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Evidence from Variable Annuity-
Mutual Fund Twins**

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ABSTRACT

We study the roles of traditional governance (boards, sponsors, etc.) and market governance (investors voting with their feet) in mutual funds and variable annuities. We find that market governance is less pronounced for variable annuity investors. Using a matched sample of variable annuity-mutual fund twins, we find that variable annuity investors are less sensitive to poor performance and high fees than mutual fund investors. Given the weaker role played by market governance, we then examine the role played by traditional governance in variable annuities. Variable annuity boards and sponsors add alternative investment options and replace advisors on behalf of their investors after poor performance and high fees. These traditional governance mechanisms are, however, less effective when conflicts of interest exist between variable annuity sponsors and fund advisors.

Introduction

In a seminal article on ownership and control, Fama and Jensen (1983) argue that the role of traditional governance mechanisms such as boards of directors is different for mutual funds and other financial mutuals than it is for corporations. Because mutual fund investors can redeem their shares at net asset value, they can effectively remove the manager from the control of those assets. The decision to redeem shares (market governance) and the associated loss of management's control over these assets can be undertaken independently by each investor. Shareholders of a corporation, however, can sell their shares in the market, but the manager typically maintains control over the assets even after investors have sold their shares. Fama and Jensen (1983) argue that this "strong form of diffuse decision control inherent in...redeemable residual claims" implies that other mechanisms for monitoring managerial actions, such as boards of trustees, are less important for financial mutuals. Yet several academic papers show benefits from board oversight for investors¹ and regulatory bodies such as the Securities and Exchange Commission (SEC) have recently emphasized the importance of traditional governance mechanisms such as boards.

We examine the roles of market and traditional governance mechanisms predicted by Fama and Jensen (1983) for a specific type of financial mutual, a variable annuity policy. Variable annuity policies combine characteristics of mutual fund-style investment accounts and insurance products. A typical variable annuity policy allows investors to allocate money among various offerings of managed funds (so-called subaccounts). The subaccounts invest in underlying mutual funds that are advised by investment companies. Variable annuity investors thus carry investment risk. The most frequent insurance component of variable annuity policies specifies that policyholders' heirs inherit at least the face value of total contributions. Because of the insurance component, dividends and capital gains that accrue on assets held in variable

¹ For example, Tufano and Sevick (1997) find evidence that fees are lower for mutual funds whose boards are smaller and have a larger fraction of independent directors. Zitzewitz (2003) shows that the incidence of stale-pricing in fund complexes is higher for funds with fewer independent directors. Khorana, Tufano, and Wedge (2006) find that there is a higher probability of a merger if a fund has underperformed and if it has a higher fraction of independent directors. Ding and Wermers (2005) find that boards with larger numbers of outside directors are more likely to replace a poorly performing manager. Qian (2006) finds that funds with higher paid boards and funds with less performance sensitive flows had a higher probability of being indicted for late-trading or market timing. For contrasting views, see Ferris and Yan (2007), who find that board and chairman independence have no explanatory power for the likelihood of a fund scandal, the level of fund fees, or fund performance.

annuity accounts are not taxed until the policy owner receives variable annuity payouts, similar to 401(k) plans.

In spite of the relatively large market for variable annuities (more than \$1.3 trillion in the United States)² research on variable annuities has been relatively sparse.³ We focus on variable annuities, however, not just because of the size of this market, but because variable annuities have two unique institutional features that allow us to carry out a test of the roles of market governance and traditional governance. First, many variable annuity subaccounts are “clones” of popular mutual funds so there is a natural control sample. We use this control sample to compare the sensitivity of flows to performance and fees (market governance) for both variable annuity and mutual fund investors. We show that mutual fund investors and variable annuity investors holding virtually the same fund have different reactions to poor performance and high fees. The fund flow performance and fund flow expense ratio relationship is considerably weaker for variable annuity funds than for mutual funds.

Given this finding of reduced market governance for variable annuity investors vis-à-vis mutual fund investors in the same asset, we ask whether traditional governance mechanisms are important for investors in variable annuity policies. To address this question, we use the second feature of variable annuities. Because a variable annuity policy consists of a number of managed subaccounts, similar to a fund-of-funds structure, the insurance sponsor of the policy or the board of the variable annuity advisor can act on behalf of investors in making changes to the investment opportunity set offered by the policy. Actions that could benefit investors, such as the addition of a new subaccount or a change in subadvisor for a given subaccount, are common. Consistent with the roles of market and traditional governance mechanisms suggested by Fama and Jensen (1983), we find that either new subaccounts are added or subadvisors are changed by the insurance sponsor when existing subaccounts have poor performance and high fees, even though investor flows are relatively insensitive to either of these fund attributes. But the provision of these changes is adversely affected when the insurance sponsor has an affiliation with the subaccount’s advisor.

² The Association for Insured Retirement Solutions (NAVA) reports that the total assets under management in variable annuities as of December 31, 2006 is \$1.3567 trillion.

³ An excellent overview of the area can be found in Brown and Poterba (2006) and Poterba (2001). Poterba (2001) summarizes the history of annuity contracts in the United States, and Brown and Poterba (2006) offer details about the market for and taxation of variable annuity products, and characterize which households hold variable annuity products.

To better understand our examination of traditional governance, it is important to understand the organizational structure of the variable annuity industry. Insurance companies offer variable annuity policies to investors. Each variable annuity policy offers a set of managed portfolios or subaccounts. We observe two principal structures for the oversight of these managed portfolios. In the first structure, which we call “sponsor only,” the insurance company or an affiliate sponsors the variable annuity but does not take an advisory role. In the role of sponsor, the insurance company exercises considerable control over which funds are offered as subaccounts and under which conditions, and could take on an important monitoring function even though they have no requirement for direct board oversight. We analyze the decision of the variable annuity sponsor to add further investment options in the form of new subaccounts. The variable annuity sponsor has the choice to add a subaccount that is managed by an investment advisor that is affiliated (e.g., GE Life and Annuity adds the GE Asset Management Small-Cap Value Equity subaccount) or unaffiliated (e.g., GE Life and Annuity adds the Dreyfus Socially Responsible Growth subaccount). We distinguish between the decisions to add an unaffiliated or affiliated subaccount to highlight the role of true independence in governance decisions.

In the second structure, which we call “sponsor-advisor,” the insurance company acts as the policy sponsor and an affiliate of the insurance company acts as the principal investment advisor. As an advisor to the subaccounts in the policy, the insurance-company-affiliated advisor contracts with either affiliated or unaffiliated subadvisors to manage the subaccounts. In this structure, the insurance company advisor can terminate a subadvisory agreement. For example, Allianz Insurance Co. offers several annuity policies whose subaccounts are overseen by USAllianz Advisors, an affiliated investment advisor. One of the subaccounts, USAZ Van Kampen Growth, is subadvised by Van Kampen. If USAllianz was dissatisfied with the subadvisor, it could terminate the subadvisory agreement and offer, for example, a USAZ Templeton Growth fund instead. As we did in the first structure, we distinguish in our empirical analysis between unaffiliated and affiliated subaccounts to understand the value of true board independence.

We find that the addition of subaccounts to variable annuity policies depends on the performance of the existing investment choices. If the existing investment choices perform poorly, insurance firms tend to add other subaccounts in that asset class. We also observe, however, different actions by the insurance firm for additions of unaffiliated and affiliated

subaccounts. Unaffiliated subaccounts are added after poor performance and if fees of existing accounts are high, but having affiliated accounts in the same asset class reduces the probability of an addition. The addition of affiliated accounts is positively related to past fund flow in the asset class and negatively related to expense ratios of existing accounts.

In the second governance structure, we find that high fees and poor performance of existing advisors are statistically and economically important determinants of the board's decision to replace an unaffiliated subadvisor. But when the board of trustees replaces an unaffiliated subadvisor with an affiliated advisor, we do not find that the replacement decision is related to either performance or fees.

The results of our paper have important implications for the recent debate on governance in mutual funds.⁴ Although the recent legislative efforts are focused on strengthening the role of independent trustees in mutual fund complexes, they have largely ignored a more fundamental issue in mutual fund governance: Both the interested and independent trustees are initially appointed by the sponsor of the mutual fund itself.⁵ Our evidence suggests that affiliations between the monitor and the monitored entity can create conflicts of interest that interfere with effective governance. Whenever the provider of governance in financial mutuals is truly independent of the management of the mutual fund, we find that they act more on behalf of their shareholders.

The remainder of the paper is organized as follows. Section 1 describes our data, the variable annuity market, and the sample construction. Section 2 contains the empirical results on the fund flow performance and fee sensitivities of variable annuities relative to mutual funds. Section 3 carries out the empirical tests on the relevance of traditional governance, and Section 4 concludes.

⁴ The role of boards in financial mutuals, generally, and mutual funds, specifically, has been a recent topic of interest to the SEC. In June, 2006, a Washington, D.C., circuit court struck down the SEC's proposed fund governance rule that would require fund boards to have an independent chair and to be composed of 75% or greater independent directors. The SEC recently reiterated its desire to address the issue, albeit in a different form than the previous regulation.

⁵ Many industry observers have argued that the structure of boards in mutual funds is ill-suited for true oversight. See, for example, the references cited in SEC (1992).

1 Data and Sample Construction

1.1 Data

The variable annuity database and the mutual fund database we use are both from Morningstar. Annual snapshots from 1997 to 2005 are constructed from the Morningstar Principia Mutual Fund and Principia Variable Annuity databases. We obtain monthly total net assets and return data from the fund databases.

1.2 Variable Annuity Policies

Variable annuity policies can be separated into qualified and nonqualified variable annuity policies. Many academics hold qualified annuities through the monthly purchase of TIAA-CREF annuities for their retirement accounts. Nonqualified annuities are purchased outside retirement plans.⁶ Morningstar has a flag that separates nonqualified and qualified variable annuities, and we focus in our study on the voluntary purchases of nonqualified annuities. Nonqualified plans can be bought with a single initial premium, or with regular contributions during the accumulation phase. Interest, dividends, and capital gains are not taxed during the accumulation phase. The policyholder can start the payout phase at any point after reaching age 59 and a half. At this point, account withdrawals can be made without incurring an early withdrawal tax penalty but these withdrawals from the investment account are taxed as regular income.

Each variable annuity policy offers its investors a set of managed portfolios (so-called subaccounts) that they can invest in. Investors can change the allocation of their investments across different subaccount investment styles without incurring a tax penalty during the accumulation phase. Most insurance companies collect two fees on their variable annuity policies: an expense ratio and an insurance-related fee. Although the insurance-related charges are typically constant across all subaccounts for a given variable annuity policy, the expense ratio varies across subaccounts for the same annuity policy. Appendix A contains a detailed description of eight different variable annuity policies offered by Allianz Life Insurance of North America. These variable annuity contracts differ with respect to death benefits, investment choices, mortality and insurance expenses, and surrender charges associated with them.

⁶ Brown and Poterba (2006) offer a detailed description of variable annuity policies. The description in this section draws on their analysis.

In general, there are four different types of death benefits offered to annuity policyholders: accumulation value (AV), rising-floor (RF), principal (PR), and stepped-up (SU) death benefits. Accumulated-value death benefits (AV) pay the dollar amount accumulated in the investor's contract at the time of his or her death. The rising-floor (RF) benefits pay out principal plus a minimum guaranteed annual increase, which is usually limited to 200% of the premiums paid, less surrenders and withdrawals. The principal death benefits (PR) pay out total premiums less surrenders, but take neither gains nor losses into account. The stepped-up benefits (SU) offer the investor the chance to replace the initial base death benefit (total premiums less withdrawals) with the value of the contract at a later date, if it is more attractive.⁷ The mortality and expense charge is compensation for the death benefit offered, and the insurance expenses are the sum of mortality and expense charges and any other administrative charges levied by the insurance company.

Variable annuity investors can switch variable annuity policies from one provider to the other without incurring tax penalties (so-called 1035 exchanges, named after the relevant section of the tax code). Insurance firms often use surrender charges to discourage investors from changing variable annuity policies. A surrender charge is usually expressed as a percentage of the amount that is either withdrawn or surrendered, and is generally imposed on the premiums paid, and not on capital gains. Similar to back-end loads, surrender charges typically decline over time. For example, the Allianz Alterity variable annuity policy in Appendix A has a surrender charge of 7% that declines each year by 1.4% and consequently is zero after five years.

Table 1 shows summary statistics for all variable annuity policies in our database for the year 2005. There are 1,162 different variable annuity policies offered by 103 different insurance companies. Table 1 shows the different investment choices, fees, surrender penalties, and death benefits offered.

The average policy offers its holders the choice between 35.6 (median: 33) different subaccounts. These subaccounts are offered by 8.6 (median 8) different subadvisors. The mortality expenses—charged as compensation for the death-benefit insurance provision—are 103.6 basis points on average. In addition, the insurance firms levy, on average, 10.4 basis points of administrative charges and 1.4 basis points of distribution charges so that the total fees collected by the insurance firm are 115.4 basis points. These numbers are consistent with those

⁷ Some variable annuity policies also offer a guaranteed face value similar to a normal life insurance policy.

reported by Brown and Poterba (2006). The considerable insurance-related fees of 115 basis points have been criticized in the business press and in academic studies. The mortality expenses appear to substantially exceed the value of the life insurance provided (e.g., Brown and Poterba [2006] and Milevsky and Posner [2001]). The average expense ratio paid to the advisor of the subaccount is 90.1 basis points, which compares to an average expense ratio of 119.8 basis points for mutual funds in 2005. The total fees paid by the variable annuity holder are 205.8 basis points, on average.

Surrender fees average 5.1% of the value of the initial investment, with an average duration of 4.6 years. Step-up, principal, and accumulation-value are the most common death benefits with about 25% each.

1.3 Matching a Variable Annuity Subaccount to its Mutual Fund Counterpart

Because we would like to evaluate the performance and fee sensitivity of variable annuity fund flows *relative* to their mutual fund counterparts to substantiate the claim for less market governance of variable annuity investors, we manually match variable annuity funds to their mutual fund counterparts.

The Morningstar database contains a link from variable annuity subaccounts to the underlying variable annuity fund. We match the underlying variable annuity fund with its mutual fund counterpart by hand.

As an example of the matched pair we are creating, we can look at the AIM Variable Insurance (V.I.) International Growth Fund. We match the AIM V.I. International Growth Fund by name to a mutual fund master list and identify the AIM International Growth Fund as a promising potential match.

Although the title of the fund and the subaccount are very similar, it is possible that the two materially differ in some respects. We therefore employ additional filters—we verify that the two funds have the same investment objective and the same manager, and that the time series of returns of the matched funds have a statistically significant correlation of 0.95 or greater. With respect to our example, both the mutual fund and the variable annuity fund are managed by Shuxin Cao, Matthew W. Dennis, Jason T. Holzer, Clas G. Olsson, and Barrett K. Sides and are categorized by Morningstar as having a foreign large cap growth investment objective. Also, the mutual fund boasts a 2004 return of 23.42% and the variable annuity reports returns of 24.00%

for series I and 23.70% for series II over the same period. Figure 1 lists the five largest allocations by country. Comparing the schedule of investments for both the mutual fund and the variable annuity shows that although the two portfolios differ, the portfolio holdings for the top five countries are very similar.

We impose two additional filters on the data. First, matches with monthly flows greater than 400% are removed. Second, only those variable annuity funds that can be identified by name as separate accounts of insurance companies are kept. The final sample includes 151 matches.

Table 2 shows summary statistics for the matched sample. The size distribution of both variable annuity funds and mutual funds is right-skewed. The average size of mutual funds (variable annuity funds) is \$826 million (\$669 million), but the median size is only \$67 million (\$127 million). Mutual funds are older and have higher expense ratios.⁸ The gross returns of the variable annuities and the matched mutual funds are statistically indistinguishable from each other, which is not surprising given our sample construction criteria. This result strengthens our claim that variable annuity funds and their matched twin mutual funds have indeed very similar performance and portfolio holdings. But the net returns and other performance metrics based on returns less fees are higher for mutual funds than for variable annuity funds because the net returns to variable annuity funds also incorporate the insurance charge for mortality expenses. Finally, mutual funds exhibit larger monthly net inflows.

1.4 Oversight of Variable Annuity Subaccounts

In our data, we observe two different governance structures for the subaccounts, “sponsor-only” and “sponsor-advisor.” These two structures are not necessarily mutually exclusive. Appendix B contains a detailed example of both structures using an actual observation from our data.

In the sponsor-only structure, the insurance company or an affiliate sponsors the variable annuity policy. The board of the insurance company or the affiliate authorizes the establishment of the policy, which consists of a number of subaccounts. Investors can choose which subaccounts to invest in and often the subaccounts are clones of a fund offered by a major

⁸ The difference in expense ratios between the mutual funds and variable annuities is approximately the size of the 12b-1 fee. Though it appears that none of the variable annuities in our matched sample is charging a 12b-1 fee, some variable annuities have begun including these fees in their expense ratios.

external investment advisor, set up as a separate account or a unit investment trust separate account. Although the board of the original fund typically monitors both the clone and the original fund with respect to internal fund issues, the sponsors choose the subaccounts that the policy will offer. Sponsors have a fiduciary responsibility with respect to these decisions; In particular, they are required by section 26(f) and 27(i) of the Investment Company Act of 1940 to ensure that “fees and charges deducted under the contract, in the aggregate, are reasonable in relation to the services rendered” for the subaccounts offered.

Figure 2 demonstrates these relations for one example of our database. Allianz Insurance of North America, the sponsor of the policy, chooses to add the AIM V.I. Growth Fund as a subaccount investment option to the policy. The AIM V.I. Growth Fund is a subaccount advised by AIM investment advisors. This subaccount is a clone of the AIM Growth Fund, sharing the same name, same manager, and the same investment objective. Although the AIM board oversees internal fund issues for both the original fund and its variable annuity subaccount clone, it is USAllianz that has the ultimate fiduciary responsibility for offering the AIM V.I. Growth investment option to its variable annuity policyholders.

For the case of the sponsor-advisor structure, the advisor can manage the fund itself, but frequently does not do so. The insurance-affiliated advisor often evaluates and selects a subadvisor to manage the portfolio decisions of the fund. Frequently the investment advisor does not have any clients other than the insurance company. The advisor’s principal role can then be defined as monitoring the subadvisors and making recommendations to the board of trustees. Under this structure, investment advisor and trustees do not seem to be subject to the same conflict of interest that often arises in the other structure. For example, Allianz Insurance of North America has given the management of many of their subaccounts to an affiliate, USAllianz Variable Insurance Products (VIP) trust. The management of the VIP trust explicitly states:

“The Manager (USAllianz Advisors) does not provide investment advice with regard to selection of individual portfolio securities, but rather evaluates and selects Subadvisers for the Trust, subject to the oversight of the Board of the Trust. The Manager monitors and reviews the activities of each of the Subadvisers to the Trust. In addition, the Manager constantly evaluates possible additional or alternative subadvisers for the Trust. The Manager currently does not have any clients other than the Trust.”

Figure 3 shows the relation for one example of our database. USAllianz offers a basic value subaccount that is subadvised by AIM. USAllianz Advisors, if dissatisfied with the performance of AIM advisors, can terminate the subadvisory contract and subcontract with a different investment advisor. Note, however, that some of the subadvisors are affiliated with Allianz (such as PIMCO), whereas others are unaffiliated managers (such as van Kampen).

2 The Relative Importance of Market Governance

If investors monitor their funds closely, and if they vote with their feet, we would expect the flows into funds to depend on past returns and fees. We study the sensitivity of the percentage net fund flow to a measure of total returns, controlling for other determinants of fund flow.

We follow Sirri and Tufano (1998) and define net percentage fund flow as the net growth in fund assets beyond reinvested dividends. It is calculated as

$$Flow_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-1} \times (1 + R_{i,t})}{TNA_{i,t-1}},$$

where i indexes funds and t either months or years. TNA is total net assets. Our measure implicitly assumes that all flows occur at the end of the year, but all our conclusions hold if we assume that the flows come at the beginning of the year.

Note that we are especially interested in the performance sensitivity of the group of variable annuity investors *relative* to the group of mutual fund investors. We employ two specifications. First, we use our matched twin sample that can control for unobservable fund characteristics and study monthly percentage flows. Second, as a robustness check, we use data on all variable annuity funds and, for each one, we randomly choose a mutual fund that is in the same investment objective category and was founded within a year of the variable annuity fund, and estimate a regression using annual flows.

The two right-side variables of interest are the performance measures for the fund and the fund's expense ratio. Evidence from Del Guercio and Tkac (2002) and Evans (2007) show that mutual fund investors respond to less sophisticated measures of performance. For this reason, we use total return and a simple risk-adjusted measure, investment objective adjusted return (fund return minus the equal-weighted return of all other funds in the same investment objective class

as defined by Morningstar), as the performance measures.⁹ In some specifications, we employ a piecewise linear specification to allow for potential asymmetries in the fund flow performance relation. We control for the previous month's (year's) net flows, the size of the fund, and the age of the fund in the regression specification.

Table 3 shows results from a fund flow-performance sensitivity regression using our matched twin sample and monthly flows.¹⁰ Our twin sample allows us to control for unobservable fund characteristics such as management and portfolio holdings, and to concentrate on the impact of investors, which is the one variable that distinguishes the variable annuity fund from the mutual fund. The dependent variable is the difference between the percentage net fund flow into a mutual fund and the percentage net fund flow into the matched twin variable annuity fund. A larger value for the dependent variable means a proportionally larger inflow into the mutual fund than into the matched variable annuity fund. The variables of interest are the three-year total return, the investment objective-adjusted return ($R_{\text{Fund}} - R_{\text{InvObj}}$) and the expense ratio. Specifications I–III use total return as the performance measure and specifications IV–VI use the investment objective-adjusted return measure. Specifications I and IV assume a linear relationship between performance and flows and specifications II–III and V–VI allow for the piecewise linear specification with a kink at the median of the performance measure. Controls for fund age, fund size ($\text{Log}(\text{TNA})$), and the lagged difference in monthly flows between the mutual fund–variable annuity pair are in specifications I–II and IV–V, and in specifications III and VI, we replace fund characteristics variables with a pairwise fixed effect. Although we allow for separate mutual fund and variable annuity coefficients on the size ($\text{Log}(\text{TNA})$) and the age variables, the high correlation in the return and expense ratio measures between the variable annuity and its mutual fund twin necessitate using only one version of these variables in the regression.¹¹ Standard errors are clustered by variable annuity–mutual fund pair.

The difference in net fund flow is positively related to both performance measures, an indication that mutual fund investors are more sensitive to performance than variable annuity investors. For a one-standard-deviation change in total return (roughly 14% annualized), monthly

⁹ We have repeated the analysis for the domestic equity funds using four-factor alphas (Fama and French [1993] and Carhart [1997]) with qualitatively and quantitatively similar results.

¹⁰ Repeating the analysis in Table 4 with annual flows, similar to Table 3, gives coefficients with similar economic magnitude to those reported, but the sample size is reduced so dramatically that none of coefficients are statistically significantly different from zero.

¹¹ The results are virtually identical if we use the variable annuity fund performance or expense ratios instead.

flows to a mutual fund would change approximately 4% more than monthly flows to its variable annuity twin. When we use a piecewise linear specification, we see that this difference in performance sensitivity is driven by performance below the median. This observed higher sensitivity of mutual fund investors to poor performance is especially interesting given the evidence showing performance persistence in the worst performing funds (e.g., Carhart [1997]). We also estimate a positive coefficient on the above median performance coefficients, which is suggestive of higher performance sensitivity for mutual funds even when the fund is performing well, but these coefficients are not statistically significant. None of the other variables in the regression has statistically significant coefficients except the intercept and the lagged flow difference variable.

To address potential concerns about the small size of our twins' sample, we estimate an annual flow-performance regression using a different matched sample. For each variable annuity subaccount, we randomly select a mutual fund with the same investment objective and with an inception date within a year of the variable annuity subaccount. Instead of using a difference in the annual flows of the variable annuity and its randomly selected control fund as the dependent variable, we use annual flows and we allow separate coefficients for variable annuities and their mutual fund twins. As before, the performance measures of interest are total return and investment objective adjusted return. In specifications I and III a linear relationship between flow and performance is assumed. In specifications II and IV, we employ a piecewise linear specification. Standard errors are clustered by fund/subaccount.

Table 4 shows the result of the OLS regression for the aggregate sample. In specifications I and III, we see that both variable annuity funds and mutual funds display a positive relation between percentage net fund flow and past returns. A test of equality of coefficients for variable annuity and mutual funds rejects the null hypothesis of equal performance sensitivity in favor of higher performance sensitivity of the mutual funds (the *p*-values are reported at the bottom of each column in Table 4). The piecewise results in columns II and IV show that flows to mutual funds are more sensitive to both above- and below-median performance than are variable annuity flows, but the difference in coefficients for the below-median performance measures is economically larger. For example, a one-standard-deviation decrease in Total Return Low (below median) performance for both mutual funds and variable annuities is associated with a 3.8% differential decrease in percentage net flow between mutual funds and variable annuities

(mutual fund flow decreases by 3.8% more than variable annuity flow). A one-standard-deviation increase in Total Return High (above median) on the other hand, is associated with a 1.8% differential increase in percentage net flow between mutual funds and variable annuities (mutual fund flow increases by 1.8% more than variable annuities). This is consistent with the results from Table 3 indicating that differences in flow-performance sensitivity between mutual funds and variable annuities were driven by sensitivity to poor performance.

We also learn from Table 4 that flows to mutual funds are negatively related to expense ratios and flows to variable annuities are weakly positively related. Although we did not find evidence of this sensitivity to expense ratios in the matched sample, this larger sample has much greater cross-sectional variation in expense ratios. This result is interesting given the evidence on the negative relationship between fund performance and expense ratios (e.g., Carhart [1997] and Edelen, Evans, and Kadlec [2007]). Because higher expense ratios are associated with worse performance, it makes sense for investors to avoid these funds.

The control variables for mutual funds have the expected sign. Large funds receive smaller percentage inflows, past inflows have a positive relationship with current inflows, and age is unrelated to performance. These results are consistent with the results on the fund flow performance and fee sensitivities reported by earlier papers (e.g., Ippolito [1992], Chevalier and Ellison [1997], Sirri and Tufano [1998] and Barber, Odean, and Zheng [2005]). Although we do not know of any previous research describing the determinants of flows into variable annuities, we are somewhat surprised by the weak positive relationship between expense ratios and flows, the positive relationship between fund age and flows, and negative relationship between past and current flows. Nonqualified variable annuities are largely sold through broker networks, so the positive relationship between expense ratios and flows may be explained by the incorporation of distribution costs into expense ratios. Also, the evidence presented in the next section regarding subaccount addition and subadvisor replacement may explain the observed relationship between age and flows. We find that poor performance and high fees are important determinants of the decisions to add new subaccounts (effectively cannibalizing the flows to existing subaccounts) and to replace subadvisors. As a result of this behavior, those subaccounts and subadvisors that have been in the sample the longest may experience the highest flows.

Overall, we conclude from the evidence presented in Tables 3 and 4 that variable annuity investors are significantly less performance-sensitive than investors in mutual funds. The weaker

market governance—investors do not react to performance—for variable annuity investors is particularly pronounced when funds are doing poorly. Although our analysis here does not shed light on the explanation for the lower performance and fee sensitivity of variable annuity investors relative to mutual fund investors, there are a number of possible explanations. Because variable annuities are pure retirement vehicles, it is possible that the longer investment horizon of these investors contributes to the lower sensitivity. There are also higher costs associated with switching for variable annuity investors (surrender fees, switching fees, etc.), tax penalties for withdrawing the money early, and additional paperwork required for switching between policies (1035 exchange) to ensure the switch is not a taxable event. All of these reasons may play a role in the observed lower sensitivity of variable annuity investors.

3 The Role of Traditional Governance

We now discuss the two main candidates for the provision of traditional governance in variable annuity policies. We start with the role of the insurance firms in the sponsor-only structure in Section 3.1. In Section 3.2, we examine the role of board governance in the sponsor-advisor structure.

3.1 The Sponsor-Only Structure: Selection of New Subaccounts

Variable annuity investors can invest in a wide array of funds in different investment objective classes. The insurance firm controls the available investment options of a given policy and can choose to add a new subaccount to an existing investment objective class or to an entirely new class. Recall that variable annuity investors cannot invest outside the subaccounts offered by their policies. Insurance firms therefore perform an important task on behalf of their investors: They can add to the list of subaccounts that are offered within each policy, or they can remove existing subaccounts.¹²

¹² The American Academy of Actuaries 2006 report (AAA [2006]) suggests that opening new subaccounts may be a more common mechanism for adjusting investment options for investors than closing down subaccounts or changing subadvisors due to the regulatory complexity of the latter two:

Any change in the fund offerings is subject to the necessary regulatory approvals. The substitution of one fund for another or the combining of several investment options into a single fund is generally more complicated and time-consuming than adding a new option or closing an existing investment option to further allocation by contract holders. Substitution of one fund for another typically involves a substitution application to the SEC and possibly requires underlying variable annuity contract-holder approval.

We examine the determinants of adding new subaccounts in one of Morningstar's investment objective classes. In particular, we test whether insurance companies are performance- and fee-sensitive with respect to the subaccounts they offer. We estimate in Table 5 a probit regression where the dependent variable is equal to one if a new subaccount is added by the policy in an investment objective class in a given year and zero otherwise.

If insurance firms monitor their existing accounts on behalf of investors, we would expect insurance firms to add new subaccounts to a specific investment objective class if the performance of the existing accounts is poor relative to all available funds within that class. Recognizing that the insurance sponsors of the variable annuities may be financially more sophisticated than the typical retail investor, in addition to the investment objective-adjusted return ($R_{Fund} - R_{InvObj}$) used in the flow-performance analysis, we also use factor-based performance measures. We divide the sample of variable annuity subaccounts into three groups: domestic equity, international equity, and fixed income. For each group we calculate alpha using an appropriate factor model. For the domestic equity subaccounts we use the methodology developed by Fama and French (1993) and Carhart (1997) to calculate a four-factor alpha accounting for the subaccount's market, book-to-market, market capitalization, and momentum exposures. For the fixed income funds, we use the methodology suggested by Fama and French (1993) and calculate a four-factor alpha accounting for the return on the aggregate fixed income performance (Lehman Brothers Aggregate Bond Index return), a term-spread factor (CRSP monthly 30-year treasury bond return minus the CRSP 30-day treasury bill return), and a default spread factor (Lehman Brothers Long Term Corporate Bond Index return minus the CRSP 30-year treasury bond return). Similar to Busse, Goyal, and Wahal (2007), we also incorporate a high-yield factor (Credit Suisse First Boston High Yield Index return). We also follow the methodology adopted by Busse, Goyal, and Wahal (2007) for international equity funds. For these funds, we calculate the international version of the original Fama and French (1993) model accounting for the fund's international market (S&P/Citigroup Extended Market Index return), international book-to-market (the international book-to-market portfolio returns from Ken French's Web site), and international market capitalization exposures (S&P/Citigroup PMI World Index return minus the S&P/Citigroup EMI World Index return). These performance measures are calculated using the previous 36 months of returns. If insurance companies act in the interest of their variable annuity investors, we would also expect new subaccounts to be

added if the fees of existing accounts are high. We measure fees as expense ratios minus the investment objective class average expense ratio.

We carefully control for other variables that may influence the decision to add subaccounts. We speculate that the decision to add a new subaccount depends on the number of self-managed subaccounts the variable annuity policy already offers, and on the relative popularity of that investment objective class in the entire variable annuity fund universe, as measured by the percentage of total variable annuity flows to that specific investment objective class. We add year-fixed effects and adjust standard errors for clustering on a variable annuity policy level. Note that we only look at the decision to add subaccounts to an investment objective class that is already established, and that we do not address the question of when an insurance firm adds a completely new investment objective class.

Table 5 reports the marginal effects of the probit regression. The probability of a new subaccount being added in a given investment objective is decreasing in the performance of the existing subaccounts. In other words, if the performance of existing subaccounts is poor, insurance firms add new subaccounts to their policies. The results do not change if we use the factor-alpha performance measure instead of the investment objective adjusted return (column 2). But the economic effect appears small. A one-standard-deviation decrease in the monthly investment objective-adjusted return (factor alpha) increases the probability of an addition of a subaccount by 0.1% (2.0%). Although the relative expense ratio has a coefficient that does not appear to be different from zero in column 1, it is positive and marginally statistically significant in column 2, indicating that if fees are high relative to the investment objective, the probability of adding a new subaccount in that investment objective class is increased. The control variables have the expected signs. If a particular investment objective has seen a lot of past fund flow, it is more likely that a subaccount is added. If an insurance firm or its affiliated advisor manages a larger fraction of the assets in the same investment objective class, it is considerably less likely additional accounts will be added.

Overall, we conclude from the results in Table 5 that insurance firms appear to monitor the performance of their subaccounts and weakly react to poor performance by adding competing accounts as choices for their investors.

Table 5 does not differentiate between whether the insurance firm adds a subaccount managed by an affiliated entity, or whether it adds a subaccount managed by an unaffiliated

advisor. But such a distinction may be important if we want to capture the true incentives for additions of accounts. In Table 6, we therefore estimate a multinomial logit regression in which we estimate separate coefficients for the addition of an unaffiliated subaccount and an affiliated subaccount.¹³

Results from two separate regressions are reported in Table 6. Columns 1 and 2 report results for the first multinomial model, in which we employ the investment objective-adjusted return as a benchmark, and columns 3 and 4 report results for a multinomial model in which the factor alpha is the main measure of performance attribution. Columns 1 and 3 report the changes for independent variables in the probability ratios of an addition to a subaccount managed by an unaffiliated advisor against no addition. Columns 2 and 4 report the corresponding values for additions of a subaccount managed by an affiliated advisor against no addition. A positive number in these regressions indicates that an increase in the independent variable makes it more likely that a new subaccount is added.

The results of columns 1 and 2 show that the determinants of subaccount additions are different for the addition of an unaffiliated-advised subaccount and an affiliated-advised subaccount. Column 1 demonstrates that an unaffiliated account is added if relative expense ratios are high and the fraction of existing assets managed by an affiliated advisor is low. But column 2 shows that affiliated subaccounts are added when expense ratios of existing accounts are low relative to the average expense ratio in the same investment objective class and the fraction of existing assets managed by an affiliated advisor is high. Although we find no sensitivity to performance in the decision to add an affiliated subaccount using the investment objective-adjusted return, the results using the factor alphas indicate there is strong sensitivity to performance. The economic magnitude of the reported coefficients can be gauged by taking the exponential of the coefficient and interpreting it as a relative-risk ratio. For example, the coefficient of 0.210 on the relative expense ratio of column 1 can be interpreted as 23% higher odds of an addition of an unaffiliated-managed subaccount for a one unit (1%) change in the relative expense ratio.

This evidence is consistent with insurance firms' not wanting to cannibalize inflows into their own subaccounts, as they are significantly less likely to add unaffiliated subaccounts if the

¹³ To identify if an advisor is affiliated with the insurance company, we hand-check fund prospecti. We do make the assumption, however, that advisors with the same name as the insurance company are affiliated.

fraction of affiliated subaccounts in a given investment objective class is high. But column 2 shows that if the fraction of affiliated accounts is high, insurance firms are more likely to add new affiliated accounts. One interpretation of this result is that insurance firms do not mind if a possible fund outflow from an affiliated account is compensated by a fund inflow into another affiliated account, but that they are reluctant to offer outside competition to an investment objective in which affiliated advisors are well established. Both the addition of an unaffiliated and affiliated subaccount is more likely if the relative dollar flow into the investment objective class across all variable annuity policies was high in the previous year, suggesting that insurance firms react to investors' demands. The multinomial model allows us to test the equality of coefficients across the different outcome variables. When we test within the multinomial logit model, whether the coefficients are different across columns 1 and 2, we are able to reject the equality of coefficients for the expense ratios and the fraction of affiliated accounts at the 5% level. Insurance firms are more likely to add affiliated subaccounts than to add independent subaccounts whenever existing investment options have lower fees and are offered in house. Columns 3 and 4 repeat the multinomial analysis, but use the 36-months factor alphas as a performance benchmark. Column 4 documents that more affiliated accounts are added after poor performance of existing accounts when we use the 36-months factor alphas as a benchmark. The other coefficients are qualitatively and quantitatively similar to the specification of columns 1 and 2. Tests of equality of coefficients across columns 3 and 4 again reject the null hypothesis for the relative expense ratio and the fraction of affiliated accounts at the 5% level.

Overall, the results from Tables 5 and 6 are mixed about the governance role of insurance firms. Although insurance firms tend to react to poor performance and higher fees by adding more subaccount choices for their annuity investors, there is evidence that they do not necessarily behave in the best interest of their investors whenever they have a conflict of interest caused by an affiliation with the fund's manager.

3.2 The Sponsor–Advisor Structure: Replacing Subadvisors

As discussed in Tufano and Sevick (1997), two principal responsibilities of mutual fund boards are to approve contracts with fund advisors and to negotiate management fees and expense ratios with those advisors. We concentrate our analysis on the approval of contracts with fund advisors, because the management fees and expense ratios we observe in our data are potentially

contaminated by undisclosed revenue-sharing agreements between insurance firms and fund advisors.¹⁴

We examine the role of nonmarket governance in the sponsor–advisor structure by analyzing the determinants of the decision to renew or replace an existing subadvisor. Tufano and Sevick (1997) describe that a nonrenewal of an advisory contract is a rare event in the universe of mutual funds. In their paper, they mention that to the best of their knowledge, over a span of 30 years, boards of mutual funds have only replaced a fund advisor against the advisor’s wishes three times. We therefore concentrate in this section on the variable annuity funds managed by insurance-affiliated trusts, in which the insurance affiliated advisor frequently subcontracts with unaffiliated investment advisors (see Figure 3).

We have a total of 1,162 fund-year observations with complete data for 11 trusts. In 77 fund-year observations, we observe a decision not to renew a management contract and to change the subadvisor. Therefore, a change of subadvisor occurs in 6.6% of all fund-years. We test whether a fund’s trust changes the subadvisor because of poor performance and high fees, carefully controlling for other determinants that may influence the decision to change subadvisors.

Table 7 presents the results of a probit regression of the decision to replace a fund manager. The regression is estimated annually, and the dependent variable is 1 if the manager is replaced in the next year or 0 otherwise. Table 7 reports marginal effects. Several advisor characteristics are included as independent variables. The principal variables of interest are the indicator of whether or not the current advisor is affiliated, the measures of performance, and relative expense ratios. As in the previous section, we estimate two separate specifications with different performance metrics and different time horizons to establish the robustness of our results. Columns 1 and 3 of Table 7 use the manager’s investment objective-adjusted return $R_{\text{Fund}} - R_{\text{InvObj}}$ over the past 36 months as a performance measure, and columns 2 and 4 use the factor alphas calculated over the previous 36 months as the performance measure. We include the investment objective-adjusted expense ratio as our second main variable of interest. As controls, we add the age of the fund, the investment objective-adjusted annual fund turnover (the minimum of purchase and sales divided by the fund size), and the natural log of fund size. All four specifications show that affiliated advisors are less likely to be replaced. Columns 1 and 2 of

¹⁴ See, for example, American Academy of Actuaries (2006).

Table 7 show that the higher the expense ratio of a fund relative to the expense ratio of the investment objective class, the more likely it is the current manager is replaced. The magnitude appears economically significant: A 50-basis-points higher expense ratio makes it approximately 4% more likely that a subadvisor is replaced. Fund age, turnover, and net assets do not influence the decision to replace a subadvisor.

Interestingly, neither performance measure seems to influence the decision to replace a subadvisor. Table 7 provides some evidence that if an insurance firm's affiliate is managing the assets of the fund, it is a statistically significant 3.5% less likely to be replaced.

In columns 3 and 4 of Table 7, we also include two of the traditional measures of board governance, board size, and board independence as additional right-side variables. Neither board size nor the fraction of independent directors appears to influence subadvisor turnover. Overall, we learn from the probit regressions of Table 7 that the main determinant of advisor replacements is a high expense ratio relative to the average expense ratio of the investment objective class.

Table 7 does not differentiate who the new advisor of the fund is, but it may matter whether new management is an unaffiliated or an affiliated entity with the insurance firm. In Table 8, we separate the changes in subadvisors into two categories. The first category includes all changes of subadvisors in which a subadvisor is exchanged against a different external subadvisor unaffiliated with the insurance firm. The second category comprises all cases in which a subadvisor is exchanged against a subadvisor that is affiliated with the insurance firm. Table 8 estimates a multinomial logit regression. Two sets of results are reported. Columns 1 and 2 report results for the investment objective-adjusted return over the past 36 months, and columns 3 and 4 report results for the factor alphas over the past 36 months as the main measure of performance attribution. Furthermore, columns 1 and 3 report the changes for independent variables in the probability ratios of a change to an unaffiliated subadvisor against no subadvisor change. Columns 2 and 4 report the corresponding values for changes to an affiliated advisor against no subadvisor change. A positive number in these regressions indicates that an increase in the independent variable makes it more likely that the subadvisor changes.

The results of columns 1 and 2 show that the determinants of advisor changes are dramatically different for changes to an unaffiliated advisor and changes to an affiliated advisor. Column 1 demonstrates that a subadvisor is replaced with a different unaffiliated manager after

poor investment objective-adjusted performance and when relative expense ratios are high. Column 2 shows no such association for expense ratios or for past performance. A test of equality of the coefficients for the expense ratio across columns 1 and 2 is rejected at the 10% level, despite the few observations that are used to identify the coefficients in column 2. Columns 3 and 4 repeat the regression analysis, but use the three-year factor alphas as a measure of performance attribution. Changing the performance measure does not change the inferences drawn from columns 1 and 2. The results are consistent across the different return measures. High fees and poor past performance influence the decision to replace a fund's manager with another unaffiliated manager, but the same characteristics do not influence the decision to change the fund's management to an affiliated entity. Tests of equality of coefficients across columns 3 and 4 for the expense ratio and past performance using the factor alphas are rejected at the 5% level.

One interpretation of the evidence of Table 8 is that boards of trustees do their due diligence and replace unaffiliated managers after poor performance and if fees are high only when there are no conflicts of interest. If the board of trustees is interested in self-managing a fund, the replacement decision is not based on poor performance and high fees.

4 Conclusion

The asset-management industry is a natural setting in which to study the relative roles of market and traditional governance suggested by Fama and Jensen (1983). We demonstrate that market governance plays a lesser role for variable annuity funds than for mutual funds. Using a database of mutual fund–variable annuity matched pairs, we find that variable annuity investors are considerably less performance- and fee-sensitive than mutual fund investors. We speculate that variable annuity investors are less willing or less able to “vote with their feet,” perhaps because they face high surrender charges for early withdrawal of their monies from policies or because they do not monitor retirement investments as closely as they would regular investments.

If market governance and traditional governance act as substitutes, we would expect that the governance arrangements for variable annuity investors differ from those of mutual fund investors, and that traditional governance mechanisms such as boards and insurance sponsors play a stronger role for variable annuity investors.

To examine the role of traditional governance mechanisms in variable annuities, we focus on the role of insurance companies and their affiliates in their roles as sponsors and advisors of the variable annuity policies and subaccounts, respectively. We analyze their decisions in two structures, the sponsor-only and the sponsor-advisor structure. In both cases, we find that the decision to add additional new investment options (sponsor-only) or to replace the existing subadvisor (sponsor–advisor) is related to poor performance and high fees of the existing subaccounts or subadvisor consistent with the roles of market and non-market governance suggested by Fama and Jensen (1983). But there is an important caveat—these traditional governance mechanisms seem to be less effective if a conflict of interest exists. If the variable annuity policy sponsor or the board of the sponsor–advisor is adding a fund whose management has ties to the insurance firm, the performance- and fee-sensitivities either cease to exist or are less pronounced.

We conclude that the oversight the insurance firms and fund boards provide is most effective when they are truly independent of the monitored entity. Our evidence has important implications for the recent debate on governance in mutual funds. It appears that the best traditional governance is provided by entities that are unaffiliated with the advisors of the funds.

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Appendix A: The Structure of Variable Annuity Policies

The table below summarizes the death-benefit options, mortality and insurance expenses, and surrender charges for eight different variable annuity policies offered by Allianz Life Insurance of North America in 2004. The death-benefit options are accumulation value (AV), rising-floor (RF), principal (PR), and stepped-up (SU) death benefits. Accumulated-value death benefits (AV) pay the dollar amount accumulated in the investor's contract at the time of his or her death. The rising-floor (RF) benefits pay out principal plus a minimum guaranteed annual increase, which is usually limited to 200% of the premiums paid, less surrenders and withdrawals. The principal death benefits (PR) pay out total premiums less surrenders, but take neither gains nor losses into account. The stepped-up benefits (SU) offer the investor the chance to replace the initial base death benefit (total premiums less withdrawals) with the value of the contract at a later date, if it is more attractive. The mortality and expense charge is compensation for the death benefit offered, and the insurance expenses are the sum of mortality and expense charges and any other administrative charges levied by the insurance company.

Policy name	Death Benefit	Number of subaccounts	Mortality expenses	Insurance expenses	Max. surrender fee (%)	Yrs after which no surr. fee
USAllianz Alterity	PR or AV	66	1.25	1.4	7	5
USAllianz Charter	PR or AV	68	1	1.15	0	0
USAllianz Rewards	face; face+AV	66	1.5	1.65	8.5	10
ValueLife	N/A	32	0.6	0.75	N/A	N/A
Valuemark II/III	AV, PR, or SU	59	1.25	1.4	6	5
Valuemark Income Plus	PR	57	1.25	1.4	5	1
Valuemark IV	SU or RF	59	1.34	1.49	6	7
Valuemark SP Var Life	N/A	32	0.6	0.75	N/A	N/A

Appendix B: Variable Annuity Policy Subaccounts

The list of subaccounts for the variable annuity policy USAllianz Rewards in 2004 contains both subaccounts that are advised by an investment advisor (sponsor-only structure) and that are advised by an advisor affiliated with the Allianz Life Insurance Company (sponsor-advisor structure). The following table shows the list of subaccounts available to USAllianz Rewards variable annuity policy holders under both structures.

Panel A: Subaccounts offered under the sponsor-only structure

Fund Name	Expense ratio
AIM V.I. International Growth	1.09
AIM V.I. Growth Fund I	0.91
AIM V.I. Capital Appreciation Fund I	0.85
AIM V.I. Premier Equity I	0.85

Panel B: Funds offered by US Allianz advisors under the sponsor-advisor structure

Fund Name	Expense ratio	Fund Name	Expense ratio
USAZ Money Market	0.87	USAZ Alliance Capital Technology	1.25
USAZ Van Kampen Emerging Growth	1.1	USAZ Van Kampen Comstock	1.2
USAZ Van Kampen Aggrssv Growth	1.25	USAZ Van Kampen Growth	1.2
USAZ PIMCO Value	1.1	USAZ Alliance Capital Large Cap Grw	1.1
USAZ PIMCO Renaissance	1.2	USAZ AIM Blue Chip	1.15
USAZ Alliance Capital Growth & Inc	1.1	USAZ Oppenheimer Emerging Growth	1.25
USAZ Templeton Developed Markets	1.25	USAZ AIM Dent Demographics Trends	1.2
USAZ Van Kampen Growth & Income	1.1	USAZ AIM International Equity	1.25
USAZ PIMCO Growth & Income	1.1	USAZ AIM Basic Value	1.1

Figure 1: Schedule of Investments for the AIM International Growth Mutual Fund and the AIM Variable Insurance International Growth Fund

Variable Insurance Fund Total Net Assets: \$301.7 million			Mutual Fund Total Net Assets: \$1,593.0 million		
Country	% Invested	Investments	Country	% Invested	Investments
Australia	3.12%	BHP Billiton, Coca-Cola Amatil, Promina Group, QBE Insurance	Australia	2.94%	BHP Billiton, Coca-Cola Amatil, Promina Group, QBE Insurance
Austria	0.61%	Erste Bank der Oesterreichischen Sparkassen	Austria	0.58%	Erste Bank der Oesterreichischen Sparkassen
Belgium	1.14%	Algemene Maatschappij, KBC	Belgium	1.09%	Algemene Maatschappij, KBC
Bermuda	0.64%	Esprit Holding Ltd.	Bermuda	0.63%	Esprit Holding Ltd.
Brazil	0.71%	Companhia de Bebidas das Americas	Brazil	0.69%	Companhia de Bebidas das Americas

Figure 2: Sponsor-Only Structure

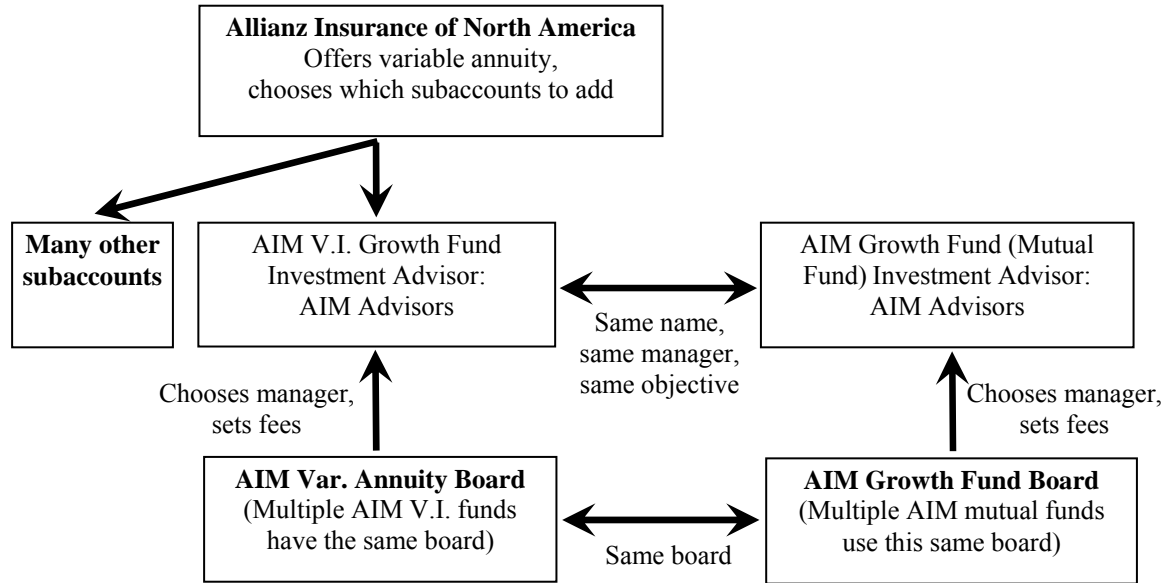


Figure 3: Sponsor–Advisor Structure

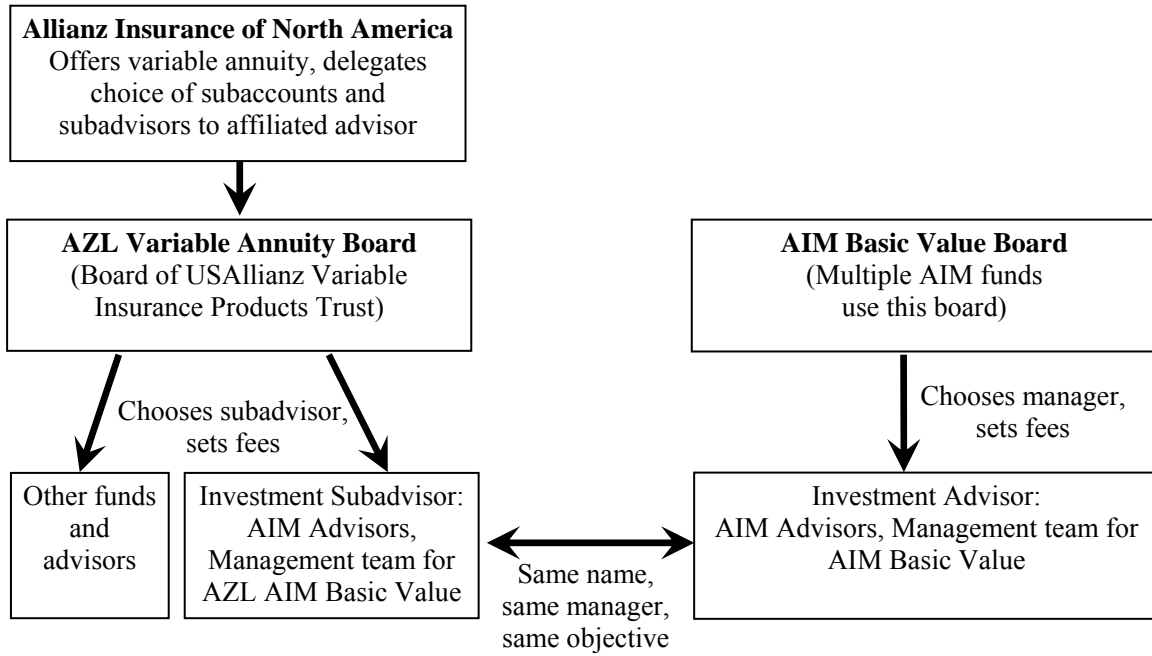


Table 1: Summary Statistics for Variable Annuity Policies

This table shows summary statistics across 1,162 different variable annuity policies offered by 103 insurance firms in 2005. The data comes from Morningstar. “No. of subaccounts” is the number of different investment options from which a policyholder can choose. “No. of subadvisors” is the number of different investment advisors offering the subaccounts. “Mortality and expense,” “Administrative,” and “Distribution” fees are generally constant per policy and are collected by the insurance firm. The expense ratio is subaccount-specific, and the table reports average expense ratios per policy. All fees are reported in basis points. “Surrender Fees” is expressed as fraction of assets invested and is the penalty paid by investors if they redeem assets prematurely. “Maximum no. of years” is the number of years after which the surrender charge ceases to exist. “Death Benefits” lists the fraction of policies that offer one of the four main death benefits. Surrender charges and death benefits are explained in detail in Appendix A.

	Mean	Median	Minimum	Maximum	Std Dev
1. Investment choices					
No. of subaccounts	35.6	33.0	1.0	218.0	20.8
No. of subadvisors	8.6	8.0	1.0	39.0	6.0
2. Fees					
a) Fees levied by insurance company (in basis points)					
Mortality and expense fee	103.6	110.0	0.0	210.0	36.3
Administrative fee	10.4	10.0	0.0	95.0	13.0
Distribution fee	1.4	0.0	0.0	100.0	6.7
Total insurance fee	115.4	125.0	0.0	235.0	41.0
b) Fees levied by fund managing subaccount (in basis points)					
Average expense ratio (varies by subaccount)	90.1	90.2	17.7	211.4	16.6
Average total expense ratio (in basis points) (Insurance + Subaccount)					
	205.8	212.6	48.0	366.4	48.8
3. Surrender Fees					
Fee as fraction of assets	5.1%	6.0%	0.0%	100.0%	6.4%
Maximum no. of years	4.6%	6.0%	0.0%	11.0%	3.5%
4. Death Benefits					
% offering step-up benefit	25.6%				
% offering rising-floor benefit	7.2%				
% offering principal benefit	27.0%				
% offering accumulation-value benefit	27.4%				
% offering other death benefits	12.8%				

Table 2: Descriptive Statistics of the Matched Sample

The table presents descriptive statistics from our matched sample. Using data from 1997 to 2005, mutual funds and their variable annuity counterparts are matched on the basis of the name, manager, and investment objective of the fund. The initial matches are filtered in three ways. First, the time series of returns from the two matched funds has to have a statistically significant correlation of 0.95 or greater. Second, only those variable annuity funds that are separate accounts of insurance companies are kept. Third, those matches with monthly flows less than 400% of the fund size are kept. The final sample includes 151 matches. For each mutual fund and variable annuity observations the mean, median, and standard deviation are included along with the p -value from a difference in means test (t-test) and difference in medians test (Wilcoxon signed-rank).

Variable	Mutual Funds			Variable Annuities			Diff. Tests p -value	
	Mean	Median	Std.Dev.	Mean	Median	Std.Dev.	Mean	Median
Size (\$ millions)	\$826	\$67	\$2860	\$669	\$127	\$2096	<0.01	<0.01
Expense ratio (%)	1.39%	1.38%	0.58%	1.09%	1.03%	0.52%	<0.01	<0.01
12b-1 fee (%)	0.32%	0.29%	0.26%	-	-	-	-	-
Insurance expense (%)	-	-	-	1.11%	1.25%	0.44%	-	-
Turnover	260%	91%	598%	229%	99%	429%	<0.01	0.20
Age (years)	10.7	8	10.8	6.8	6	3.6	<0.01	<0.01
Annual net ret. (%)	5.17%	6.03%	13.05%	4.59%	5.32%	12.14%	<0.01	<0.01
Annual gross ret. (%)	6.71%	7.34%	12.9%	6.77%	7.74%	12.7%	0.13	0.21
Jensen's alpha (%)	-0.62%	-0.69%	7.44%	-1.01%	-1.39%	6.71%	<0.01	<0.01
Factor alpha (%)	-1.95%	-1.48%	6.01%	-2.40%	-2.15%	4.85%	<0.01	<0.01
Monthly net flows (%)	3.6%	0.8%	24.7%	2.2%	0.14%	17.9%	<0.01	<0.01

Table 3: Flow Performance-Sensitivity—Twin Sample

The table presents estimates from a regression of monthly relative net flows to a fund on past fund characteristics. The regression uses a matched sample of mutual funds to their variable annuity counterparts. The dependent variable is the difference between the monthly net flows (%) to the mutual fund and monthly net flows (%) to its variable annuity twin. The independent variables in the regression include: an intercept; and log of total net assets for the mutual fund and the variable annuity (t-1); the fund’s expense ratio (t-1); fund age in years for both the mutual fund and the variable annuity; and the lagged value of the difference in relative net flows. Two specifications of the return variable are used. In columns I–III, two-year total return is used. In columns IV–VI, a three-year investment objective-adjusted return is used (fund return minus the equal-weighted average return of all other funds in the investment objective). In columns I and IV, a linear specification is used. In columns II–III and V–VI, a piecewise linear specification is used with a kink at the median return. Both columns III and VI include fixed effects for each Mutual Fund—Variable Annuity (MF–VA) matched pair. All standard errors are clustered by matched pair and are included in parentheses. The asterisks denote statistical significance as follows:

*** - significant at 0.1%, ** - significant at 1%, and * - significant at 5%.

Independent Variable	I	II	III	IV	V	VI
Intercept	4.29 ** (1.86)	4.52 ** (1.91)	4.28 *** (0.16)	5.50 *** (1.89)	5.85 *** (12.11)	4.89 *** (0.34)
Total return	3.56 *** (1.15)					
Total return high (above median)		2.22 (2.02)	0.32 (3.14)			
Total return low (below median)		5.01 ** (1.92)	3.49 (2.63)			
$R_{Fund} - R_{InvObj}$				10.23 *** (3.50)		
$R_{Fund} - R_{InvObj}$ high (above median)					8.60 (7.25)	2.59 (10.93)
$R_{Fund} - R_{InvObj}$ low (below median)					12.11 ** (4.65)	12.12 * (7.46)
Log (TNA) - mutual fund	-0.30 (0.24)	-0.28 (0.24)		-0.34 (0.23)	-0.33 (0.23)	
Log (TNA) - variable annuity	-0.30 (0.32)	-0.31 (0.33)		-0.39 (0.31)	-0.40 (0.33)	
Expense ratio	-0.031 (1.10)	0.0030 (1.11)		-0.09 (1.06)	-0.023 (1.08)	
Mutual fund age (years)	-0.028 (0.050)	-0.029 (0.049)		-0.023 (0.051)	-0.022 (0.051)	
Variable annuity age (years)	0.047 (0.15)	0.037 (0.15)		0.077 (0.15)	0.063 (0.15)	
Lagged flow difference (MF - VA)	-0.13 *** (0.029)	-0.13 *** (0.029)		-0.13 *** (0.029)	-0.13 *** (0.029)	
Total number of observations	3447	3447	3447	3447	3447	3447
Number of matched pairs	151	151	151	151	151	151
MF-VA pair fixed effects	No	No	Yes	No	No	Yes
Adjusted R ²	1.81%	1.80%	1.47%	2.02%	2.00%	1.52%

Table 4: Flow Performance-Sensitivity – Aggregate Sample

The table presents estimates from a regression of annual percentage net flows to a fund on past fund characteristics. Net fund flow is calculated as the current year's total net assets minus the previous year's assets (adjusted by the fund's annual return), divided by the previous year's assets. The regression pools variable annuity and mutual fund observations but allows separate coefficients for both investment vehicles. The sample for the regression uses data from 1997 to 2005, where for each variable annuity fund (828 different insurance funds), a comparison mutual fund is selected. The comparison mutual fund is randomly selected from the group of funds that are matched by investment objective and by fund age. The independent variables in the regression include: an intercept; the previous year's percent net flows; percent flows to the investment objective; log of total net assets; the fund's expense ratio; and the fund's age in years. Two specifications of the return variable are used. In specifications I and II, three-year total return is used. In specifications III and IV, three-year investment objective-adjusted return is used (fund return minus the equal-weighted average return of all other funds in the investment objective). In specifications I and III, the regression specification assumes a linear relationship with the return measure. In specifications II and IV, a piecewise linear specification is used with a kink at the median return. Investment objective-year fixed effects are included for both the variable annuities and the mutual funds separately. The standard errors are reported in parentheses below the coefficient and are adjusted for clustering at the fund level. The asterisks denote statistical significance as follows:

*** - significant at 0.1%, ** - significant at 1%, and * - significant at 5%.

Independent Variable	I Coefficients for		II Coefficients for		III Coefficients for		IV Coefficients for	
	MF	VA	MF	VA	MF	VA	MF	VA
Intercept	0.838 *** (0.138)	1.079 (0.659)	0.766 *** (0.133)	1.089 * (0.658)	0.557 *** (0.125)	1.167 * (0.657)	0.547 *** (0.126)	1.173 * (0.656)
Total return	0.219 *** (0.027)	0.171 ** (0.083)						
Total return high (above median)			0.259 *** (0.049)	0.231 * (0.124)				
Total return low (below median)			0.165 *** (0.038)	0.111 (0.117)				
$R_{Fund} - R_{InvObj}$					0.219 *** (0.027)	0.171 ** (0.083)		
$R_{Fund} - R_{InvObj}$ high (above median)							0.258 *** (0.073)	0.261 (0.203)
$R_{Fund} - R_{InvObj}$ low (below median)							0.194 *** (0.030)	0.120 (0.111)
Net flows (t-1)	0.138 *** (0.052)	-0.254 *** (0.017)	0.137 *** (0.053)	-0.254 *** (0.017)	0.138 *** (0.052)	-0.254 *** (0.017)	0.137 *** (0.053)	-0.254 *** (0.017)
Log(TNA)	-0.086 *** (0.014)	-0.345 *** (0.030)	-0.088 *** (0.015)	-0.345 *** (0.030)	-0.086 *** (0.014)	-0.345 *** (0.030)	-0.086 *** (0.014)	-0.345 *** (0.030)
Expense ratio	-0.064 *** (0.023)	0.249 * (0.129)	-0.069 *** (0.023)	0.247 ** (0.125)	-0.064 *** (0.023)	0.249 * (0.129)	-0.066 *** (0.023)	0.238 * (0.125)
Fund age (years)	-0.002 (0.004)	0.036 *** (0.014)	-0.001 (0.004)	0.036 *** (0.014)	-0.002 (0.004)	0.036 *** (0.014)	-0.002 (0.004)	0.036 *** (0.014)
Total number of observations	3504		3504		3504		3504	
Adjusted R ²	26.65%		26.64%		26.65%		26.63%	
Year*Invest. Objective fixed effects	Yes		Yes		Yes		Yes	
p-Value for difference in return coefficients	<0.001				<0.001			
p-Value for difference in high return coef.			<0.001				<0.001	
p-Value for difference in low return coef.			<0.001				<0.001	

Table 5: Determinants of the Addition of New Subaccounts

The table presents marginal effects from a pooled time-series cross-sectional probit regression of the decision to add a new subaccount in an established investment objective of a variable annuity policy from 1997 to 2005. If an insurance variable annuity policy adds one or more subaccounts in a given investment objective in a given year, the dependent variable for that policy and that investment objective is 1. If no accounts were added, the dependent variable is 0. The units of the regression are variable annuity policy-investment objective-years. The dependent variables include: $R_{ExistingSubaccounts} - R_{InvObj}$, the difference in the 36-month equal-weighted total return of the other subaccounts in the same investment objective minus the 36-month equal-weighted average return of all subaccounts in the same investment objective; Factor alpha, the equal-weighted average 36-month factor alpha of the existing subaccounts; $ExpRatio_{ExistingSub} - ExpRatio_{InvObj}$, the equal-weighted expense ratio of the policy's existing subaccounts in the investment objective minus the equal-weighted expense ratio of all subaccounts in the investment objective; Inv obj. fraction of total dollar flows, the fraction of total net dollar flows that went to the investment objective in the previous years; and Fraction of affiliated accounts, the fraction of all existing subaccounts in that investment objective that are managed by insurance-affiliated advisors. The standard errors are clustered by variable annuity policy (1,089 different policies). The asterisks denote statistical significance as follows:

*** - significant at 1%, ** - significant at 5%, and * - significant at 10% level.

	Model 1	Model 2
$R_{ExistingSubaccounts} - R_{InvObj}$	-0.001** (0.001)	
Factor alpha		-0.020*** (0.004)
$ExpRatio_{ExistingSub} - ExpRatio_{InvObj}$	0.010 (0.009)	0.015* (0.009)
Fraction of affiliated accounts	-0.051*** (0.005)	-0.053*** (0.005)
Inv obj. fraction of total dollar flows	0.124*** (0.023)	0.140*** (0.023)
Calendar fixed effects (year)	Yes	Yes
Observations	39603	39936
Observed probability	0.136	0.138
Predicted probability	0.132	0.134
Pseudo-R ²	0.014	0.017
Chi-square	436.4	541.56
p-value	0.000	0.000

Table 6: Determinants of Types of Additions of New Subaccounts

The table presents estimates from a multinomial regression of the decision to add a new subaccount in an investment objective class for a variable annuity policy. The unit of observation in the regression is variable annuity policy-investment objective-years. The sample period is 1997 to 2005. The dependent variable is equal to 0 if the insurance firm did not add a subaccount to an existing investment objective class within a variable annuity policy. It is equal to 1 if the insurance firm added a subaccount managed by an unaffiliated entity, and 2 if the insurance firm added a subaccount managed by an entity affiliated with the insurance firm offering the subaccount. For each independent variable, the regression reports changes in the odds ratio of adding a subaccount with an unaffiliated advisor (the unaffiliated column of Model 1 and 2 against no addition and changes in the odds ratio of adding a subaccount with an affiliated advisor against no addition (the affiliated column of Model 1 and 2). A positive coefficient indicates that as a variable increases the probability of being replaced increases. The following characteristics for the year before the addition (January 1 through December 31 of year t-1) are included as independent variables: $R_{ExistingSubaccounts} - R_{InvObj}$, the difference in the 36 month equal-weighted total return of the other subaccounts in the same investment objective minus the 36 month equal-weighted average return of all subaccounts in the same investment objective; the Factor alpha the equal-weighted average 36-month factor alpha of the existing subaccounts; $ExpRatio_{ExistingSub} - ExpRatio_{InvObj}$, the equal-weighted expense ratio of the policy's existing subaccounts in the investment objective minus the equal-weighted expense ratio of all subaccounts in the investment objective; Inv obj. fraction of total dollar flows, the fraction of total net dollar flows that went to the investment objective in the previous years; and fraction affiliated, the fraction of all existing subaccounts in that investment objective that are managed by insurance-affiliated advisors. The standard errors are reported in parentheses and are clustered by variable annuity policy. The asterisks denote statistical significance as follows: *** - significant at 1%, ** - significant at 5%, and * - significant at 10%.

	Multinomial Model 1		Multinomial Model 2	
	Unaffiliated	Affiliated	Unaffiliated	Affiliated
$R_{ExistingSubaccounts} - R_{InvObj}$	-0.007* (0.004)	-0.013 (0.008)		
Factor alpha			-0.139** (0.038)	-0.284*** (0.079)
$ExpRatio_{ExistingSub} - ExpRatio_{InvObj}$	0.210** (0.079)	-0.538*** (0.184)	0.233*** (0.078)	-0.369*** (0.176)
Fraction of affiliated accounts	-0.636*** (0.050)	0.314*** (0.084)	-0.637*** (0.049)	0.280*** (0.083)
Inv obj. fraction of dollar flows	0.938*** (0.211)	1.405*** (0.442)	1.049*** (0.208)	1.637*** (0.433)
Calendar fixed effects (year)	Yes	Yes	Yes	Yes
Observations	39603	39603	39936	39936
Number of additions	4513	914	4632	935
Pseudo-R ²		0.02		0.02
Chi-square		639.79		725.51
p-value		0.00		0.00

Table 7: Determinants of Advisor Replacement

The table presents marginal effects from a probit regression of the decision to replace a subadvisor. The regression is estimated using fund-year observations for funds overseen by 11 insurance-affiliated trusts. The sample period is 1997 to 2005. The dependent variable is 1 if the subadvisor is replaced between January 1 and December 31 of year t or 0 otherwise. The regression estimates the probability of being replaced. The following subadvisor characteristics for the year before the change (January 1 through December 31 of year $t-1$) are included as independent variables: an indicator variable of whether or not the subadvisor is affiliated with the insurance company overseeing the trust (1 = affiliated); $R_{Fund}-R_{InvObj}$, the manager's investment objective-adjusted return over the past 36 months (models 1 and 2); Factor alpha (models 3 and 4) over the past 36 months; $ExpRatio_{ExistingSub}-ExpRatio_{InvObj}$, the investment objective-adjusted expense ratio; the age of the matched mutual fund; $Turnover_{Fund} - Turnover_{InvObj}$, investment objective-adjusted annual fund turnover (the minimum of purchase and sales divided by the fund size); $\text{Log}(TNA)$, the natural log of fund size; the size of the insurance trust's board; and the fraction of the board that is interested (models 3 and 4). The standard errors are clustered by trust (11 trusts). The asterisks denote statistical significance as follows:

*** - significant at 1%, ** - significant at 5%, and * - significant at 10%.

	Model 1	Model 2	Model 3	Model 4
Affiliated advisor	-0.036** (0.015)	-0.037** (0.016)	-0.028* (0.015)	-0.030* (0.016)
$ExpRatio_{Fund}-ExpRatio_{InvObj}$	0.094** (0.037)	0.078** (0.037)	0.108** (0.037)	0.077** (0.043)
$R_{Fund}-R_{InvObj}$	-0.023 (0.017)		-0.023 (0.018)	
Factor alpha		-0.018 (0.016)		-0.015 (0.018)
$Turnover_{Fund} - Turnover_{InvObj}$	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
$\text{Log}(TNA)$	-0.001 (0.006)	0.003 (0.005)	-0.002 (0.006)	0.007 (0.005)
Fund age (years)	0.001 (0.002)	0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)
Board size			0.000 (0.002)	0.001 (0.002)
Fraction of interested directors			-0.196 (0.15)	-0.195 (0.136)
Observations	1016	1162	967	1110
Observed probability	0.068	0.066	0.066	0.059
Predicted probability	0.059	0.055	0.054	0.05
Pseudo- R^2	0.045	0.038	0.061	0.051
Chi-square	26.6	31.7	94.7	290.0
p -value	0.000	0.000	0.000	0.000

Table 8: Determinants of Types of Advisor Replacement

The table presents estimates from a multinomial regression of the decision to replace a subadvisor. The regression is estimated using fund-year observations for funds overseen by 11 insurance-affiliated fund trusts. The sample period is 1997 to 2005. The dependent variable is equal to 0 if the subadvisor did not change between January 1 and December 31 of year t ; it is equal to 1 if the fund's management changed to a different unaffiliated subadvisor, and 2 if the fund's management changed to an advisor affiliated with the insurance firm offering the subaccount. For each independent variable, the regression reports changes in the odds ratio of replacing a fund with an unaffiliated subadvisor (columns labeled unaffiliated) against no change in subadvisor and changes in the odds ratio of replacing a fund with an affiliated advisor (columns labeled affiliated) against no changes in subadvisor. A positive coefficient indicates that as the variable increases the probability of being replaced increases. The following subadvisor characteristics for the year before the change (January 1 through December 31 of year $t-1$) are included as independent variables: $R_{Fund} - R_{InvObj}$, the manager's investment objective-adjusted return over the past 36 months (Model 1); the Factor alpha (Model 2) over the past 36 months; $ExpRatio_{ExistingSub} - ExpRatio_{InvObj}$, the investment objective-adjusted expense ratio; the age of the fund in years; $Turnover_{Fund} - Turnover_{InvObj}$, investment objective-adjusted annual fund turnover (the minimum of purchase and sales divided by the fund size); and $\text{Log}(TNA)$, the natural log of fund size. The standard errors are reported in parentheses and are clustered by trust (11 trusts). The asterisks denote statistical significance as follows: *** - significant at 1%, ** - significant at 5%, and * - significant at 10%.

	Multinomial Model 1		Multinomial Model 2	
	Change to Unaffiliated	Change to Affiliated	Change to Unaffiliated	Change to Affiliated
$ExpRatio_{Fund} - ExpRatio_{InvObj}$	2.23*** (0.72)	0.65 (0.64)	2.18*** (0.70)	0.32 (0.64)
$R_{Fund} - R_{InvObj}$	-0.60** (0.28)	0.49 (0.64)		
Factor alpha			-0.47* (0.284)	0.30 (0.271)
$Turnover_{Fund} - Turnover_{InvObj}$	-0.002 (0.002)	-0.001 (0.005)	-0.0020 (0.002)	-0.0020 (0.003)
$\text{Log}(TNA)$	0.032 (0.087)	-0.21** (0.097)	0.095 (0.073)	-0.11 (0.082)
Fund age (years)	-0.015 (0.038)	0.046 (0.081)	-0.019 (0.035)	0.032 (0.071)
Observations	1016	1016	1162	1162
Number of mgr replacements	60	9	65	9
Pseudo- R^2		0.042		0.031
Chi-Square		39.28		23.18
p -Value		0.00		0.01