Bond High Yield
US Fund Inflation-Protected Bond	65	42	Bloomberg Barclays Global Inflation-Linked: U.S. TIPS TR Unhedged
US Fund Intermediate Core Bond	426	755	Bloomberg Barclays US Aggregate Total Return Value Unhedged USD
US Fund Intermediate Core-Plus Bond	162	76	Bloomberg Barclays US Aggregate Total Return Value Unhedged USD
US Fund Intermediate Government	148	64	Bloomberg Barclays US MBS Total Return Value Unhedged USD
US Fund Long Government	21	27	S&P/BGCantor US Treasury Bond Total Return USD
US Fund Long-Term Bond	34	122	Bloomberg Barclays US Government Credit Long Total Return
US Fund Multisector Bond	155	159	Bloomberg Barclays Multiverse Total Return USD
US Fund Muni California Intermediate	41	9	S&P Municipal Bond California
US Fund Muni California Long	57	0	S&P Municipal Bond California
US Fund Muni Massachusetts	24	0	S&P Municipal Bond Massachusetts TR
US Fund Muni Minnesota	24	0	S&P Municipal Bond Minnesota TR
US Fund Muni National Interm	161	235	S&P Municipal Bond Total Return
US Fund Muni National Long	126	54	S&P Municipal Bond Total Return
US Fund Muni National Short	104	147	S&P Municipal Bond Short
US Fund Muni New Jersey	25	0	S&P Municipal Bond New Jersey TR
US Fund Muni New York Intermediate	26	3	S&P Municipal Bond New York TR
US Fund Muni New York Long	45	0	S&P Municipal Bond New York TR
US Fund Muni Ohio	25	0	S&P Municipal Bond Ohio TR
US Fund Muni Pennsylvania	30	0	S&P Municipal Bond Pennsylvania TR
US Fund Muni Single State Interm	159	5	S&P Municipal Bond TR
US Fund Muni Single State Long	180	0	S&P Municipal Bond TR
US Fund Muni Single State Short	23	3	S&P Municipal Bond Short TR
US Fund Muni Target Maturity	4	0	S&P Municipal Bond TR
US Fund Nontraditional Bond	127	48	Bloomberg Barclays Multiverse Total Return USD
US Fund Preferred Stock	16	29	S&P Preferred Stock Total Return
US Fund Short Government	103	67	Bloomberg Barclays 1-3 Yr Gov Total Return Value Unhedged USD
US Fund Short-Term Bond	243	364	Bloomberg Barclays 1-3 Yr Credit Total Return Value Unhedged US
US Fund Ultrashort Bond	117	109	Bloomberg Barclays US Treasury Bellwethers 6 Months TR Unhedged
US Fund World Bond	159	170	S&P Global Developed Sovereign Bond
US Fund World Bond-USD Hedged	28	4	Bloomberg Barclays Global Aggregate Total Return Hedged

Internet Appendix Table 2

Benchmark Vanguard Index Funds

This table lists the set of Vanguard index funds that we use for alpha computations. For each fund, it reports the first and last quarters for which we have returns.

Vanguard Index Fund	Start Date	End Date
Equity		
Emerging Mkts Stock Index Investor	2000q1	2019q4
Small Cap Index Investor	2000q1	2019q4
Value Index Investor	2000q1	2019q4
European Stock Index Investor	2000q1	2019q4
Pacific Stock Index Investor	2000q1	2019q4
500 Index Investor	2000q1	2019q4
Mid Cap Index Investor	2000q1	2019q4
Fixed Income		
Emerging Mkts Govt Bd Index Admiral	2016q1	2019q4
Total Intl Bd Index Investor	2016q1	2019q4
Short-Term Bond Index Investor	2000q1	2019q4
Long-Term Investment-Grade Investor	2000q1	2019q4
High-Yield Corporate Investor	2000q1	2019q4
Interm-Term Tx-Ex Investor	2000q1	2019q4
Long-Term Treasury Investor	2000q1	2019q4

Internet Appendix Table 3

Morningstar Categories and Separate Account Transition Costs

This table lists transition costs for all Morningstar categories in the twins sample. For each category, it reports annualized transition costs, in basis points, assuming a six-year portfolio holding period, both for transitions with and without portfolio overlap. It also reports typical portfolio overlap percentages for transitions within investment categories.

Morningstar Category	Transition Costs without Portfolio Overlap (bps)	Portfolio Overlap within Investment Category Class (%)	Transition Costs with Portfolio Overlap (bps)
Equity			
US Fund China Region	16.67	25%	12.50
US Fund Communications	16.67	25%	12.50
US Fund Diversified Emerging Mkts	16.67	25%	12.50
US Fund Diversified Pacific/Asia	16.67	25%	12.50
US Fund Energy Limited Partnership	16.67	25%	12.50
US Fund Equity Energy	16.67	25%	12.50
US Fund Equity Precious Metals	16.67	25%	12.50
US Fund Europe Stock	12.50	38%	7.81
US Fund Financial	16.67	25%	12.50
US Fund Foreign Large Blend	16.67	25%	12.50
US Fund Foreign Large Growth	16.67	25%	12.50
US Fund Foreign Large Value	16.67	25%	12.50
US Fund Foreign Small/Mid Blend	16.67	25%	12.50
US Fund Foreign Small/Mid Growth	16.67	25%	12.50
US Fund Foreign Small/Mid Value	16.67	25%	12.50
US Fund Global Real Estate	33.33	25%	25.00
US Fund Infrastructure	33.33	25%	25.00
US Fund Intermediate Core Bond	8.33	25%	6.25
US Fund Japan Stock	16.67	25%	12.50
US Fund Large Blend	16.67	25%	12.50
US Fund Large Growth	16.67	25%	12.50
US Fund Large Value	16.67	25%	12.50
US Fund Latin America Stock	16.67	50%	8.33
US Fund Long-Short Equity	16.67	25%	12.50
US Fund Mid-Cap Blend	16.67	25%	12.50
US Fund Mid-Cap Growth	16.67	25%	12.50
US Fund Mid-Cap Value	16.67	25%	12.50
US Fund Natural Resources	16.67	25%	12.50
US Fund Pacific/Asia ex-Japan Stk	16.67	25%	12.50
US Fund Real Estate	33.33	25%	25.00
US Fund Small Blend	16.67	25%	12.50
US Fund Small Growth	16.67	25%	12.50
US Fund Small Value	16.67	25%	12.50
US Fund Technology	16.67	25%	12.50
US Fund Utilities	16.67	25%	12.50
US Fund World Allocation	16.67	25%	12.50
US Fund World Large Stock	16.67	25%	12.50
US Fund World Small/Mid Stock	16.67	25%	12.50

Morningstar Category	Transition Costs without Portfolio Overlap (bps)	Portfolio Overlap within Investment Category Class (%)	Transition Costs with Portfolio Overlap (bps)
Fixed Income			
US Fund Allocation--50% to 70% Equit	13.33	25%	10.00
US Fund Bank Loan	8.33	25%	6.25
US Fund Corporate Bond	8.33	25%	6.25
US Fund Diversified Emerging Mkts	8.33	25%	6.25
US Fund Emerging Markets Bond	8.33	25%	6.25
US Fund High Yield Bond	16.67	25%	12.50
US Fund Inflation-Protected Bond	8.33	25%	6.25
US Fund Intermediate Core Bond	8.33	25%	6.25
US Fund Intermediate Core-Plus Bond	8.33	25%	6.25
US Fund Intermediate Government	4.17	10%	3.75
US Fund Large Blend	16.67	25%	12.50
US Fund Long Government	4.17	10%	3.75
US Fund Long-Term Bond	8.33	25%	6.25
US Fund Multisector Bond	8.33	25%	6.25
US Fund Muni California Intermediate	0.83	50%	0.42
US Fund Muni California Long	0.83	50%	0.42
US Fund Muni National Interm	0.83	50%	0.42
US Fund Muni National Long	0.83	50%	0.42
US Fund Muni National Short	0.83	50%	0.42
US Fund Nontraditional Bond	33.33	25%	25.00
US Fund Preferred Stock	16.67	25%	12.50
US Fund Short Government	4.17	10%	3.75
US Fund Short-Term Bond	8.33	25%	6.25
US Fund Ultrashort Bond	8.33	25%	6.25
US Fund World Bond	8.33	25%	6.25
US Fund World Bond-USD Hedged	8.33	25%	6.25

Internet Appendix Table 4

Separate Accounts and Category Matched Mutual Funds - Counterfactual Performance Differences in the Twins Sample

This table compares the performance separate account investors would have achieved had they invested in hypothetical mutual fund twins with the performance of mutual fund investors. It does so using only those strategies and quarters that have both separate accounts and mutual fund versions (the twins sample). Hypothetical mutual fund twins are built by subtracting from separate accounts the average return or alpha difference between separate accounts and their twin mutual funds (in the twin sample), a difference that is a linear function of latent liquidity, or a category-specific average difference. Panel A reports gross of fee results and Panel B reports net of fee results. We compute three net returns that apply to investors of different sizes: small investors ($10 million mandate), medium investors ($75 million mandate), and large investors ($500 million mandate). The data cover the period from January 2000 through December 2019. *t*-statistics based on standard errors, robust to conditional heteroscedasticity and serial correlation as in Newey and West (1987), are reported in parentheses. Average quarterly differences are annualized by multiplying the quarterly figures times four and reported as basis points. ***, **, * denote statistical significance at 1%, 5%, and 10% levels, respectively.

	Panel A: Gross Counterfactual Performance Differences		
	Gross Excess Returns	Gross Alphas (Category Benchmark)	Gross Alphas (Vanguard Benchmarks)
CSA-MF Difference (Constant Gap)	-0.031*	-0.049***	-0.034*
	(-1.70)	(-2.65)	(-1.67)
Annualized Difference (bps per year)	-12.40	-19.60	-13.60
CSA-MF Difference (Liquidity-Based Gap)	-0.020	-0.039**	-0.028
	(-1.12)	(-2.14)	(-1.37)
Annualized Difference (bps per year)	-0.80	-15.60	-11.20
CSA-MF Difference (Category-Specific Gap)	-0.047**	-0.065***	-0.046**
	(-2.62)	(-3.56)	(-2.29)
Annualized Difference (bps per year)	-18.80	-26.00	-18.40

	Panel B: Net Counterfatual Performance Differences								
	Net Excess Neturns			Net Alphas (Category Benchmark)			Net Alphas (Vanguard Benchmarks)		
	Small Investor	Medium Investor	Large Investor	Small Investor	Medium Investor	Large Investor	Small Investor	Medium Investor	Large Investor
CSA-MF Difference (Constant Gap)	-0.059***	-0.060***	-0.058***	-0.075***	-0.076***	-0.074***	-0.061***	-0.062***	-0.061***
	(-3.10)	(-3.11)	(-3.00)	(-3.72)	(-3.72)	(-3.61)	(-2.88)	(-2.90)	(-2.80)
Annualized Difference (bps per year)	-23.60	-24.00	-23.20	-30.00	-30.40	-29.60	-24.40	-24.80	-24.40
CSA-MF Difference (Liquidity-Based Gap)	-0.049**	-0.050**	-0.048**	-0.066***	-0.066***	-0.064***	-0.056**	-0.057**	-0.055**
	(-2.62)	(-2.59)	(-2.46)	(-3.28)	(-3.25)	(-3.12)	(-2.64)	(-2.62)	(-2.50)
Annualized Difference (bps per year)	-19.60	-20.00	-19.20	-26.40	-26.40	-25.60	-22.40	-22.80	-22.00
CSA-MF Difference (Category-Specific Gap)	-0.076***	-0.077***	-0.076***	-0.093***	-0.094***	-0.092***	-0.076***	-0.076***	-0.075***
	(-4.02)	(-3.99)	(-3.89)	(-4.64)	(-4.61)	(-4.51)	(-3.64)	(-3.63)	(-3.54)
Annualized Difference (bps per year)	-30.40	-30.80	-30.40	-37.20	-37.60	-36.80	-30.40	-30.40	-30.00