

**The Role of Market Governance in Financial Mutuals:
Evidence from Variable Annuities**

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ABSTRACT

We study the relative importance of market governance and board governance in financial mutuals using a matched sample of mutual funds and variable annuity funds with the same manager, very similar portfolio holdings, and high return correlation. We show that variable annuity fund investors exercise little market governance. Fund flow into variable annuity funds is significantly less sensitive to performance and fees than fund flow into mutual funds. We then examine if other governance mechanisms play a stronger role for variable annuity funds. We find that boards of variable annuity funds act more in the interest of their investors than mutual fund boards with respect to two decisions. Variable annuity boards negotiate lower management fees and replace a poorly performing advisor more often. Furthermore, insurance firms play an important role by carefully selecting new investment options for their investors. Our evidence is consistent with the suggestion of Fama and Jensen (1983) that board and market governance play complementary roles.

1 Introduction

In their seminal article on ownership and control, Fama and Jensen (1983) argue that the ability of investors to redeem shares at current net asset values (market governance) renders boards and other governance mechanisms less important for mutual funds than for traditional corporations. However, a number of academic studies¹ and the Security and Exchange Commission's controversial regulation regarding mutual fund boards appear to re-emphasize the role of board governance.

We study the relative importance of market governance and board governance using a unique matched sample of 'twin' funds. In the sample, we observe two versions of the same fund with the same manager, the same investment objective and very similar performance but with different investors and different boards. The sample of twins consists of mutual funds and their variable annuity counterparts. Variable annuities typically serve as an alternative or a complement to traditional retirement vehicles and often offer their investors 'clones' of popular mutual fund investment alternatives.

Using this matched sample, we show that important differences exist between mutual fund investors' and variable annuity investors' ability or willingness to redeem shares. Variable annuity investors appear to be more passive than mutual fund investors. This suggests that the role of board governance and other governance mechanisms may be more important for variable annuity investors. We then analyze the role of board governance in variable annuities by examining the determinants of board decisions such as manager replacement and fee-setting. We find that in spite of the insensitivity of investor flows to fees or poor performance, variable annuities have lower expense ratios than their mutual fund counterparts. We also find that high fees and poor performance of existing investment options are important determinants of the decisions to replace a manager. Because the board is responsible for the setting of expense ratios and the hiring and firing of managers, we interpret these results as evidence that board governance does play a role for variable annuities.

In the United States, variable annuities constitute a \$1.5 trillion market. A typical variable annuity policy is a retirement account that allows investors to allocate money

¹ These papers are discussed in section 2.

among various offerings of managed funds (so-called subaccounts). Many variable annuity policies offer their investors separately managed versions of popular mutual funds.² These variable annuity funds have the same manager, the same investment objective and offer approximately the same gross return as their mutual fund counterparts.³

We match, by hand, each of the variable annuity policies' subaccounts to the corresponding, but distinct, mutual fund. The advantage of such a 'twin' sample is that it allows us to examine the sensitivity of retirement investors to performance and fees *relative* to non-retirement investors in the same asset, which alleviates concerns about omitted variable biases in the regression specifications.

We establish that the role of market governance is greater in mutual funds by showing that the fund-flow – performance relation, one measure of investors' willingness to vote with their feet, is significantly lower for variable annuity funds than for the matched mutual funds.

We then examine whether board governance plays a larger role for variable annuity funds, effectively a test of the Fama and Jensen (1983) hypothesis. We ask whether the board structure of variable annuity funds differs from the board structure of regular mutual funds, and whether variable annuity boards of trustees undertake actions that are consistent with stricter oversight than those undertaken by regular boards.

We find that variable annuity boards appear to negotiate smaller expense ratios than their mutual fund counterparts. Furthermore, insurance firms frequently choose an in-house advisor for their variable annuity subaccounts. The affiliated advisor typically does not select portfolios or manages money, but chooses subadvisors to do so. We show that this particular structure enables variable annuity funds' trust to exercise effective oversight: Poor performance of any of the subaccounts can lead to a change of advisors, an action rarely seen in regular mutual funds.

² For example, investors in the US Allianz Rewards variable annuity policy can invest in the AIM Basic Value Fund, the Van Kampen Emerging Growth Fund or the PIMCO Value Fund, in addition to other options.

³ Because the funds are managed separately, differences in flows across the two investment vehicles can differentially impact performance. Also, examining snapshots of holdings between the two investment vehicles shows that the holdings differ, albeit, to a small degree.

Finally, we study one additional governance mechanism that arises for variable annuity funds. Insurance firms have discretion over which investment choices they offer their variable annuity investors. We show that insurance firms perform an important task on behalf of their investors. The addition of subaccounts to variable annuity policies strongly depends on the performance of the existing investment choices. If the existing investment choices perform poorly or have high fees, insurance firms tend to add other subaccounts in that asset class.

Overall, our results indicate that market governance and other governance mechanisms appear to act as substitutes in the fund industry. Variable annuity investors appear to be less willing or able to redeem shares at net asset value than mutual fund investors in the same asset. As a response, boards of trustees and insurance firms have increased their oversight.

Our approach offers a unique setting to test the relative importance of governance mechanisms. A frequently voiced critique of the governance literature is that differences in governance mechanisms across firms may depend on subtle differences within a firm's environment. These differences are often difficult to identify and to control for, and if unidentified differences in the firms' environment drive both the differences in governance and the differences in the outcome variables studied in the cross-section, effects ascribed to governance mechanisms can be spurious. Our twin fund setup allows us to study the relative importance of governance mechanisms controlling for 'firm-specific' characteristics.

The remainder of the paper is organized as follows. Section 2 briefly reviews the related literature, section 3 develops testable hypotheses, section 4 describes our data, the variable annuity market, and the sample construction, and section 5 contains the empirical results. Section 6 concludes.

2 Related literature

This paper is related to three different strands of the literature; performance sensitivity/market governance, board governance and retirement investing. The empirical evidence regarding the overall effectiveness of the market governance mechanism in

mutual funds is mixed. Ippolito (1992), Chevalier and Ellison (1997) and Sirri and Tufano (1998) show that net flows are sensitive to high performance but they seem to be relatively insensitive to poor past performance. Similarly, Barber, Odean, and Zheng (2005), find no relationship between net investment flows and mutual fund operating expenses. In an analysis of recent mutual fund scandals, however, Qian (2005) finds evidence that funds with higher fund flow - performance sensitivity were less likely to be indicted, consistent with the hypothesis that market governance plays an important role.

Current research on fund governance has concentrated on the relationship between board characteristics and fees, stale pricing, fund merger activity, manager turnover and fund performance. In a seminal paper about the role of independent mutual fund directors in setting fund fees, 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 but the economic significance of this result is small. 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) examine a sample of fund mergers and conclude that there is a higher probability of a merger if a fund has underperformed and it has higher fraction of independent directors. Ding and Wermers (2005) examine the role that independent directors play in fund manager turnover. They find that a larger number of outside directors are more likely to replace a poorly performing manager. Lastly, a number of recent papers, Chen, Goldstein, and Jiang (2005), Cremers, et al. (2005) and Meschke (2004) all document that funds whose directors hold a larger fraction of their shares exhibit superior performance.

Research on variable annuities has been relatively sparse, despite the estimated \$1.12 trillion that was invested in these products in 2004 (Brown and Poterba (2006)). 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.

Our study contributes to the literature in two ways. First, our matched sample design provides a natural experiment in which to test the joint roles of board and market governance suggested by Fama and Jensen (1983). With the exception of Qian (2006), previous research has analyzed the market and board governance mechanisms separately.

Our evidence suggests that they do play complementary roles and should be analyzed jointly. Second, we examine the market and board governance mechanisms for individual retirement investments, specifically variable annuity investments. A separate analysis of these governance mechanisms for retirement vehicles is warranted because of the longer investment horizons and higher barriers to exit inherent in retirement investments. As a result, Fama and Jensen's suggested market governance mechanism could be less effective in retirement investments. A separate analysis is also warranted because important differences exist between mutual fund boards and variable annuity boards. Members of mutual fund boards are often nominated and approved by the management company who is then hired to manage the fund. Because the board seats are allocated by the agent who is then hired by the board to run the fund, the potential for directors' incentives to be misaligned is high. The SEC is certainly aware of these problems and has created a particularly strong role for independent directors in the Investment Company Act of 1940.

3 Development of key hypotheses

In their analysis of the separation of ownership and control, Fama and Jensen (1983) argue that the board of directors is less important in financial mutuals than in traditional corporations. The crux of their argument lies in the difference between redeeming a share in a financial mutual and selling a share of a traditional corporation. When mutual fund investors redeem their shares, they effectively remove the manager from control of those assets. The decision to withdraw resources and the associated loss of management's control over these assets can be undertaken independently by each investor – i.e. they can vote with their feet. As a result, there is a one-to-one relation between the claimant's decision to sell her shares and management's loss of control over those assets. If mutual fund investors can remove management from control by the simple action of redeeming their shares (i.e. market governance), then they are less dependent on a board for governance.

When investors in a traditional corporation sell their shares to other investors, management still has control over those assets. While the decision of a shareholder to

sell her shares may send a signal to the equity market, unless there is a takeover bid or the board of directors decides to change top management through management turnover, the decision of a single shareholder to sell her stake does not affect management's control over the firm's assets. Because investors in a traditional corporation cannot directly remove management from control through the sale of their shares, they are more dependent on a board for governance.

The Fama and Jensen (1983) hypothesis relies on two assumptions: investors are aware of fund performance, fees and other relevant characteristics and investors are willing and able to redeem their shares when the fund performance, fees, or other characteristics are suboptimal. Both assumptions may not be fulfilled for investors in long-term retirement plans. Investors in such plans may automatically transfer money each month to the same investment vehicle without closely monitoring performance, or impediments to withdrawing or transferring funds between annuities may reduce the perceived liquidity of the investment vehicles.⁴ We test the following null hypotheses on investor behavior:

H0 (1a): There is no difference in the fund flow – performance sensitivity between variable annuity funds and their mutual fund counterparts.

H0 (1b): There is no difference in the fund flow – expense ratio relation between variable annuity funds and the corresponding mutual funds.

These null hypotheses are contrasted with their logical alternatives:

H1 (1a): Net flows to variable annuity subaccounts are significantly less performance sensitive than net flows to the corresponding mutual funds.

H1 (1b): Flows in and out of variable annuity subaccounts are significantly less sensitive to expense ratios than flows in the corresponding mutual funds.

If we reject the null hypotheses above, we establish that market governance is weaker for variable annuity funds than for mutual funds.

⁴ Capital gains taxation is not an impediment to changing variable annuity policies or to changing the composition of the portfolio within the same variable annuity policies because of so-called “1035 exchanges.” 1035 refers to a provision in the tax code that allows for the direct transfer of accumulated funds in an annuity policy to another annuity policy without creating a taxable event. Surrender charges are an impediment to changing variable annuity policies, but not to changing the asset allocation within a policy.

If fund flow into variable annuity funds is less sensitive to performance and fees than their mutual fund counterparts, then we would expect a more important role for board/non-market governance mechanisms, consistent with the argument of Fama and Jensen (1983). Each of the subaccounts of a variable annuity policy is governed by a board of trustees. Two main tasks of the board are to negotiate the management fees with the advisor, and to approve or terminate advisory contracts. We indirectly examine the role of board or non-market governance mechanisms by analyzing these decisions. In the case of management fees, we compare the fees of the variable annuity subaccount to its mutual fund counterpart and test the following hypothesis:

H0 (2a): The expense ratios associated with variable annuity funds are as large as those associated with comparable mutual funds.

In the case of approval or termination of advisory contracts, we cannot compare variable annuity subaccounts to their mutual fund counterparts because we never observe an advisory contract termination in the mutual fund sample. Instead of comparing variable annuities to their mutual fund counterparts, we examine the decision to terminate a variable annuity subaccount advisory contract in isolation. We look specifically at the role of poor performance and high fees in this decision and test the following hypothesis:

H0(2b): The boards of trustees of variable annuity funds disregard high expenses and poor performance in their decision to renew management contracts with subadvisors.

These hypotheses are contrasted with their logical alternatives:

H1 (2a): The expense ratios associated with variable annuity funds are smaller than those of mutual funds.

H1(2b): The boards of trustees of variable annuity funds regard high expenses and poor performance in their decision to renew management contracts with subadvisors.

An additional dimension of oversight of variable annuities' subaccounts is provided by the insurance firms offering the variable annuity policies. Insurance firms can add new investment options (i.e., subaccounts) to their variable annuity policies. We test whether insurance firms act in the interests of their shareholders by examining the

determinants of the decisions to add additional managed portfolios. We test the following hypothesis against its logical alternative:

H0(3): Insurance companies are not performance and fee sensitive with respect to the funds they offer under a variable annuity policy.

H1(3): Insurance companies are performance sensitive with respect to the funds they offer under a variable annuity policy. If a fund is performing poorly, it will either be dropped or new funds of a similar investment class will be added.

4 Data and Sample Construction

4.1 Data

The variable annuity database⁵ 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 for the mutual fund database. The variable annuity database has monthly returns as well, but the total net asset data for the variable annuity subaccounts is quarterly. In addition to the fund and annuity data from Morningstar, we construct a database of mutual fund and variable annuity board characteristics. Starting with the matched sample, we hand collect board data for both the mutual funds and their variable annuity counterparts.

4.2 Variable Annuity Policies

An insurance company frequently offers their customers several variable annuity policies to choose from. Variable annuity policies typically have different death benefits, investment choices, mortality and insurance expenses, and surrender charges associated with them. The structure of the data is most easily understood using an example.

Each variable annuity policy offers its investors a set of managed portfolios (so-called subaccounts) that they can invest in. Equity and bond portfolios are the most

⁵ Variable annuities can be purchased both inside and outside of retirement plans. We focus on annuities purchased using non-retirement plan assets, which are non-qualified annuities.

common options. While the insurance-related charges are typically constant across all subaccounts for a given variable annuity policy, the expense ratio (which includes the compensation for the management of the subaccount) varies across subaccounts for the same policy. It is typically related to the investment objective of the fund, with expense ratios increasing in the complexity of the investment objective. Appendix A contains a detailed description of one variable annuity policy and the associated benefits.

There are some subtle differences between buying mutual fund shares and allocating part of the investment in a variable annuity contract to a subaccount. Mutual fund investors become the owners of the underlying securities of the fund. Variable annuity investors become owners of a unit investment trust. The insurance company creates a segregated investment account, and registers it as a unit investment trust with the SEC. The variable annuity policies are sold by the insurance company through this so-called separate account. The assets of the separate account are the property of the insurance company so that the insurance company is technically the investor. The assets are held for the benefit of the owners and other persons entitled to payments under the variable annuity contracts issued through the separate account.⁶

Table 1 shows summary statistics for the 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 holder the choice of 35.6 (median: 33) different subaccounts. These subaccounts are offered by 8.6 (median 8) different subadvisors. The mortality expenses per policy 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. Brown and Poterba (2006) show similar numbers. The value of the life insurance component of the variable annuity policy relative to the considerable mortality expenses paid for that insurance has been the topic of much debate (e.g., Brown and Poterba

⁶ The assets of the separate account, equal to the reserves and other liabilities of the separate account, are not chargeable with liabilities that arise from any other business that the insurance company may conduct and, as a result, unlike most life insurance or fixed annuity products, these assets are not subject to claims by the insurance company's creditors should the insurance company become insolvent.

(2006), Milevsky and Posner (2001)). The preliminary conclusion from this research is that the mortality expense paid exceeds the value of the life insurance. The average expense ratio that is 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 (see Appendix A for details on these benefits).

4.3 Variable Annuity Subaccounts

Subaccounts invest in funds that are advised by investment companies. Three structures, that are not mutually exclusive, are employed. The first two structures are the insurance-advised and externally-subadvised subaccounts. In these structures, the insurance company has an affiliated or subsidiary management company which creates a fund and either manages the fund itself (insurance-advised) or contracts with external investment advisors to subadvise it (externally-subadvised). The third structure is characterized by an independent investment advisor sponsoring a separate fund in which variable annuity investors can invest (externally-advised). In this paper we concentrate on the externally-advised and externally-subadvised structures. It is important to know that an investment in these variable annuity funds is restricted to monies from variable annuities, i.e. no mutual fund investor could invest in these funds. Appendix B contains a detailed example of both structures we study using an actual observation from our data.

For the case of a fund offered by a major investment advisor (externally-advised), the fund is overseen by a trust that was set up by the major investment advisor itself. Funds under this structure typically collect monies from subaccounts of many different variable annuity policies offered by many different insurance firms. Ownership is typically concentrated, because insurance firms remain owners of the assets through the unit investment trusts. Yet, the insurance firm has no influence over the fund itself, unless it has board representation on its trust. The fund, along with many other funds, is overseen by a board of trustees that was first chosen by the investment advisor. The

potentially misaligned incentives that plague regular mutual funds and its boards – the management company who is supposed to be supervised originally chose the trustees that supervise – also plague this structure.

For the case of a fund advised by an affiliate of the insurance company (insurance-advised and externally-subadvised), the advisor typically does not select individual portfolio securities, but evaluates and selects subadvisers for a group of funds in the same trust. Often, the investment advisor does not have any clients other than the trust. The advisor’s principal role can be defined as monitoring the subadvisors and making recommendations to the board of trustees. 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, consider the following excerpt from the statement of additional information of the USAllianz VIP Trust:

“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.”

4.4 Matching a Variable Annuity Subaccount to its Mutual Fund Counterpart

Variable annuity funds are manually matched 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 masterlist and identify the AIM International Growth Fund as a promising potential match.

While the title of the fund and the sub-account 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, similar returns, and the

same manager. 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. 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 the series II over the same period.

As a last indication of the comparability of the fund and its variable annuity counterpart, figure 1 shows the investments in stocks from the first five countries listed in the schedule of investments for the mutual fund and the variable annuity. The investments are virtually identical, only in some of the later countries (not listed) do we find differences in holdings. Note that our matching procedure finds a very close, but not perfect match. For example, the assets under management of the mutual fund are substantially larger than the assets under management of the variable annuity fund. We are able to initially match 1,005 variable annuity funds to their mutual fund counterparts.

Once we have the initial matched sample, we employ three additional filters. First, the time series of returns from the two matched funds is required to have a statistically significant correlation of 0.95 or greater to guarantee that we are indeed matching on the same underlying fund. This step leaves 670 matches. Second, only those variable annuity funds that can be identified by name as separate accounts of insurance companies are kept, which leaves us with 273 matches.⁷ Third, those matches with monthly flows less than 400% of the fund size and greater than -100% of fund size are kept. The final sample includes 180 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. The gross returns of the variable annuities and the matched mutual funds are statistically indistinguishable from each other. This result strengthens our claim that variable annuity funds and their matched twin mutual funds have indeed very similar portfolio holdings. However, 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

⁷ In future versions, we will improve on this selection criterion to retain the majority of the initial matches.

variable annuity funds also incorporate the insurance charge for mortality expenses. Finally, mutual funds exhibit larger monthly net inflows.

4.5 Collection of variable annuity board data

We match all variable annuity funds to the respective trust through which they are offered. We then hand collect data on their board of trustees. The data is taken from the statements of additional information (form 485bpos) that have to be filed by the trusts with the SEC. During our sample period, these forms are available electronically from the SEC. website. We collect the following board variables: director/trustee name, age, independent/interested director (Y/N), law or finance background (Y/N), retired (Y/N), length of time on the board, holdings of fund shares and for independent trustees, total compensation from the fund.

We collect data on 109 variable annuity trusts. The average number of funds associated with a trust is 24.7 (median 20.0). The minimum number of funds covered by a trust is 1, the maximum number is 83. The 109 trusts cover 86% of the value-weighted aggregate investment in variable annuity subaccounts.⁸

Table 3 shows the total number of trust-years for which we were able to collect board data, and offers summary statistics for the board of trustees data. Panel A shows data for all trusts. The average board size is 8.5 members, of which approximately 75% are independent. More than 50% of all trustees have work experience in the finance and law domain. As a fraction, 6% of all active trustees have retired from their principal occupation. The average age of trustees is 61 years, and trustees have been on the board for an average of 6.8 years. The number of funds covered by a trustee within the same family is almost twice as large as the number of funds covered by any given trust, suggesting that trustees sit on multiple boards within the same family.

Trustees received on average \$17,000 for their services on a given trust, and overall \$71,000 for their services within the same fund family. These numbers, together with the statistics on the number of funds covered, suggest that compensation for services on other funds within the same family may be higher than compensation for service on variable annuity boards.

⁸ We have identified the trusts for an additional 11% of all variable annuity funds, but have not yet collected board data. For 3% of all variable annuity funds, we were not able to find the associated trust.

Panel B separates the trusts that oversee funds of affiliated advisors from trusts that oversee funds of outside investment advisors. Several observations are interesting. Trustees of affiliated trusts are usually younger and have served a shorter period on the board. The fraction of trustees of affiliated trusts with a finance background is larger, and the fraction of busy directors is lower. The affiliated trusts oversee more assets under management and more accounts. Trustees of affiliated trusts receive a larger compensation, and the fraction of compensation they receive from the particular trust is significantly larger than the fraction of trustees of outside trusts. The univariate statistics of table B are a potential indication for higher quality boards in the funds of funds structure – board members are paid more for their services, they have more work experience in the industry of interest, are less busy with other board seats, and are less often retirees.

5 Empirical Results

5.1 The Importance of Market Governance

If investors follow the performance of 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 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 change the denominator to an average of past and current TNA or 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 data on all variable annuity funds and, for each variable

annuity fund, 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. Second, we choose a more elaborate specification and use our matched twin sample and study monthly percentage flows.

The two right-hand side variables of interest are the 3-year total return of the fund and the fund's expense ratio.⁹ In some specifications, we differentiate between 3-year total return above and below the median 3-year return of the same investment objective class to allow for potential asymmetries in the fund-flow performance relation. We control for the previous year's (month's) net flows, the size of the fund, and the age of the fund in the regression specification. In addition, we include year-investment objective fixed effects for the variable annuities and mutual funds in the first specification. These fixed effects allow variable annuity funds and mutual funds in each investment objective class to have a separate intercept.

Table 4 shows the result of the multivariate OLS regression for the first specification. Column one shows the results of the linear return specification. We see from table 4, column 1 that both variable annuity and mutual funds display a positive relation between percentage net fund flow and past returns. The 3-year total returns have coefficients of 0.165 (variable annuities) and 0.211 (mutual funds). The coefficient for mutual funds is comparable to the coefficient reported by Sirri and Tufano (1998). We test whether the coefficients for mutual funds and variable annuities are statistically different from each other and are able to reject that the past return coefficient for variable annuities is equal to the one of mutual funds at less than the one percent level. In other words, the fund flow – past return sensitivity is significantly larger for mutual funds than for variable annuity funds.

Columns two allows for asymmetries in the fund flow – performance relation by interacting the past three-year return with an indicator variable for above or below median investment objective class performance in a given year. Interestingly, we find that the difference between the fund flow – performance sensitivities of mutual funds and variable annuity funds appears to be driven by poorly performing funds. The coefficients

⁹ We obtain quantitatively and qualitatively similar results if we use other measures for performance attribution such as Jensen's alpha or a four-factor alpha.

on 3-year total returns above the median for variable annuity funds and mutual funds are statistically indistinguishable from each other at 0.315 and 0.303, respectively. Both variable annuity and mutual fund investors appear to react to good past performance. Mutual fund investors who hold funds with a prior performance below the median investment objective class fund's performance are performance sensitive, while variable annuity investors are not. If performance is poor, variable annuity investors do not appear to withdraw their monies from a fund to reallocate them to other investment options. Mutual fund investors appear to vote with their feet, as indicated by the positive and significant coefficient, although the fund flow – performance sensitivity is lower for poorly performing funds than for well performing funds.

In addition, we learn from table 4 that the expense ratio is associated with fund flow for mutual funds, but not for variable annuities. For mutual funds, columns one and two show that the higher is the past year's expense ratio, the lower is the fund flow. The relation is indistinguishable from zero for variable annuity funds.

The control variables have the expected sign. Large funds receive smaller percentage inflows, past high inflows are correlated with current high inflows (for mutual funds), and the younger the fund, the higher the inflow (for variable annuity funds). The R-squared of our regressions of about 19% compares well with the R-squared of 14.2% obtained by Sirri and Tufano (1998).

Table 5 shows results from a fund flow – performance sensitivity regression using our matched twin sample. While we control in table 4 for several exogenous variables that could ex ante influence both past return and fund flows, our twin sample allows us to draw stronger conclusions if we find a similar relation: We now control for the same manager and very similar portfolio holdings and concentrate on the impact of investors, which is the one variable that distinguishes the variable annuity fund from the mutual fund. Table 5 uses monthly fund flows. 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. We use as control variables the age of the mutual fund, and total net assets of both the variable annuity and mutual fund. The variables of interest are the 3-year total return

of the mutual fund and the expense ratios of the variable annuity and mutual fund. Note that one of the sample construction criteria was a return correlation of 0.95 between the mutual fund and the variable annuity fund return, so we cannot include both return measures in the regression framework.¹⁰ The results of columns 1 and 2 show a similar relation as the one presented in table 4. The difference in net fund flow is positively related to the total return measure. In other words, the higher is the past return, the more money is flowing into the mutual fund *relative* to the twin variable annuity fund. When we split mutual fund and variable annuity fund performance into above and below median investment objective performance, we see that the difference in fund flows is more sensitive to performance below the median than to performance above the median, which is consistent with the results of table 4. Note however that in our twin sample, the above median return also has a positive sign, which is suggestive of higher performance sensitivity for mutual funds even when the fund is performing well. The variable annuity expense ratio is positively and significantly related to the difference in fund flow, which is surprising given the relative insensitivity of variable annuity flows to expenses in the aggregate regression. In specifications 3 and 4, however, when a fixed effect is included for each matched pair, variable annuity flows are no longer statistically significantly related to expenses, in fact, the sign of the coefficient switches. The mutual fund expense ratio has a negative, but statistically insignificant coefficient.

Table 5, columns 3 and 4 contain the coefficients of a variable annuity – mutual fund fixed effects regression. In this setup, we identify the coefficient on past performance from the time-series variation within each variable annuity – mutual fund twin. Columns 3 and 4 of table 5 demonstrate that the relative fund flow – performance sensitivity is still strongly significant under this alternative specification.

Overall, we conclude from the evidence presented in tables 4 and 5 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.

¹⁰ The results are virtually identical if we use the variable annuity fund performance instead.

5.2 The Role of the Board of Trustees

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. To assess the role of board governance and other non-market governance mechanisms we compare MF and VA expense ratios and we examine the determinants of the decisions to hire or fire an advisor.

5.2.1 *Expense ratios in the VA and MF sample*

We test the null hypothesis that expense ratios are the same for mutual funds and variable annuity funds, both on the aggregate sample of variable annuities and mutual funds, and on our more restrictive matched twin sample.

In an investigation of mutual fund advisory contracts, Deli (2002) finds that investment objective, turnover, a closed-fund indicator, the natural log of fund size, the natural log of family size and the number of services that the fund offers are statistically related to fund advisory fees. In their examination of the role of expenses on fund flows, Barber, Odean, and Zheng (2005) find that past flows and market-adjusted returns are statistically significant determinants of changes in fund expense ratios. Using this previous research as a guide for the determinants of expense ratios, we include fund size, turnover, past flows and past return measures as the independent variables in our regression. For our matched sample, we exclude investment objective and the family size variables because these variables are exactly the same across the regression. We also exclude the number of fund services due to data limitations and the closed-end fund indicator because our funds are all open-end. The results of our regression are in table 6 (aggregate sample) and table 7 (twin sample).

Table 6 shows the results from the pooled aggregate sample. For each of the 4294 variable annuity fund-year observations, we randomly select a mutual fund from the same investment objective class, the same year, and the same size decile. The dependent variable is the expense ratio for variable annuity funds, and the expense ratio minus 12b-1 fees for mutual funds.¹¹ The right-hand side variables include the separate intercepts

¹¹ While some variable annuity funds do include 12b-1 charges in their expense ratio, this fraction of VA funds that use 12b-1 fees is smaller than the fraction of mutual funds that use 12b-1 fees. Because the Morningstar data do not separately identify 12b-1 fees for the variable annuity subaccounts, we subtract

for mutual funds and variable annuities, natural logarithm of total net assets, past net percentage flows, past 3-year gross returns, and annualized turnover. In order to make clear the economic interpretation of the mutual fund and variable annuity intercepts, all other variables have been demeaned. All right-hand side variables are interacted with an indicator variable that is equal to one if the observation is a mutual fund, and zero otherwise. These interaction terms enable us to report a coefficient for variable annuity funds and mutual funds. Table 6 demonstrates that mutual funds have higher expense ratios than variable annuity funds. Column 1 shows simple sample means. Mutual funds have, on average, expense ratios (less their 12b-1 fees) of 119 basis points, and variable annuities have expense ratios of 90 basis points. The difference between these expense ratios is statistically different at less than the 0.1 percent level. In columns two through five, we include the control variables and different fixed effects for investment objective class, years, fund advisors, and fund total net assets deciles to guarantee robustness of the results. In all specifications, the mutual fund intercept and the variable annuity intercept are statistically significantly different from each other. The variable annuity intercept is significantly smaller, suggesting that variable annuity funds have significantly smaller expense ratios. Of the control variables, total net assets and annual turnover are robust across most specifications and have the expected sign. Larger funds and funds with less turnover have smaller expense ratios.

In Table 7, we study our twin sample. The dependent variable is the difference in expense ratios from the matched twin mutual fund-variable annuity sample. We subtract 12b-1 fees from the mutual fund expense ratio before we calculate the difference for a more conservative comparison. The independent variables are an intercept, fixed effects for mutual fund and variable annuity fund size (the sample is separated into thirds and the fixed effects are given relative to the largest size third), percent flows, gross returns and turnover. In order to give the intercept an economically meaningful interpretation, all other variables are demeaned. Because the mutual fund and the variable annuity fund gross returns and turnover are strongly correlated, these variables are included separately

12b-1 fees from the expense ratio of mutual funds and ignore the existence of 12b-1 fees for variable annuity funds in order to conservatively address the issue. Note that this will, at worst, bias our results against the alternative hypothesis that variable annuities subaccounts have lower expense ratios than their mutual fund counterparts.

in different specifications. We learn from table 7, column 1 that mutual funds have a higher expense ratio than variable annuity funds. The intercept of 0.072 shows that mutual funds have a 7.2 basis points higher expense ratio than variable annuity funds. Note that this difference is 21.8 basis points smaller than the 29 basis points difference we report in table 6, column 1, which suggests that it is important to use our twin sample to account for the effects of unobservable firm characteristics. Columns 2 through 4 of table 7 add additional control variables to the specification, but the size and economic significance of the intercept remain identical. Mutual funds have an expense ratio that is about 7.2 basis points higher than that of their twin variable annuity counterparts.

Overall, we conclude from the evidence presented in tables 6 and 7 that variable annuity funds have significantly smaller expense ratios than their mutual fund counterparts. As expense ratios are negotiated by the board of trustees, our results are consistent with an increased role for board governance in variable annuities.

5.2.2 Determinants of Subadvisor Turnover

We next examine whether the boards of trustees of variable annuity funds do not renew management contracts with their advisors. Tufano and Sevick (1997) describe that such an action 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 that are governed by the funds of funds structure, i.e. the boards of an affiliated advisor's trust. We carefully study the decision to renew management contracts for three of these trusts – American Skandia Trust, US Allianz Trust, and ING Investment Trust.¹²

We have a total of 383 fund-year observations with complete data for these three trusts. In 21 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 5.5% of all firm-years (21/ 383). 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.

¹² In future versions of the paper, we intend to study all eleven trusts that are affiliated with the insurance firms.

Table 8 presents the results of a logit regression of the decision to replace a manager. The sample period is 1997 to 2005 for the US Allianz Trust and the American Skandia Trust and 2004-2005 for the ING Investment trust. The regression is estimated annually, and the dependent variable is 1 if the manager is replaced in the next year or 0 otherwise. Several advisor characteristics are included as independent variables. The principal variables of interest are measures of performance attribution and expense ratios. Column 1 of table 8 uses the manager's investment objective-adjusted return $R_{\text{Fund-RInvObj}}$ as a performance measure, and column 2 uses a 3-year four factor alpha (Fama-French factors plus momentum) as the performance measure. We include the investment objective-adjusted expense ratio as our second main variable. As controls, we add the age of the matched mutual 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. Table 8 shows that the performance metrics are strongly statistically significant. The investment objective adjusted return enters with a statistically significant negative sign – the poorer a fund's performance, the more likely is it that the management contract with the subadvisor is not renewed. The same conclusion holds with our more elaborate performance attribution variable, the four-factor alpha. The lower the four-factor alpha of a fund, the higher the probability that the subadvisor changes. In both column 1 and 2, the investment-objective adjusted expense ratio of a fund matters: the higher the expense ratio relative to the investment objective class, the higher the probability of a subadvisor change.

Overall, we conclude from table 8 that trusts of affiliated funds exercise their fiduciary duty and monitor poorly performing funds. Fund subadvisor changes do occur after poor performance.

Table 9 compares the old funds with the funds they are replaced with. The table shows summary statistics of key variables relative to the overall average in the same investment objective class. We can see from the table that the median performance of the replaced fund was below the industry's performance and that the new fund had a statistically significant better performance. While the other numbers reported in table 9 are suggestive that funds are replaced by younger and smaller funds with less turnover, the current small sample size fails to identify statistical significant differences.

5.3 The Role of Insurance Firms: 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 of the subaccounts offered by their policy. 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.¹³

We test in this section whether insurance companies are performance and fee sensitive with respect to the subaccounts they offer. We ask what are the determinants of adding new subaccounts and study the annual decision to add a new subaccounts in one of Morningstar's investment objective classes. For each policy-investment objective class-year combination, we estimate a logit regression where the dependent variable is equal to one if a new subaccount is added by the policy in the investment objective class 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. We measure performance of the given subaccounts either by Jensen's alpha relative to Jensen's alpha in the same investment objective class, or by the total return over the past three years relative to the average 3-year total return in the same investment objective class. As a further robustness test, we use the four-factor alpha of the subaccount as a performance measure. Also, if insurance companies act in the interest of their variable annuity investors, we would expect new subaccounts to be added if the

¹³ The American Academy of Actuaries 2006 report on Revenue Sharing in Variable Annuities (American Academy of Actuaries (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 contractholder approval."

fees of existing accounts are high, especially if at the same time performance is low. We measure fees either as expense ratios or management fees minus the investment objective class average fee. If a firm does not offer subaccounts in a given investment objective class, we set the prior performance and fee measures to zero and an indicator variable for no investment in that class equal to one.

We carefully control for other variables that may influence the decision to add subaccounts. We conjecture that the decision to add a new subaccount depends on the number of subaccounts the variable annuity policy already offers, on whether it offers any account in a given investment objective class, and on the relative popularity of that investment objective class in the entire variable annuity fund universe, as measured by the percent 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.

Table 10 reports coefficients of the logit regression. The relative performance of the existing subaccounts decreases the probability to add a new subaccount in that investment objective class. In other words, if the relative performance of existing subaccounts is poor, insurance firms add new accounts to their policies. The results do not change if we use the 24-four-month four-factor alpha instead of the relative return measure (column 2). The relative expense ratio has a positive coefficient. If the expenses of existing subaccounts are high relative to funds in the same investment objective class, insurance firms are more likely to add new subaccounts. The control variables have the expected signs. If a particular investment objective has seen a lot of growth, it is more likely that a subaccount is added. Given that a particular investment objective is not offered, it is less likely that the insurance firm adds an account. However, the interaction term of no account with large inflows in the past year is positive: Given that the inflows in a particular investment objective class are large in the entire variable annuity database, and the policy does not offer an account, it is more likely to add an account to that class. Controlling for everything else, the number of existing subaccounts does not influence the decision to add new accounts.

Overall, we conclude from the results in table 10 that insurance firms appear to monitor the performance of their subaccounts and react to poor performance and high fees by adding competing accounts as choices for their investors.

6 Conclusion

The asset management industry is a natural setting in which to study the complementary roles of market and board governance suggested by Fama and Jensen (1983). We demonstrate that market governance plays a lesser role for variable annuities 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 then analyze the determinants of variable annuity board decisions to see if board governance substitutes for the weaker market governance and show that it does in multiple ways. Variable annuity boards of trustees appear to negotiate smaller fees with the management of the funds, and for a particular structure of funds, we observe frequent management turnover after poor performance, a board action that is almost never observed for regular mutual funds. Insurance firms themselves play an important role in governance by strategically adding alternative investment options to the choices offered to their investors

Because our matched sample allows us to control for unobservable firm characteristics, the results of our cross-sectional study are less vulnerable to criticisms of omitted variables biases. Since twin firms with identical managers do not exist for corporations, the only alternative to our set-up to correct for firm-specific unobservable characteristics would be to look at the time-series changes for the same firm. This is generally problematic, because governance mechanisms typically are slow-moving, and thus even if effects exist, one would often not be able to detect them.

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Appendix A: The structure of variable annuity policies using an example from our database

Allianz Life Insurance of North America offered eight policies with different death benefits options, mortality and insurance expenses and surrender charges in 2004.

The following table shows a summary of the eight policies, and we explain the characteristics – death benefits, mortality expenses, and surrender fees in detail below.

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

In general, there are four different types of death benefits offered to annuity policy holders: 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 pays 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 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.¹⁴ The Allianz Alterity policy, for example, offers policy holders the choice between principal or accumulation value death benefits.

The mortality and expense charge is compensation for the death benefit offered, and the insurance expenses are the sum of mortality and expense charge and any other administrative charges levied by the insurance company.

¹⁴ Some variable annuity policies also offer a guaranteed face value similar to a normal life insurance policy.

Surrender charges are often used in place of front-end sales loads. Usually, the surrender charge is expressed as a percentage of the amount of the money 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 has a surrender charge of 7% that declines each year by 1.4% and consequently is 0 after 5 years.

Appendix B: The Structure of Subaccounts of the variable annuity policy USAllianz Rewards

The list of subaccounts for the variable annuity policy USAllianz Rewards in 2004 contains subaccounts that are advised by an investment advisor and an advisor affiliated with the Allianz Life Insurance Company. There are subaccounts that have large, independent advisors (e.g., AIM V.I. International Growth, managed by AIM advisors) and subaccounts which have advisors affiliated with the Allianz Life Insurance Company (e.g., USA Van Kampen aggressive growth, managed by US Allianz advisors and subadvised by Van Kampen). The following table shows the list of subaccounts available to USAllianz Rewards variable annuity policy holders that are offered by the investment advisor AIM and by the investment advisor USAllianz, the entity affiliated with the insurance company.

Panel A: Funds from the AIM Variable Insurance Funds Trust offered by the Allianz Reward Variable Annuity Policy

<u>Fund Name</u>	<u>Expense ratio</u>
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 from the USAZ Variable Insurance Products Trust offered by the Allianz Reward Variable Annuity Policy

<u>Fund Name</u>	<u>Expense ratio</u>	<u>Fund Name</u>	<u>Expense ratio</u>
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 Aggrsv 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

In Panel A, the fund offered by AIM investment advisors is overseen by a trust that AIM set up itself. AIM advisors have created the “AIM Variable Insurance Funds” trust, which, in 2005, oversaw 27 different funds that were offered as subaccounts through various different variable annuity policies. For example, the AIM V.I. International Growth Fund collected monies from subaccounts of X different variable annuity policies offered by Y different insurance firms. The structure of ownership of one of these 27 funds, AIM V.I. International Growth Fund, is therefore representative: Three insurance firms hold almost 40% of all assets (Allstate Insurance (25.14%), Hartford Life and Annuity (8.59%), and Lincoln National Life Insurance (6.03%)).

In Panel B, USAllianz Advisor, which is affiliated with Allianz Insurance as, is the advisor to a series of funds, belonging to the same USAllianz Variable Insurance Products Trusts. USAllianz advisors does not select individual portfolio securities, but evaluates and selects subadvisers for the Trust. USAllianz Advisor does not have any clients other than the trust. The advisor’s principal role can be defined as monitoring the subadvisor and making recommendations to the board of trustees. If a subaccount is not doing well, USAllianz Advisors will recommend to their board that the subadvisor should be replaced, effectively eliminating the need for investors to transfer funds to another subaccount. For example, USAllianz Rewards policy holders can invest in the USAZ AIM Basic Value fund. If the board of trustees of USAllianz advisors is dissatisfied with the services provided by AIM as subadvisers to their basic value fund, they can replace the subadvisor with a different investment management firm, say, Van Kampen Advisors.

Figure 1: Schedule of Investments for the AIM International Growth Mutual Fund and the AIM V.I. International Growth fund

Variable Annuity fund			Mutual Fund		
Total Net Assets: \$301.7 Million			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

Table 1: Summary Statistics for Variable Annuity Policies

The 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 a policy holder can choose from. No. of subadvisors is the number of different investment advisors offering the subaccounts. Mortality & 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 charge is expressed as fraction of assets invested and is the penalty paid by investors if they redeem assets prematurely. Maximum number of years is the number of years after which the surrender charge ceases to exist. Death benefits list 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 & Expense Fee	103.6	110.0	0.0	210.0	36.3
Administrative Charge	10.4	10.0	0.0	95.0	13.0
Distribution Charge	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 (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 and greater than -100% of fund size are kept. The final sample includes 180 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 (t-test) and difference in medians (Wilcoxon signed-rank) test.

Variable	Mutual Funds			Variable Annuities			Diff. Tests	
	Mean	Median	Std.Dev.	Mean	Median	Std.Dev.	Mean	Median
Size (\$MM)	\$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
4-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: Variable Annuity Boards – Summary Statistics

The table reports characteristics of the board of trustees for variable annuity funds. Sample period is 1997 to 2005. The table reports pooled time-series and cross-sectional data. Board size is number of trustees, % of interested trustees is the fraction of trustees who also work as managers of the funds' advisor(s), % of trustees with finance (law) background is the fraction of trustees who work in a finance (law) related area. Average tenure of trustees is the average time since first appointment to the trust. Average compensation from the trust and from all funds within the same family is the reported average compensation for each non-interested trustee for this trust and all affiliated trusts of the same fund sponsor. Panel A contains summary statistics for the overall sample, and panel B splits trusts into trusts affiliated and unaffiliated with insurance firms. In panel B, columns 5 and 6 report p-values from a test of differences of means and medians across the two groups. Statistically significantly different means and medians at the one, five, and ten percent level are indicated by ***, **, and *, respectively.

Panel A:

	N	N Miss	Mean	Median
Size of Board	811	0	8.5	8.0
% of Interested Trustees	811	0	25.1%	25.0%
% of Trustees with Finance Background	811	0	48.1%	50.0%
% of Trustees with Law Background	811	0	7.5%	0.0%
% of Trustees who are retired	811	0	6.0%	0.0%
% of Busy Trustees (more than two other boards)	539	272	16.5%	8.3%
Average Age of Trustees	811	0	61.5	61.7
Average Tenure of Trustees	798	13	6.8	6.4
Average Number of Funds Covered in this trust	811	0	24.7	20
Average Number of Funds Covered in family	312	499	53.2	41.3
Average Compensation from this trust	785	26	17693	10904
Average Compensation from all funds within fund family	795	16	70883	54400
	N		% of all trust-years	
No of trusts that report title of Trustees	741		91.4%	
Trusts that designate a chairman	147		19.8%	
Trusts that designate a chairman who is interested	143		19.3%	

Table 3, Panel B:

Variable	fund-years with outside investment advisor (n=714)		fund years with affiliated investment advisor (n=97)		p-values of test of difference for	
	Mean	Median	Mean	Median	Means	Medians
Size of Board	8.50	8.00	8.23	7.00	0.524	0.067*
% of Interested Trustees	0.25	0.25	0.26	0.25	0.305	0.528
% of Trustees with Finance Background	0.47	0.50	0.59	0.60	<.0001***	<.0001***
% of Trustees with Law Background	0.08	0.00	0.07	0.00	0.861	0.674
% of Trustees who are retired	0.06	0.00	0.06	0.00	0.822	0.563
% of Busy Trustees (more than two other boards)	0.18	0.09	0.08	0.00	<.0001***	0.002**
Average Age of Trustees	61.88	62.00	59.10	59.60	<.0001***	<.0001***
Average Tenure of Trustees	6.98	6.63	5.74	5.00	0.001***	0.006***
Average Number of Funds Covered in this trust	13.54	11.00	24.84	21.00	<.0001***	<.0001***
Average Number of Funds Covered in family	52.66	41.00	57.36	55.25	0.482	0.147
Total net assets in trust	7151	2206	11228	6540	0.014**	<.0001***
Average Comp. from this trust	15431	9449	33923	28458	<.0001***	<.0001***
Average Comp. from all funds within fund family	73129	56535	54519	42710	<.0001***	0.026**

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 current value of the previous year's assets, 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 (831 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 (+/- 1 year) as the variable annuity reference fund. The independent variables in the regression include an intercept, 3-year total return, 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 first column the regression specification assumes a linear relationship with total return. In next column the regression specification uses return measures that are isolated into above and below median coefficients. 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%. Standard errors are included in parentheses.

Table 4, continued

Independent Variable		
Intercept	0.868*** (0.189)	0.790*** (0.187)
VA 3-Year Total Return	0.165*** (0.035)	
MF 3-Year Total Return	0.211*** (0.026)	
VA 3-Year Total Return High (Above Median)		0.315*** (0.058)
VA 3-Year Total Return Low (Below Median)		-0.009 (0.045)
MF 3-Year Total Return High (Above Median)		0.303*** (0.051)
MF 3-Year Total Return Low (Below Median)		0.154*** (0.034)
VA Net Flows (t-1)	0.024 (0.027)	0.018 (0.027)
MF Net Flows (t-1)	0.095* (0.038)	0.069* (0.029)
VA Log(TNA)	-0.135*** (0.019)	-0.141*** (0.019)
MF Log(TNA)	-0.077*** (0.011)	-0.087*** (0.015)
VA Fund Exp. Ratio	-0.009 (0.070)	-0.001 (0.067)
MF Fund Exp. Ratio	-0.044** (0.020)	-0.088** (0.030)
VA Fund Age (Years)	-0.012*** (0.003)	-0.011*** (0.003)
MF Fund Age (Years)	-0.004 (0.003)	-0.003 (0.003)
Total Number of Obs.	5870	5870
R-Squared	18.9%	20.4%
Year*Invest. Objective Fixed Effects	Yes	Yes

Table 5 – 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 the percentage monthly net flows (%) to its variable annuity twin. The independent variables in the regression include an intercept, 3-year total return, 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 III, the regression specification assumes a linear relationship with total return. In specifications II and IV, the regression uses return measures that are isolated into above and below median coefficients. Columns III and IV include fixed effects for each Mutual Fund – Variable Annuity (MF-VA) matched pair and the standard errors are clustered by matched pair. The asterisks denote statistical significance as follows: *** - significant at 0.1%, ** - significant at 1%, and * - significant at 5%. Standard errors are included in parentheses.

Independent Variable	I	II	III	IV
Intercept	-0.28 (2.35)	-0.11 (2.36)	-2.04 (6.51)	-2.30 (6.51)
3-Year Total Return	2.23*** (0.46)		2.08*** (0.46)	
3-Year Total Return High (Above Median)		1.69* (0.74)		2.43** (0.82)
3-Year Total Return Low (Below Median)		2.75*** (0.55)		1.76** (0.57)
Mutual Fund - Log(Total Net Assets)	0.05 (0.24)	0.08 (0.24)		
Variable Annuity – Log(Total Net Assets)	-0.42 (0.37)	-0.42 (0.37)		
Mutual Fund - Fund Expense Ratio	-2.17 (1.25)	-2.28 (1.26)	-5.00 (3.54)	-5.04 (3.58)
Variable Annuity - Fund Expense Ratio	6.11** (2.10)	6.39** (2.10)	-1.33 (5.66)	-1.24 (5.66)
Mutual Fund Age (Years)	-0.005 (0.03)	-0.006 (0.03)	0.11* (0.05)	0.12* (0.05)
Total Number of Observations	3173	3173	3173	3173
Number of Matched Pairs	148	148	148	148
MF-VA Pair Fixed Effects	No	No	Yes	Yes
Adjusted R-Squared	1.07%	1.06%	1.06%	1.03%

Table 6 – Determinants of Expense Ratios - Aggregate Sample

The table presents estimates from a regression of expense ratios on past fund characteristics. The regression pools variable annuity and mutual fund observations but allows separate coefficients for each type of investment vehicle. The sample for the regression uses data from 1997 to 2005 where for each variable annuity fund a comparison mutual fund is selected. The comparison mutual fund is randomly selected from the group of funds that are matched by investment objective, date and by size decile as the variable annuity reference fund. The dependent variable is expense ratio for the variable annuities and expense ratio minus 12b-1 fees for the mutual funds. The independent variables in the regression include an intercept, a variable annuity dummy, the log of fund size, the previous year's percent net flows, the fund's 3-year gross return and annual turnover. In order to give the MF and VA dummy variables a meaningful economic interpretation, the remaining independent variables are demeaned. Investment Objective and Year fixed effects are included in the third, fourth and fifth specifications. In the fourth specifications, fund advisor fixed effects are included and in the fifth specification, the Log(TNA) variables are replaced by TNA decile fixed effects. The standard errors are clustered by fund. The asterisks denote statistical significance as follows: *** - significant at 0.1%, ** - significant at 1%, and * - significant at 5%. Standard errors are included in parentheses.

Independent Variables					
Mutual Fund Dummy	1.19*** (0.02)	1.43*** (0.07)	1.42*** (0.06)	1.25*** (0.04)	1.20*** (0.02)
Variable Annuity Dummy	0.90*** (0.01)	0.66*** (0.05)	0.66*** (0.05)	0.83*** (0.04)	0.89*** (0.01)
MF Log(TNA)		-0.15*** (0.02)	-0.14*** (0.02)	-0.08*** (0.009)	
VA Log(TNA)		-0.05*** (0.005)	-0.04*** (0.005)	-0.04*** (0.004)	
MF – Annual Net Flows (%)		-0.08 (0.11)	-0.09 (0.11)	-0.10 (0.10)	-0.20 (0.13)
VA – Annual Net Flows (%)		0.0008 (0.0005)	0.0008 (0.0005)	0.0007* (0.0003)	0.0011* (0.0005)
MF – 3 Year Gross Return		0.23* (0.10)	0.09 (0.14)	0.17 (0.10)	-0.02 (0.15)
VA – 3 Year Gross Return		-0.04 (0.05)	-0.21* (0.10)	0.06 (0.06)	-0.23* (0.11)
MF – Annual Turnover		0.025** (0.008)	0.025*** (0.008)	-0.0004 (0.01)	0.03** (0.01)
VA – Annual Turnover		0.041*** (0.005)	0.041*** (0.005)	-0.0006 (0.003)	0.04*** (0.004)
Total Number of Obs.	8588	8588	8588	8588	8588
Adjusted R-Squared	5.9%	19.7%	25.3%	68.9%	22.2%
Investment Objective FE	No	No	Yes	Yes	Yes
Year Fixed Effects	No	No	Yes	Yes	Yes
Fund Advisor Fixed Effects	No	No	No	Yes	No
Fund TNA Decile FE	No	No	No	No	Yes

Table 7 – Determinants of Expense Ratios – Twin Sample

The table presents estimates from a regression of expense ratios on past fund characteristics. The regression uses a matched sample of mutual funds (MF) and their variable annuity (VA) twins. The dependent variable is the difference between the mutual fund expense ratio (less its 12b-1 fees) and the variable annuity expense ratio. The independent variables in the regression include an intercept, and the following variables for both mutual funds and variable annuities: fixed effects for the smallest and middle 1/3 of funds by TNA (relative to the largest 1/3) and annual net flows (in %). We also include 3 year gross returns and annual turnover but because these variables are strongly correlated, we include them one at a time. In order to make the intercept economically meaningful, all other variables are demeaned. Standard errors are clustered by matched pair. The asterisks denote statistical significance as follows: *** - significant at 0.1%, ** - significant at 1%, and * - significant at 5%. Standard errors are included in parentheses.

Independent Variables				
Intercept	0.072**	0.072***	0.072***	0.072***
	(0.022)	(0.020)	(0.020)	(0.020)
MF Dummy-Small vs. Large TNA		0.15**	0.19***	0.20***
		(0.052)	(0.053)	(0.55)
MF Dummy-Medium vs. Large TNA		0.20***	0.21***	0.22***
		(0.043)	(0.043)	(0.043)
VA Dummy-Small vs. Large TNA		-0.15***	-0.13**	-0.14**
		(0.043)	(0.043)	(0.045)
VA Dummy-Medium vs. Large TNA		-0.035	-0.025	-0.020
		(0.034)	(0.033)	(0.032)
MF – Annual Net Flows (%)		-0.012	-0.023	-0.002
		(0.0065)	(0.0082)	(0.007)
VA – Annual Net Flows (%)		-0.009	-0.0096	-0.010
		(0.011)	(0.011)	(0.011)
MF – 3 Year Gross Returns			0.0007	
			(0.0007)	
VA – 3 Year Gross Returns				-0.00006
				(0.0002)
MF – Annual Turnover			-0.011***	
			(0.0032)	
VA – Annual Turnover				-0.020***
				(0.0043)
Total Number of Observations			630	
Number of Matched Pairs			165	
Adjusted R-Squared	6.05%	11.4%	13.6%	16.61%

Table 8 – Determinants of Advisor Replacement

The table presents estimates from a logit regression of the decision to replace a manager. The regression is run using a subsample of the data for the variable annuity fund of funds structures. The subsample comprises variable annuity advisor changes for the funds overseen by three trusts affiliated with insurance firms (US Allianz VIP trust, American Skandia Trust, ING investment trust). The sample period is 1997 to 2005 and 2004-2005 for ING Investment trust. The regression is estimated annually and the dependent variable is 1 if the manager is replaced in the next year or 0 otherwise. The regression estimates the probability of being replaced so a positive coefficient indicates that as that variable increases the probability of being replaced increases as well. The advisor characteristics for the year of the change are included as independent variables. These variables include: the manager’s investment objective-adjusted return, $R_{Fund}-R_{InvObj}$, 3-Year 4-Factor Alpha (Fama-French factors plus momentum), the investment objective-adjusted expense ratio, $ExpRatio_{ExistingSub}-ExpRatio_{InvObj}$, the age of the matched mutual fund, investment objective-adjusted annual fund turnover (the minimum of purchase and sales divided by the fund size), $Turnover_{Fund} - Turnover_{InvObj}$, and the natural log of fund size, $Log(TNA)$. The standard errors are clustered by trust (3 trusts). The asterisks denote statistical significance as follows: *** - significant at 0.1%, ** - significant at 1%, and * - significant at 5%. Standard errors are included in parentheses. The reported R-squared is Cox and Snell’s generalization of goodness-of-fit to the logistic likelihood ($R^2=1-[L(0)/L(\theta)]^{2/n}$).

Independent Variable		
Intercept	-5.46*** (0.42)	-6.11*** (0.66)
$R_{Fund}-R_{InvObj}$ (36 Months)	-0.08*** (0.001)	
4-Factor Alpha (36 Months)		-0.72*** (0.20)
$ExpRatio_{Fund}-ExpRatio_{InvObj}$	1.43** (0.53)	1.14** (0.42)
Fund Age (Years)	-0.02 (0.05)	0.004 (0.08)
$Turnover_{Fund} - Turnover_{InvObj}$	-0.0002 (0.0008)	-0.0005 (0.0007)
$Log(TNA)$	0.40*** (0.08)	0.51** (0.17)
Total Number of Observations	383	368
Number of Manager Replacements	21	21
Generalized R-Squared	1.91%	2.37%

Table 9 – Comparison of Replaced Advisors with New Advisors

The table presents descriptive statistics from the sample of new and replaced advisors. The table reports the mean and median of the fund’s 3-year return minus the average return of it’s investment objective over that time , $R_{ExistingSubaccounts} - R_{InvObj}$, Jensen’s Alpha, the expense ratio of the fund minus the average expense ratio of the fund’s investment objective, fund age in years, turnover and fund size. The statistics are calculated using a subsample of the data for the variable annuity fund of funds structures. The subsample comprises all variable annuity advisor changes for US Allianz and American Skandia from 1997 to 2005. In the last two columns, the p-values for two-sample t-test (Mean) and Wilcoxon two-sample test (Median).

	Old Advisor		New Advisor		Diff. Tests (p-values)	
	Mean	Median	Mean	Median	Mean	Median
$R_{ExistingSubaccounts} - R_{InvObj}$	0.05	-0.72	2.37	2.71	0.20	0.04
Jensen’s Alpha (36 Mo.)	0.51	-0.24	1.90	0.39	0.52	0.25
$ExpRatio - ExpRatio_{InvObj}$	-0.22	-0.25	-0.12	-0.18	0.33	0.18
Fund Age (Years)	16	9	11	8	0.22	0.12
Turnover (%)	99	75	75	74	0.28	0.32
Size (\$Millions)	2349	1465	1839	189	0.58	0.06

Table 10 – Determinants of the Addition of New Subaccounts

The table presents estimates from a pooled time-series cross-sectional logit regression of the decision to add a new subaccount in a given investment objective 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 where the potential investment objectives are all objectives identified by Morningstar for a given year. The dependent variables include an intercept, $R_{ExistingSubaccounts} - R_{InvObj}$, the difference in the 3-year equal-weighted total return of the other subaccounts in the same investment objective minus the 3-year equal-weighted average return of all subaccounts in the same investment objective, 4-Factor $Alpha_{ExistSub}$, the equal-weighted average 24-month 4-Factor alpha (market, size, book-to-market and momentum) 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 \$ Flows, the fraction of total net dollar flows that went to the investment objective in the previous years, $ID(NewInvObjOffering)$, a dummy variable that takes a value of 1 if the policy has not previously offered any subaccounts in the investment objective, $ID(NewInvOff)*InvObjFrctn\$Flows$, and interaction term between the newly offered investment objective dummy variable and the fraction of net flows that went to the investment objective, and # Subaccounts in Policy, the total number of subaccounts offered by the policy. If the policy previously had no offerings in a given investment objective (i.e., $ID(NewInvObjOffering)=0$) then $R_{ExistingSubaccounts} - R_{InvObj}$, $Alpha_{ExistSub}$, $ExpRatio_{ExistingSub} - ExpRatio_{InvObj}$, are all set to 0. The standard errors are clustered by insurance policy (1089 difference insurance policies). The asterisks denote statistical significance as follows: *** - significant at 1%, ** - significant at 5%, and * - significant at 10% level. Standard errors are corrected for clustering at the policy level and are included in parentheses.

Independent Variable		
Intercept	-1.59*** (0.12)	-1.63*** (0.11)
$R_{ExistingSubaccounts} - R_{InvObj}$	-0.011*** (0.0038)	
4-Factor $Alpha_{ExistSub}$ (24 Months)		-0.11*** (0.024)
$ExpRatio_{ExistingSub} - ExpRatio_{InvObj}$	0.224** (0.092)	0.22*** (0.083)
Inv Obj. Fraction of Total \$ Flows	1.19*** (0.18)	1.31*** (0.18)
$ID(NewInvObjOffering)$	-1.20*** (0.035)	-1.16*** (0.034)
$ID(NewInvOff)*InvObjFrctn\$Flows$	2.43*** (0.39)	2.24*** (0.40)
# Subaccounts in Policy	-0.0027 (0.0040)	-0.0040 (0.0039)
Total Number of Observations	87269	88741
Number of New Selections	6169	6432
Year-Fixed Effects	Yes	Yes