Fight Inside the Wrapper: The Balance of Power between Insurance Companies and Asset Management Companies

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***JEL classification*:** G23, G30, G32

***Keywords*:** Variable Annuity, Insurance Company, Fund Management Company, Bargaining Power

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I. Introduction

The recent financial crisis and the demise of AIG has brought to the fore the role of the insurance companies in the financial markets and their interactions with the other financial players – e.g., banks and asset managers. Insurance companies play a major role in the financial system, not only as investors and asset managers, but also as providers of intermediation between asset managers and investors. Indeed, many investors do invest in the financial market only by acquiring life insurance contracts that invest in financial assets. In this paper, we focus on variable annuity contracts which are one of the fastest growing segments of insurance plans.

A variable annuity is an "insurance wrapper" that offers a set of investment options ("subaccounts") - e.g. stock funds, bond funds, and money market funds to the investor ("annuitant"). The annuitant by depositing money in the wrapper can choose the funds in which such money will be allocated. While the annuitant is strongly discouraged from withdrawing money from the wrapper by high withdrawal fees and tax penalties, he is allowed to reallocate money from one subaccount to another within the same wrapper at no cost subject to some restrictions on the frequency of such reallocations.

The insurance company plays the role of an intermediary between the annuitant and mutual funds. This intermediating role has grown steadily over the last two decades. For example, in the United States, the number of investment vehicles that have been sold within variable annuity wrappers as well as the total net assets they managed has grown at a rate much higher than that experienced by equivalent (open-end) funds directly sold to the investors. The number of variable annuity funds has increased by 260% from 665 in 1995 to 1,731 in 2012, while the number of open-end funds has increased only by 132% from 5,725 in 1995 to 7,596 in 2012 (Investment Company Factbook (2013)). This growth has coincided with a huge increase in the absolute

amount of assets under management. In 1995, variable annuity funds managed 260 billion dollars of assets, while in 2012 this number has grown to 1,441 billion dollars. In comparison, open-end mutual funds managed 2,551 billion dollars of assets in 1995 that has grown to 11,604 billion dollars in 2012.

The structure of variable annuities is quite interesting. The insurance company offers a menu of subaccounts to the investors. These subaccounts represent funds that may be managed either in-house by the insurance company (or its affiliated fund management company) itself or by an unaffiliated fund management company. In a typical variable annuity plan, the insurance company includes subaccounts that are managed in-house as well as subaccounts from several unaffiliated fund management companies. In this paper, our main focus is on the performance difference between the affiliated and unaffiliated variable annuity funds as well as the cross-sectional variation in the performance among external variable annuity funds.

In fully competitive markets with no distortions induced by taxation, distribution costs or other non-price related features, it should be the case that the asset managers would be indifferent between selling their investment services directly to investors or indirectly through variable annuity plans. Even more importantly, the insurance companies should also be indifferent between providing themselves the funds within the wrapper or sub-delegating fund management function to asset management companies. This would suggest that there should be no difference between the performance of the variable annuity funds that are offered by unaffiliated asset management companies and the ones that are directly managed by the insurance companies. Therefore, our null hypothesis is that there is no link between the performance of the fund offered within the wrapper and the type of fund manager (insurance company vs unaffiliated fund management company) managing it.

The performance of funds may be affected by the incentives of the insurance companies and the management companies. The insurance company would ideally prefer to include only good quality unaffiliated funds in its variable annuity plans. If the insurance company has more bargaining power vis-a-vis the asset managers, we would expect the funds offered inside the wrapper by unaffiliated management companies to deliver better performance than the ones offered by the insurance company itself. In other words, the insurance company uses its bargaining power to extract better performance than it itself offers. We will call this the "insurance company bargaining power hypothesis".

The alternative hypothesis is the possibility that insurance companies depend on the asset management companies for funds so much that they are willing to compromise on the performance of funds provided by unaffiliated management companies. In this case, the bargaining power would be on the side of the asset managers and we would expect the funds managed by unaffiliated management companies to deliver poor performance. Such (negative) performance differential will get even more negative with the bargaining power of the asset management company. We will call this the "management company bargaining power hypothesis".

In this paper, we test these hypotheses by focusing on the complete sample of variable annuities within the US over the period 2001-2011. We have available information on all the variable annuity plans, the insurance companies sponsoring these plans, the funds that are offered within these plans and the identity of the management company that manages these funds. We also have the inception date of each subaccount which is the date when the subaccount was initially offered in the variable annuity. A fund can be offered as subaccount in many variable

annuities at different points of time. Therefore, there can be multiple subaccounts for a fund with different inception dates.

We categorize the funds into four parts. Our first category of variable annuity funds includes the funds managed by insurance companies themselves ("Pure Internal Funds"). In this case, the insurance company has an affiliated fund management company that manages all the subaccounts in its variable annuity plan. The second category includes funds managed by asset management companies that do not have any affiliated insurance company offering variable annuity plans ("Pure External Funds"). We refer to the funds managed by asset management companies that manage funds for their own affiliated insurance companies as well as for one or more unaffiliated insurance companies as "Hybrid Funds". We divide the Hybrid Funds into two categories – those offered exclusively within affiliated variable annuity plans ("Hybrid Internal Funds") and those offered in at least one unaffiliated variable annuity plan ("Hybrids External Funds"). In this paper, we sometimes refer to Pure Internal Funds and Hybrid Internal Funds simply as Internal Funds. Similarly, Pure External Funds and Hybrids External Funds may be referred as External Funds.

We first relate the fund category to fund performance. We consider four different measures of fund performance – market-adjusted return, CAPM alpha, 3-factor alpha and 4-factor alpha. We find that on average both the Pure External and the Hybrid External funds deliver a performance higher than the internal funds. However, the ones that significantly differentiate themselves are the Hybrid External funds. In terms of performance measures based on gross returns in Fama-Macbeth specifications, the coefficients for Hybrid External funds represent performance differential over Pure Internal funds equal to 10.5 basis points per month (1.27% per year) market-adjusted return, 9.8 bps per month (1.18% per year) CAPM alpha, 9.3 bps per month

(1.12% per year) three-factor alpha and 12.2 bps per month (1.47% per year) four-factor alpha. We confirm these results using alternative econometric specifications. Overall, these results suggest that insurance companies are able to extract superior performance from unaffiliated management companies. This result is consistent with the insurance company bargaining power hypothesis.

However, this is not the complete story. Further investigation reveals that not all external funds are equally good. While insurance companies may have higher bargaining power vis-à-vis unaffiliated management companies on average, there is potential cross-sectional heterogeneity across management companies in terms of their bargaining power. We create measure of the managing firm's bargaining power as follows. For each pair of fund management company and insurance company, we define the bargaining power of the fund management company relative to the insurance company. A management company may offer its funds in variable annuity plans of several insurance companies. Therefore it makes sense to measure the bargaining power of each management company relative to each insurance company separately. We make use of data segregated at subaccount level for this purpose. We define the bargaining power of a management company vis-à-vis a specific insurance company as the ratio of the number of subaccounts that the management company manages for the specific insurance company to the total number of subaccounts that this insurance company offers in its variable annuity plans. We find a strong negative relationship between the bargaining power of the management company and the performance of its funds offered to other insurance companies. A two standard deviation increase in *power* reduces market-adjusted return by 1.02% per year, CAPM-alpha by 1.08% per year, three-factor alpha by 0.85% per year and four-factor alpha by 1.29% per year. These results suggest that fund management companies with higher bargaining power are able to be part of

wrappers even if they deliver worse performance. In other words, fund management companies with lower bargaining power must provide better performance if they want their funds to be included in variable annuities.

One potential issue is that the bargaining power may be endogenous and related to other unobservable characteristics of the fund management company. This issue is already partially accounted for by the fact that the results always display a negative relationship between bargaining power and performance. Indeed, if our measure of bargaining power did instead proxy for quality of the management company, we would have expected a positive relationship. However, to properly address this issue, we perform an instrumental variables regression to estimate the relation between bargaining power and fund performance. We define *relation_age* between a fund management company and an insurance company as the number of years since the insurance company first included in its variable annuity plan a fund of that management company. For a fund offered in variable annuities of several insurance companies, we take simple average of *relation_age* with respect to all insurance companies. The instrumental variable regression results confirm the previous ones.

Our paper has strong normative implications in terms of the interaction between insurance companies and asset managers as well as in terms of the role of favorable taxation on capital gains helping insurance companies. The latter increase the bargaining power of the insurance companies in a direction that is unknown in the typical asset management industry. Indeed, while it is the case that there is now consistent evidence that outsourced funds tend to underperform the ones managed in-house (Chen et al. (2013), Del Guercio and Reuter (2013), Chuprinin, Massa and Schumaker (2015)), in the case of the insurance wrappers we find that the outsourced funds deliver better performance due to the greater bargaining power of insurance companies likely

induced by the preferential tax treatment of variable annuities. The insurance company may have higher bargaining power also due to the fact that it is the owner of the variable annuity plan and has exclusive right to decide which funds are included in the wrapper.

Our paper is close to work of Chen et al. (2013) who study outsourcing of fund management in the mutual fund industry. They explore the mutual fund industry and show that outsourced funds underperform those managed internally. If we think of externally managed variable annuity funds as analogous to outsourced funds then our first result that external funds outperform internal funds seems to contradict Chen et al. (2013). However, in our later set of results focusing only on external funds, we find that higher bargaining power of unaffiliated management companies leads to poor performance which is consistent with Chen et al. (2013).

Our paper is also related to the recent paper by Sialm, Starks and Zhang (2013). They focus on the 401(k) funds offered within the menu of company-specific defined contribution retirement plan. Also, we contribute to the literature on outsourcing (e.g., Antras (2003, 2005), Antras and Helpman (2004), Grossman and Helpman (2005), Feenstra and Hanson (2005)) and, in particular, to outsourcing in financial markets (Chen et al. (2013), Del Guercio and Reuter (2013), Chuprinin, Massa and Schumaker (2015)). Finally, our paper sheds some light on the variable annuity industry. This industry has attracted scarce attention in the finance literature (except for Del Guercio and Tkac (2002) and Massa and Yadav (2016)). Our paper attempts to fill this gap in the literature.

The remainder of the paper is organized as follows. In Section II, we provide some institutional details on the variable annuity market. In Section III, we describe the data and the main variables. In Sections IV, we provide the main empirical findings. A brief conclusion follows.

II. The Variable Annuity Market

A variable annuity is a contract between an individual ("the annuitant") and an insurance company ("the insurer"). The annuitant can buy the variable annuity by either making a single immediate payment or a series of future payments and the insurer agrees to make periodic payments to the individual beginning either immediately or at some future date.

A typical variable annuity contract has two stages: accumulation and distribution. During the accumulation stage, the annuitant makes purchase payments that credit his account. The annuitant can choose to invest this money among different investment options that are on offer within the same plan ("insurance wrapper"). These investment options, called subaccounts, in general take the form of mutual funds that invest in stocks, bonds, money market instruments, or some combination of the three. For example, the annuitant can allocate 50% of the purchase payments to a large-cap equity fund, 30% to a corporate bond fund, and 20% to a diversified index fund. The money allocated to each subaccount will increase or decrease over time, depending on the fund's performance. The value of the annuitant's investment depends on the amount of the invested capital and on the performance of the funds in which this capital is allocated.

The subaccounts offered within a variable annuity wrapper can be managed in-house by the insurance company itself or by one of its affiliated fund management companies. Alternatively, these subaccounts can be funds managed by unaffiliated fund management companies. For example, Fidelity Personal Retirement Annuity is a variable annuity plan that offers Fidelity VIP Equity Income, an in-house fund, as well as Morgan Stanley Emerging Markets Equity, an external fund, as subaccount.

A typical variable annuity plan offers a menu of around fifty subaccounts to the investor. For example, the complete list of subaccounts (investment options) offered in the AXA Retirement Cornerstone Variable Annuity includes 37 asset allocation funds, 5 large cap blend stock funds, 11 large cap growth stock funds, 7 large cap value stock funds, 11 mid cap stock funds, 6 small cap stock funds, 13 international stock funds, 15 specialty funds, 3 international/global bond funds, 3 high yield bond funds, 12 bond funds, and 2 money market funds. Within each category, some subaccounts may be managed by AXA itself while others may be funds managed by unaffiliated fund management companies. The unaffiliated funds need not be offered as subaccount exclusively to AXA. For example, Fidelity VIP Contrafund has been offered as subaccount in variable annuities of more than 30 different insurance companies.

At the end of the accumulation stage (during the distribution stage), the annuitant may either receive the overall money (i.e., purchase payments plus investment income and gains) as a lump-sum payment, or as a stream of payments at regular intervals. In the latter case, the insurance company guarantees a series of regular payments whose values are contingent on the capital available in the wrapper (hence the name "variable annuity").[3] The annuitant is in general unable to withdraw capital from the wrapper in excess of some established allowance limits and penalties on such early withdrawals are placed by the insurer ("surrender charges").[4] The

[3] A common feature of variable annuities is the death benefit. If the annuitant dies, the beneficiary will receive the greater of: (i) all the money in the account, or (ii) some guaranteed minimum (such as all purchase payments minus prior withdrawals).

[4] If money is withdrawn within a certain period after a purchase payment, the insurance company usually will charge a "surrender" fee. This charge is used to pay the agent a commission for selling the variable annuity to the investor. This is a percentage of the amount withdrawn, and

surrender charge can be as high as 9% of the purchase amount. In contrast, insurance companies in general allow policyholders to move their assets among various subaccounts within the wrapper, usually with different investment objectives, without fees or penalties.

Moreover, if an investor surrenders a variable annuity, he will owe ordinary income tax on any profit on his investments within the contract. Indeed, if money is withdrawn from the insurance wrapper, the annuitant is taxed on the earnings at ordinary income tax rates. In contrast, an investor can use tax-free '1035 exchange' allowed by Section 1035 of the U.S. tax code to exchange an existing variable annuity contract for a new annuity contract without paying any tax on the income and investment gains in his current variable annuity account.[5]

These features are in line with the fact that variable annuities are designed to be long-term investments, to meet retirement and other long-range goals. They allow investors to set money aside for retirement. In fact, the insurers themselves advise investors that the annuity investments should be for the long-run and should be made using savings earmarked for the "long-term". As such, many variable annuity holders use these policies as substitutes for corporate or employer-maintained retirement plans (e.g., Individual retirement annuities (IRAs) or employer-sponsored 401(k) plans). However, an annuitant who invests in the variable annuity through a tax-advantaged retirement plan (e.g., 401(k) plan) does not receive any additional tax advantage from the variable annuity.

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declines gradually over a period of several years, known as the "surrender period." For example, a 9% charge might apply in the first year after a purchase payment, 8% in the second year, 7% in the third year, and so on until when the surrender charge no longer applies.

[5] Income withdrawn pays a 10% federal tax penalty if the annuitant withdraws money before the age of 59½.

The typical variable annuity contract has both an investment component and an insurance element. It is in fact a mix between a set of mutual fund investments and an insurance policy. However, a variable annuity fund typically differs from an open-end mutual fund along some important dimensions. First, variable annuities allow the annuitant to receive periodic payments for the rest of his life. Second, they entail a death benefit. If the annuitant dies before the insurer has started making payments to him, the beneficiary (e.g., the spouse) is guaranteed to receive a specified amount (in general at least as high as the purchase payments made by the annuitant). Third, variable annuities are tax-deferred – i.e., no taxes are due on the income and investment gains until the money is withdrawn.

III. Data and Main Variables

Our main data source is Morningstar Direct that provides survivorship-bias free data on variable annuity funds. The traditional Morningstar data has survivorship bias (Elton, Gruber and Blake (2001)), and CRSP Mutual Fund Database does not allow us to identify variable annuity funds as it does not have *historical information* for such identification but just the current status of the fund. In contrast, we have been provided by Morningstar Direct with information on all the surviving as well as non-surviving funds. More specifically, Morningstar Direct provides us a direct link between all the (dead and alive) variable annuity plans and the variable annuity funds that are offered as subaccounts in these variable annuity plans. We have information about the insurance company that offers the variable annuity plan and the fund management companies that manage the subaccounts offered within these plans. A fund may be offered as subaccount in several variable annuity plans offered by different insurance companies. Morningstar Direct

reports the inception date of each subaccount. Therefore, our link between the insurance company, its variable annuity plan, funds offered as subaccounts in the variable annuity plan and the fund family managing the fund is dynamic and consequently accurate at each point of time.

Funds have unique identification codes in the Morningstar Direct data. However, there are no standard codes for identifying fund management companies and insurance companies which are identified only by their name. For the sake of accuracy in data analysis, we assign codes to fund management companies and insurance companies. For example, since Allstate Life Insurance Company of New York operates as a subsidiary of Allstate Life Insurance Company, we assign the same code to both companies. As another example, we assign same code to Fidelity Investments which is a fund management company and Fidelity Investments Life Insurance Company which is an insurance company that offers variable annuities. This coding helps us identify affiliations between insurance companies that offer variable annuities and fund management companies that offer their funds as subaccounts in variable annuities.

Our sample covers the period 2001-2011. We focus on variable annuity funds that invest mainly in US domestic equities. More precisely, we include a fund in our sample if it is offered as a subaccount in a variable annuity, its domicile is “United States”, its US_Broad_Asset_Class is ‘U.S. Stock’ and its Equity_Style is one of the following: 'Large Blend', 'Large Growth', 'Large Value', 'Mid Blend', 'Mid Growth', 'Mid Value', 'Small Blend', ‘Small Growth’ and ‘Small Value’. We exclude index funds. We also exclude funds that have less than $5 million in assets under management and also those that are less than two years old.

Although multiple share classes are listed as separate funds in the data, they have the same pool of securities, the same portfolio manager and the same returns before expenses. For each fund, we have information on its share classes as well as the whole fund. Some information, such

as the name, expense ratio, fees, and net assets are reported at the share class level, while others, such as investment style, domicile, holdings, and family affiliation are identical across all share classes of the same fund. We aggregate data on the different share classes of a fund in a month to create a single fund observation. The total net asset (TNA) for a fund is the sum of TNAs of all its share classes and age is the age of the oldest share class of the fund. Expense ratio, turnover and return are calculated as the weighted average of the corresponding figures of all the share classes, the weights being the lagged TNA of the share classes. The family size for a fund is the sum of TNAs managed by all the funds in the family of the fund except the fund itself.

We define the following variables: Fund total net assets is the sum of the net assets of different classes of the same fund. Family size is the total assets under management of the other funds in the family that the fund belongs to excluding the asset of the fund itself. Log of Family Total Net Assets is logarithm of one plus family size. Annual turnover is the minimum of aggregated sales or aggregated purchases of securities, divided by the average 12-month total net assets of the fund in the previous year. Age is the number of years since the fund was first offered. Expense ratio is the ratio of total investment that shareholders paid for the fund's operating expenses in the previous year. Net return is the monthly return received by the investors after fund expenses. Gross return is net return plus monthly expense ratio where monthly expense ratio is calculated as the annual expense ratio divided by twelve. Net (gross) market adjusted return is net (gross) return minus market return. Fund flow is the percentage fund flow into the mutual fund over the past 12 months.

CAPM alpha, 3-factor alpha and 4-factor alpha of a fund for a month are calculated using factor loadings obtained by running a time-series regression of fund excess return on market excess return (MKTRF) for CAPM alpha, the three Fama-French factors (MKTRF, SMB and

HML) for 3-factor alpha, and four factors (the three Fama-French factors plus the momentum factor) for 4-factor alpha using monthly observations over past 36 months. The fund alpha for current month is obtained as the fund excess return minus the sum of the products of the factor loadings with the current month factor realizations. We estimate alpha using net returns as well as gross returns.

More specifically, we calculate alpha of fund *i* in month *T*, following the standard two-stage estimation method (e.g., Carhart (1997)). We illustrate the method for 4-factor alpha. First, we estimate the fund's factor loadings using the following regression on prior 36 months of returns:

$$R_{it} - R_{ft} = \alpha_i + b_i^{MKTRF} * MKTRF_t + b_i^{SMB} * SMB_t + b_i^{HML} * HML_t + b_i^{UMD} * UMD_t + \varepsilon_{it}$$

The estimated β_i^{MKTRF}, β_i^{SMB}, β_i^{HML} and β_i^{UMD} are the factor loadings. Then, we calculate the monthly alpha of fund *i* in month *T* as:

$$\alpha_{iT} = (R_{iT} - R_{fT}) - (\beta_i^{MKTRF} * MKTRF_T + \beta_i^{SMB} * SMB_T + \beta_i^{HML} * HML_T + \beta_i^{UMD} * UMD_T)$$

We divide the variable annuity funds each month into four groups as a function of the type of relation between its management company and the insurance company offering the wrapper. There are some fund management companies that manage funds only for variable annuities of an affiliated insurance company. For example, the management company First Investors manages

funds that are offered in variable annuities offered by First Investors Life Insurance[6]. First Investors does not manage funds for variable annuities of other insurance companies. We refer to this group of funds as "Pure Internal Funds".

Our second group of fund management companies is composed of those that do not have an affiliated insurance company but offer their funds to variable annuities of unaffiliated insurance companies. We refer to funds of these management companies as "Pure External Funds". For example, Putnam Investments does not have an affiliated insurance company but its funds are offered as subaccounts in variable annuities offered by several insurance companies like The Hartford Financial Services Group and Allstate Insurance Company.

The third group of fund management companies is composed of those that manage funds for an affiliated insurance company as well as for unaffiliated insurance companies. We refer to funds of these management companies as "Hybrid Funds". Within the set of hybrid funds, we refer to those offered only in variable annuities of affiliated insurance companies as "Hybrid Internal Funds" and the rest as "Hybrid External Funds". For example, the fund management company Fidelity Investments offers its funds in variable annuities managed by Fidelity Investments Life Insurance Company (classified as "Hybrid Internal Funds" in this paper) as well as in variable annuities offered by more than fifty different unaffiliated insurance companies like AXA Equitable Life Insurance Company and Nationwide Life Insurance Company (classified as "Hybrid External Funds" in this paper).

We report some descriptive statistics in Tables 1 and 2. The number of distinct funds in the sample is 1,689 and the total number of fund-month observations is 157,630. In Table 1, we

[6] First Investors changed its brand name to Foresters Financial effective September 21, 2015 (prnewswire, September 21, 2015).

report the number of funds and the number of share classes for each category of funds in the month of June of every year from 2001 to 2011. The number of funds increases throughout the sample period for all four types of funds. We note that the pure external funds make the largest category of funds in our sample.

In Table 2, we report summary statistics for the sample of mutual funds used in this paper. We present the summary statistics separately for the four groups we defined above. These numbers suggest that pure internal funds are on average smaller and belong to smaller fund management companies whereas hybrid funds are much bigger and belong to very large fund management companies. We also note that the expense ratios are comparatively lower for both pure internal and hybrid internal funds. The external funds, pure as well as hybrid, have better performances despite higher expense ratios. The average net of fees market-adjusted returns (annualized) are -0.04% and 0.48% per year for pure internal and hybrid internal funds respectively, and 1.44% and 1.08% per year for pure external and hybrid external funds respectively. Similar performance differences are observed for gross market-adjusted return and CAPM alpha, 3-factor alpha and 4-factor alpha based on net as well as gross returns.

IV. Performance and Bargaining Power

We start by analyzing the relation between the type of fund and its performance. Then, focusing only on the subset of external funds, we consider the role played by the relative bargaining power of asset management companies vis-à-vis insurance companies.

A. Internal vs External Funds: Evidence of Performance Differential

We relate performance to the status of the fund by using both Fama-Macbeth regressions and pooled regressions. As we mentioned earlier, we consider four different measures of fund performance – market-adjusted return, CAPM alpha, 3-factor alpha and 4-factor alpha. Each performance measure is calculated using net returns as well as gross returns of the funds.

We report the results in Table 3. We create dummy variables corresponding to each fund type. Pure internal funds are used as the control group, therefore the dummy variable corresponding to pure internal funds is not included in the regressions. The coefficients for the other three dummy variables represent the performance in excess of that of the Pure Internal funds. Panel A reports the results based on Fama-Macbeth regressions, while Panel B reports the pooled regression results. The results show that on average both the Pure External and the Hybrid External funds deliver a performance higher than the internal funds. However, the ones that statistically significantly differentiate themselves are the Hybrid External funds. In terms of performance measures based on gross returns in Fama-Macbeth specifications, the coefficients for Hybrid External funds represent performance differential over Pure Internal funds equal to 10.5 basis points per month (1.27% per year) market-adjusted return, 9.8 bps per month (1.18% per year) CAPM alpha, 9.3 bps per month (1.12% per year) three-factor alpha and 12.2 bps per month (1.47% per year) four-factor alpha.

Next, we look at the performances of subaccount funds from a different perspective. The superior performance of external subaccount funds may be due to the fact these are managed by families with superior management. Chen et al (2004) show that fund families play an important role in determining fund performance. In particular, funds belonging to larger fund families perform better. Since each subaccount is managed by some fund family, we ask the following question: How does the performance of subaccount funds compare with the performance of open

end funds managed by these fund families? It is possible that certain characteristics of fund families with Pure External funds are different from those with Hybrid funds. Therefore, we analyze the two groups separately and present our results in Table 4 (for families with Pure External funds) and Table 5 (for families with Hybrid funds).

In Table 4, we run regressions to compare the performances of Pure External funds with those of non-subaccount open end funds belonging to the same fund families. Pure External is a dummy variable that takes value 1 for Pure External funds and 0 for open end funds. Therefore, the coefficient of Pure External in these regressions represents the performance differential over open end funds. The results clearly show that the Pure External funds perform significantly better than comparable open end funds. In terms of performance measures based on gross returns in Fama-Macbeth specifications, the coefficients for Pure External funds represent performance differential over open end funds equal to 13.7 basis points per month (1.27% per year) market-adjusted return, 13.0 bps per month (1.56% per year) CAPM alpha, 8.0 bps per month (0.96% per year) three-factor alpha and 6.4 bps per month (0.77% per year) four-factor alpha.

In Table 5, we run regressions to compare the performances of Hybrid Internal and Hybrid External funds with those of non-subaccount open end funds belonging to the same fund families. In these regressions, Hybrid Internal and Hybrid External are dummy variables that take value 1 for funds in the respective categories and 0 otherwise. Therefore, the coefficients of Hybrid Internal and Hybrid External in these regressions represent the performance differential of the respective categories of funds over open end funds. The results show that the performance of Hybrid Internal funds is not significantly different from that of open end funds. However, the Hybrid External funds do significantly outperform open end funds. In terms of performance measures based on gross returns in Fama-Macbeth specifications, the coefficients for Pure External funds represent performance differential over open end funds equal to 13.5 basis points

per month (1.62% per year) market-adjusted return, 10.5 bps per month (1.26% per year) CAPM alpha, 7.3 bps per month (0.88% per year) three-factor alpha and 8.1 bps per month (0.97% per year) four-factor alpha.

What are the potential determinants of the bargaining power of insurance companies? The rise in variable annuities has been favored by the advantageous fiscal treatment that allows the investors in insurance wrappers to defer the payment of the taxes on capital gains and dividends. This represents an amazing subsidy from the State to the insurance industry that manages the insurance wrappers. Such a subsidy should provide the manager of the insurance wrapper – i.e., the insurance company – with a stronger bargaining power vis-à-vis the asset managers – e.g., the mutual fund management company. Also, insurance companies may have higher bargaining power due to the fact that they are the sponsors of variable annuity funds and therefore have the final say in deciding which funds will be included as subaccounts.

We should also note that the superior performance of external funds cannot be due to potentially higher expertise of fund management companies. The fact that Hybrid External funds outperform Hybrid Internal funds rules out this potential explanation.

B. External Funds: Relative Bargaining Power of Fund Management Companies vis-à-vis *Insurance Companies*

Upto this point, we have compared the performance of internal funds vis-à-vis those of external funds. Overall, these results suggest that the external funds, especially the Hybrid External funds, perform significantly better than the internal funds. This result is counterintuitive in view of Chen et al (2013) who study the effect of outsourcing on mutual fund performance and

find that outsourced funds underperform those run internally by about 50 basis points per year. Our results suggest that outsourcing is not always a bad strategy and even outsourced funds may provide superior performance depending on the context.

One potential explanation of the outperformance of external funds in case of variable annuity funds is the balance of bargaining power of fund management companies vis-a-vis insurance companies. The results so far suggest that Insurance companies, due to their higher bargaining power, are able to extract higher performance from fund management companies. Are all fund management companies at a relative disadvantage in terms of bargaining power? We might conjecture that the bigger fund management companies might be in a relatively better negotiating position and therefore may not have to offer higher returns to insurance companies for being included in variable annuity plans. In case of internal funds, there is no issue of bargaining because the fund management company and the insurance company belong to the same parent company. Therefore, we focus only on the outsourced funds – i.e., the Pure External and the Hybrid External funds. In other words, we have already established that external funds on average outperform internal funds and now we want to examine what determines the cross-sectional variation in performance within the subset of external funds.

A fund management company offers its funds to several insurance companies. Therefore, we can think in terms of relative bargaining power corresponding to each pair of fund management company and insurance company. For a given pair of fund management company and insurance company, we define the relative bargaining power of fund management company as follows:

$$power = \frac{firm\_insu\_numfunds}{insu\_numfunds}$$

where firm_insu_numfunds is the number of funds that the management company manages for the specific insurance company and insu_numfunds is the total number of funds in the variable annuities of this insurance company. The intuition is that if the specific management company manages a bigger part of the funds contained in the wrappers offered by the insurance company, then it has more bargaining power vis-à-vis the specific insurance company. The value of *power* is between 0 and 1, by definition.

Since a fund may be offered as subaccount in variable annuities of several insurance companies, there may be multiple observations for each fund in a given month with the value of the variable *power* different for each pair of fund management company and insurance company. We aggregate multiple subaccount-month observations of a fund into a single observation. The variable *mean_power* for a fund in a month is equal to the mean of the *power* of all subaccount-month observations of the fund. We report the results in Table 6. The variable *mean_power* takes values between 0 and 1 with a standard deviation of 0.09. In case of gross returns, a two standard deviation increase in *mean_power* reduces market-adjusted return by 1.18% per year, CAPM-alpha by 1.11% per year, three-factor alpha by 0.77% per year and four-factor alpha by 0.75% per year.

These results suggest that fund management companies with higher bargaining power are able to be part of wrappers even if they deliver worse performance. This is in line with the management company bargaining power hypothesis. This result should not be interpreted as saying that fund management companies have more bargaining power than insurance companies and therefore can offer their bad funds in variable annuities. This result is based only on the subset of external funds and provides a comparison across management companies. The management companies with lower bargaining power must offer significantly higher returns in

order to be included in variable annuities while those with higher bargaining power can keep their funds in variable annuities even with relatively poorer performance. It is in this sense that we can claim support for the management company bargaining power hypothesis. However, on average, the fund management companies must provide higher returns in order to be included in variable annuities as postulated by the insurance company bargaining power hypothesis.

The overall conclusion from these results is that the fund management companies that have higher bargaining power because of their size can afford to supply relatively inferior funds in the variable annuities of insurance companies whereas those with lower bargaining power must offer superior funds in order to be included in variable annuities.

C. Instrumental Variables Approach

One potential issue is that the bargaining power may be endogenous and related to other unobservable characteristics of the fund management company. This issue is already partially accounted for by the fact that the results always display a negative relationship between bargaining power and performance. Indeed, if our measure of bargaining power did instead proxy for quality of the management company, we would have expected a positive relationship. However, to properly address this issue, we perform an instrumental variables regression to estimate the relation between bargaining power and fund performance.

Since the definition of bargaining power depends on both the fund management company and the insurance company, ideally the instrumental variable should also depend on both these entities. The length of the relation between fund management company and insurance company is one such variable. We define *relation_age* as the number of months since the relation between

fund management company and insurance company was first established, which is when the insurance company included a fund from the management company in its variable annuity for the first time. *Relation_age* is unlikely to affect fund performance directly, so it is clearly exogenous. A fund may be offered in several variable annuities from different insurance companies. We calculate *mean_relation_age* for a fund in a given month as the mean of the length of its family's relations with all such insurance companies.

Whether *mean_relation_age* is a good instrument depends on its correlation with power. We report the first stage regression in column (1) of Table 7. The coefficient of relation_age is positive and statistically significant. This suggests that *mean_relation_age* is a good instrument for bargaining *power*. The first stage regression corresponding to each performance variable is same, therefore we report it only once in column (1). We also perform weak identification test of the instrumental variable. The Cragg-Donald Wald F statistic is 63394.70 for the null hypothesis of weak identification. The critical values for Stock and Yogo (2005) weak instrument test (5 percent significance) are 16.38, 8.96, 6.66 and 5.53 for maximal IV size 10%,, 15%, 20% and 25% respectively. This means that the weak instrument hypothesis is rejected at 5% level of significance even with the most stringent criterion.

We report the second stage regressions in columns (2)-(9). The coefficient of power is negative and significant in all specifications. In case of gross returns, a two standard deviation increase in power reduces market-adjusted return by 1.96% per year, CAPM-alpha by 1.86% per year, three-factor alpha by 1.47% per year and four-factor alpha by 1.35% per year.

Our earlier results showed that the external funds in variable annuity plans provide a better performance on average. On the other hand, within the set of external funds, the relative bargaining power between the fund management company and the insurance company is a

significant factor for the fund performance. The results show that, within the set of external funds, the fund management companies that have relatively higher bargaining power vis-à-vis insurance companies can afford to offer inferior funds to the insurance companies whereas those with lower bargaining power must offer good performance.

VI. Conclusion

We study the role played by insurance companies as providers of intermediation between asset managers and investors. We focus on a typical insurance product - the variable annuity plans. We argue that advantageous fiscal treatments provide insurance companies that offer the variable annuity wrapper with a strong bargaining power vis-à-vis the management companies that manage the funds offered within the wrapper. The insurance company may have higher bargaining power also due to the fact that it is the owner of the variable annuity plan and has the final say in deciding which funds are included in the wrapper. We compare two alternative hypotheses. The first (the insurance company bargaining power hypothesis) posits that the insurance company has more bargaining power than the asset managers and this implies that the funds offered within the wrapper by unaffiliated management companies deliver better performance than the ones offered by the insurance company itself. The alternative hypothesis (fund management bargaining power hypothesis) posits that the fund management companies with higher bargaining power will offer inferior funds in variable annuity wrappers.

We first show that the external (or unaffiliated) funds outperform internal (or affiliated) funds on average. That is, insurance companies are able to extract good performance from the

management companies that want to include their funds in the variable annuity wrappers of insurance companies. This result supports the insurance company bargaining power hypothesis.

While focusing only on external funds, we find a significant negative relationship between the bargaining power of the management company vis-à-vis the insurance company and the performance of the fund. Overall, our results suggest that fund management companies with higher bargaining power are able to be part of wrappers even if they deliver worse performance but those with lower bargaining power must provide superior returns in order to be included in variable annuities.

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Appendix 1: Definitions of Variables

Variable	Definition
TNA	The total net assets under management
LOGTNA	Logarithm of TNA
LOGFAMSIZE	Logarithm of one plus the total assets under management of the other funds in the family that the fund belongs to excluding the asset of the fund itself.
TURNOVER	Minimum of aggregated sales or aggregated purchases of securities, divided by the average 12-month Total Net Assets of the fund in the previous year.
AGE	Number of years since the fund was first offered.
EXPRATIO	Ratio of total investment that shareholders paid for the fund's operating expenses in the previous year.
FLOW	The percentage net fund flow into the mutual fund over a period of time. It is defined as $Flow_{t-1,t} = (TNA_t / TNA_{t-1}) - (1+R_{t-1,t})$, where TNA_{t-1} and TNA_t are TNAs of the fund at the beginning and the end of the period respectively, and $R_{t-1,t}$ is the total return of the fund during the period.
LAGFLOW	Lagflow is the percentage fund flow into the mutual fund over the 12 months preceding the current month.
Net Return	Investor return per share net of fund expenses for a month.
Gross Return	Gross return of a fund for a month is its net return plus one-twelfth of its annual expense ratio.
Market Adjusted Return	Market-adjusted return of a fund for a month is its net return minus the return of the market for the month.
4-Factor Alpha	The 4-factor alpha for current month is calculated as the fund excess return minus the sum of the products of the factor loadings with the current month factor realizations, as in Carhart (1997). The factor loadings for the fund are calculated by running a time-series regression of fund excess return on the four factors (three Fama-French factors plus the momentum factor) using past 36 months data. 4-factor alpha is calculated using net returns as well as gross returns.
3-Factor Alpha	3-factor alpha is calculated using same method as for 4-factor alpha except that only three factors – MKTRF, SMB and HML – are used to calculate 3-factor alpha. 3-factor alpha is calculated using net returns as well as gross returns.
Beta-adjusted Return (CAPM Alpha)	CAPM alpha is calculated using same method as for 4-factor alpha except that only one factor – MKTRF – is used to calculate CAPM alpha. CAPM alpha is calculated using net returns as well as gross returns.

Pure Internal	Dummy variable for internal funds
Pure External	Dummy variable for dedicated funds
Hybrid Internal	Dummy variable for hybrid internal funds
Hybrid External	Dummy variable for hybrid external funds
Firm_insu_numfunds	Firm_insu_numfunds is the number of funds that the management company manages for the specific insurance company
Insu_numfunds	Insu_numfunds is the total number of funds in the variable annuities of this insurance company
Power	Firm_insu_numfunds / Insu_numfunds
Mean_power	Mean_power for a fund in a month is equal to the mean of the power of all fund-month observations in the subaccounts level disaggregated data
Relation_age	The number of months since the relation between fund management company and insurance company was first established, which is when the insurance company included a fund from the management company in its variable annuity for the first time
Mean_relation_age	Mean_ relation_age for a fund in a month is equal to the mean of the relation_age of all fund-month observations in the subaccounts level disaggregated data

Table 1: Frequency Distribution of Funds

We divide variable annuity funds in our sample into four groups: Pure Internal funds, Pure External funds, Hybrid Internal funds and Hybrid External funds. We report the number of funds and the number of share classes for each category of fund in the month of June of every year from 2001 to 2011.

	Pure Internal funds		Pure External funds		Hybrid Internal Funds		Hybrid External Funds	
Year	Number of Funds	Number of Share Classes	Number of Funds	Number of Share Classes	Number of Funds	Number of Share Classes	Number of Funds	Number of Share Classes
2001	74	83	825	1344	99	263	71	135
2002	35	46	767	1252	125	307	74	142
2003	28	41	787	1298	138	318	87	167
2004	136	150	1154	1853	270	583	137	302
2005	142	163	1243	1998	314	653	144	314
2006	187	246	1280	2059	319	652	154	332
2007	188	248	1267	2055	337	664	160	335
2008	203	266	1194	1942	392	746	156	314
2009	261	329	1469	2318	474	899	178	364
2010	274	338	1474	2321	477	892	186	372
2011	331	400	1542	2429	524	964	189	375

Table 2: Mutual Fund Summary Statistics

This table reports summary statistics for the sample of funds used in this paper. The sample covers monthly observations from January 2001 to December 2011. The number of distinct funds in the sample is 1,689 and the total number of fund-month observations is 157,630. We present the statistics separately for the four groups. Fund total net assets is the sum of the net assets of different classes of the same fund. Family size is the total assets under management of the other funds in the family that the fund belongs to excluding the asset of the fund itself. Log of Family Total Net Assets is logarithm of one plus family size. Turnover is the minimum of annual aggregated sales or aggregated purchases of securities, divided by the average 12-month total net assets of the fund. Age is the number of years since the fund was first offered. Expense ratio is the ratio of total investment that shareholders paid for the fund's operating expenses in the previous year. Net return is the monthly return received by the investors after fund expenses. Gross return is net return plus monthly expense ratio where monthly expense ratio is calculated as the annual expense ratio divided by twelve. Net (gross) market adjusted return is net (gross) return minus market return. CAPM alpha, 3-factor alpha and 4-factor alpha of a fund for a month are calculated by running a time-series regression of fund excess return on market excess return (MKTRF) for CAPM alpha, the three Fama-French factors (MKTRF, SMB and HML) for 3-factor alpha, and four factors (three Fama-French factors plus the momentum factor) for 4-factor alpha using past 36 months data. The fund alpha for current month is obtained as the fund excess return minus the sum of the products of the factor loadings with the current month factor realizations. Alpha is calculated using net returns as well as gross returns. Fund flow is the percentage fund flow into the mutual fund over the past 12 months.

	Pure Internal Funds		Pure External Funds		Hybrid Internal Funds		Hybrid External Funds	
Variable	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Fund Total Net Assets ($ million)	530.0	293.0	1756.1	468.4	3145.9	464.9	3996.5	609.7
Family Total Net Assets ($ million)	56505.5	30167.2	83457.4	47003.2	162434.8	76172.7	260590.1	58516.3
Log of Fund TNA ($ million)	5.6	5.6	6.0	6.1	6.1	6.1	6.5	6.4
Log of Family TNA ($ million)	10.2	10.3	10.3	10.7	11.1	11.2	11.3	10.9
Net Expense Ratio (% per year)	0.88	0.93	1.08	1.06	0.81	0.82	1.09	1.10
Gross Expense Ratio (% per year)	0.93	0.95	1.16	1.11	0.85	0.84	1.13	1.12
Turnover (% per year)	70.7	57.0	81.6	61.0	80.1	68.0	83.8	68.0
Age (years)	8.9	7.9	14.5	11.7	12.3	9.0	13.3	10.6
Market-Adj Ret (% per month) - Net	-0.003	-0.035	0.120	0.045	0.040	-0.001	0.090	0.020
CAPM Alpha (% per month) - Net	-0.026	-0.075	0.109	0.032	0.026	-0.028	0.074	-0.021
3-Factor Alpha (% per month) - Net	-0.123	-0.108	-0.049	-0.060	-0.079	-0.071	-0.050	-0.074
4-Factor Alpha (% per month) - Net	-0.127	-0.112	-0.072	-0.071	-0.089	-0.076	-0.065	-0.081
Market-Adj Ret (% per month) - Gross	0.072	0.037	0.212	0.130	0.113	0.065	0.184	0.105
CAPM Alpha (% per month) - Gross	0.050	-0.003	0.198	0.118	0.096	0.036	0.172	0.066
3-Factor Alpha (% per month) - Gross	-0.047	-0.038	0.040	0.026	-0.005	-0.004	0.043	0.008
4-Factor Alpha (% per month) - Gross	-0.052	-0.042	0.018	0.014	-0.015	-0.006	0.032	0.007
Fund Flow (% per year)	-13.5	-28.2	-15.3	-33.8	-12.3	-30.8	-15.3	-33.4

Table 3: Relation between Fund Affiliation and Performance

This table reports the results of regressions in which fund performance is the independent variable and dummy variables for the four categories of funds are the main explanatory variables. Pure Internal funds group is the control group and its dummy variable is not included the regressions. We utilize four different measures of fund performance – market-adjusted return, CAPM alpha, 3-factor alpha and 4-factor alpha. Each performance measure is calculated using net returns as well as gross returns of the funds. The sample is monthly observations from January 2001 to December 2011. Panel A reports Fama-Macbeth regressions in which the standard errors are adjusted for serial correlation using Newey-West lags of order three. Panel B reports pooled regressions in which time fixed effects are included and standard errors are clustered by fund. The t-statistics are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level of significance respectively.

Panel A: Fama-Macbeth Regressions

	Gross Fund Returns				Net Fund Returns			
	Market-Adj	Beta-Adj	3-Factor	4-Factor	Market-Adj	Beta-Adj	3-Factor	4-Factor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pure External	0.047	0.072*	0.054	0.069	0.044	0.068*	0.050	0.065
	(1.37)	(1.94)	(1.18)	(1.50)	(1.27)	(1.85)	(1.08)	(1.41)
Hybrid Internal	0.024	0.025	0.010	0.036	0.020	0.022	0.007	0.032
	(0.66)	(0.55)	(0.21)	(0.81)	(0.54)	(0.48)	(0.13)	(0.71)
Hybrid External	0.105**	0.098*	0.093	0.122**	0.100**	0.093*	0.086	0.115**
	(2.45)	(1.96)	(1.56)	(2.14)	(2.34)	(1.85)	(1.45)	(2.04)
LOGTNA	-0.026**	-0.019**	-0.019**	-0.019**	-0.027***	-0.019**	-0.019**	-0.020**
	(-2.60)	(-2.09)	(-2.24)	(-2.01)	(-2.68)	(-2.17)	(-2.32)	(-2.08)
LOGFAMSIZE	0.002	0.004	-0.001	-0.002	0.002	0.004	-0.001	-0.002
	(0.46)	(1.01)	(-0.26)	(-0.49)	(0.43)	(0.98)	(-0.29)	(-0.52)
TURNOVER	-0.075***	-0.064**	-0.054***	-0.060***	-0.076***	-0.065**	-0.055***	-0.061***
	(-2.90)	(-2.20)	(-2.72)	(-3.38)	(-2.92)	(-2.23)	(-2.75)	(-3.42)
AGE	-0.000	-0.000	0.001	0.001	-0.000	-0.000	0.001	0.001
	(-0.26)	(-0.19)	(0.59)	(0.73)	(-0.21)	(-0.16)	(0.62)	(0.76)
EXPRATIO	0.148**	0.134**	0.053	0.040	0.083	0.068	-0.012	-0.025
	(2.46)	(2.23)	(0.93)	(0.67)	(1.37)	(1.14)	(-0.21)	(-0.43)
LAGFLOW	0.000**	0.000	0.000	0.000	0.000**	0.000	0.000	0.000
	(2.00)	(0.75)	(1.46)	(0.99)	(2.05)	(0.82)	(1.53)	(1.08)
CONSTANT	0.475*	0.216	0.309	0.329	0.481*	0.220	0.313	0.332
	(1.68)	(0.91)	(1.62)	(1.40)	(1.70)	(0.93)	(1.64)	(1.42)
Style F.E.?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	133299	133299	133299	133299	133299	133299	133299	133299
R^2	0.27	0.27	0.15	0.14	0.27	0.27	0.15	0.14

Panel B: Pooled Regressions

	Gross Fund Returns				Net Fund Returns			
	Market-Adj	Beta-Adj	3-Factor	4-Factor	Market-Adj	Beta-Adj	3-Factor	4-Factor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pure External	0.065***	0.084***	0.050***	0.047**	0.051***	0.069***	0.036**	0.032*
	(3.49)	(4.39)	(2.79)	(2.50)	(2.82)	(3.74)	(2.00)	(1.74)
Hybrid Internal	0.044**	0.050**	0.037*	0.044**	0.042**	0.048**	0.035*	0.042**
	(2.13)	(2.29)	(1.86)	(2.08)	(2.05)	(2.21)	(1.76)	(1.97)
Hybrid External	0.099***	0.103***	0.078***	0.090***	0.080***	0.084***	0.059**	0.071**
	(3.27)	(3.18)	(2.80)	(3.12)	(2.69)	(2.63)	(2.12)	(2.47)
LOGTNA	-0.034***	-0.030***	-0.021***	-0.025***	-0.032***	-0.028***	-0.019***	-0.024***

	(-7.63)	(-6.49)	(-5.65)	(-6.50)	(-7.41)	(-6.18)	(-5.18)	(-6.02)
LOGFAMSIZE	0.003	0.004	0.001	0.001	0.003	0.004	0.002	0.002
	(0.98)	(1.35)	(0.67)	(0.56)	(1.16)	(1.50)	(0.89)	(0.75)
TURNOVER	-0.051***	-0.056***	-0.050***	-0.057***	-0.055***	-0.060***	-0.054***	-0.061***
	(-5.31)	(-5.22)	(-5.26)	(-5.88)	(-5.74)	(-5.58)	(-5.63)	(-6.26)
AGE	0.000	0.000	0.001**	0.001***	0.000	0.000	0.001**	0.001***
	(0.60)	(0.72)	(2.25)	(2.94)	(0.72)	(0.83)	(2.37)	(3.06)
EXPRATIO	0.023	0.014	0.006	0.003	0.011	0.002	-0.005	-0.009
	(1.05)	(0.77)	(0.87)	(0.50)	(0.87)	(0.22)	(-1.22)	(-1.53)
LAGFLOW	0.000***	0.000***	0.000***	0.000**	0.000***	0.000***	0.000***	0.000**
	(3.54)	(3.37)	(2.86)	(2.57)	(3.54)	(3.37)	(2.87)	(2.55)
CONSTANT	0.648***	0.510***	0.333***	0.413***	0.545***	0.406***	0.230***	0.310***
	(6.11)	(4.63)	(3.98)	(4.80)	(5.51)	(3.86)	(2.79)	(3.62)
Style F.E.?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	133299	133299	133299	133299	133299	133299	133299	133299
R^2	0.14	0.14	0.12	0.12	0.14	0.14	0.12	0.12

Table 4: Pure External Variable Annuity Funds versus Open End Funds of Same Families

This table compares the performances of Pure External funds with those of non-subaccount open end funds belonging to same fund families. Pure External is a dummy variable that takes value 1 for pure external funds and 0 for open end funds. We utilize four different measures of fund performance – market-adjusted return, CAPM alpha, 3-factor alpha and 4-factor alpha. Each performance measure is calculated using net returns as well as gross returns of the funds. The sample is monthly observations from January 2001 to December 2011. Panel A reports Fama-Macbeth regressions in which the standard errors are adjusted for serial correlation using Newey-West lags of order three. Panel B reports pooled regressions in which time fixed effects are included and standard errors are clustered by fund. The t-statistics are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level of significance respectively.

Panel A: Fama-Macbeth Regressions

	Gross Fund Returns				Net Fund Returns			
	Market-Adj	Beta-Adj	3-Factor	4-Factor	Market-Adj	Beta-Adj	3-Factor	4-Factor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pure External	0.137***	0.130***	0.080**	0.064*	0.136***	0.130***	0.080**	0.064*
	(3.46)	(3.25)	(2.33)	(1.96)	(3.45)	(3.24)	(2.33)	(1.96)
LOGTNA	-0.037***	-0.029***	-0.026***	-0.026***	-0.037***	-0.028***	-0.026***	-0.025***
	(-3.18)	(-3.47)	(-3.81)	(-3.26)	(-3.16)	(-3.41)	(-3.76)	(-3.20)
LOGFAMSIZE	0.004	0.006	0.003	0.004	0.004	0.006	0.003	0.003
	(0.97)	(1.52)	(0.99)	(1.07)	(0.93)	(1.47)	(0.91)	(0.99)
TURNOVER	-0.074**	-0.066**	-0.069***	-0.069***	-0.073**	-0.066**	-0.069***	-0.069***
	(-2.53)	(-2.31)	(-2.89)	(-4.49)	(-2.52)	(-2.33)	(-2.90)	(-4.48)
AGE	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001
	(0.53)	(0.49)	(0.79)	(0.85)	(0.54)	(0.49)	(0.79)	(0.85)
EXPRATIO	0.106**	0.110***	0.059	0.060	0.025	0.029	-0.021	-0.019
	(2.17)	(2.75)	(1.55)	(1.56)	(0.52)	(0.74)	(-0.55)	(-0.50)
LAGFLOW	0.001***	0.001***	0.001***	0.000***	0.001***	0.001***	0.001***	0.000***
	(4.20)	(3.12)	(3.85)	(3.67)	(4.22)	(3.10)	(3.84)	(3.65)
CONSTANT	0.623*	0.359	0.370**	0.347*	0.618*	0.352	0.364**	0.339*
	(1.82)	(1.47)	(2.21)	(1.71)	(1.80)	(1.43)	(2.18)	(1.68)
Observations	148791	148791	148791	148791	148791	148791	148791	148791
R^2	0.28	0.28	0.14	0.14	0.28	0.28	0.14	0.14

Panel B: Pooled Regressions

	Gross Fund Returns				Net Fund Returns			
	Market-Adj	Beta-Adj	3-Factor	4-Factor	Market-Adj	Beta-Adj	3-Factor	4-Factor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pure External	0.125***	0.116***	0.060***	0.049***	0.124***	0.115***	0.060***	0.049***
	(10.36)	(9.79)	(5.93)	(4.83)	(10.32)	(9.76)	(5.91)	(4.83)
LOGTNA	-0.041***	-0.034***	-0.026***	-0.025***	-0.040***	-0.033***	-0.025***	-0.025***
	(-8.54)	(-7.32)	(-6.50)	(-6.18)	(-8.51)	(-7.25)	(-6.43)	(-6.09)
LOGFAMSIZE	0.003	0.006**	0.004	0.004	0.003	0.006**	0.004	0.003
	(1.10)	(2.05)	(1.41)	(1.33)	(1.06)	(1.99)	(1.32)	(1.23)
TURNOVER	-0.037	-0.034	-0.038*	-0.039*	-0.036	-0.034	-0.038*	-0.039*
	(-1.48)	(-1.51)	(-1.85)	(-1.88)	(-1.48)	(-1.52)	(-1.85)	(-1.88)

AGE	0.001	0.001	0.001**	0.001**	0.001	0.001	0.001**	0.001**
	(1.31)	(1.18)	(2.02)	(2.39)	(1.33)	(1.18)	(2.03)	(2.41)
EXPRATIO	0.099***	0.082***	0.048***	0.050***	0.019	0.002	-0.032*	-0.030*
	(4.50)	(3.99)	(2.92)	(2.91)	(0.86)	(0.07)	(-1.95)	(-1.75)
LAGFLOW	0.001***	0.001***	0.000***	0.000***	0.001***	0.001***	0.000***	0.000***
	(7.56)	(7.09)	(5.70)	(6.12)	(7.59)	(7.10)	(5.71)	(6.11)
CONSTANT	0.654***	0.444***	0.344***	0.339***	0.649***	0.437***	0.339***	0.334***
	(5.83)	(4.11)	(3.76)	(3.61)	(5.80)	(4.06)	(3.71)	(3.56)
Observations	148791	148791	148791	148791	148791	148791	148791	148791
R^2	0.14	0.14	0.09	0.10	0.14	0.14	0.09	0.10

Table 5: Hybrid Internal and Hybrid External Variable Annuity Funds versus Open End Funds of Same Families

This table compares the performances of Hybrid Internal and Hybrid External funds with those of non-subaccount open end funds belonging to same fund families. Hybrid Internal and Hybrid External are dummy variables that take value 1 for funds in the respective categories and 0 otherwise. We utilize four different measures of fund performance – market-adjusted return, CAPM alpha, 3-factor alpha and 4-factor alpha. Each performance measure is calculated using net returns as well as gross returns of the funds. The sample is monthly observations from January 2001 to December 2011. Panel A reports Fama-Macbeth regressions in which the standard errors are adjusted for serial correlation using Newey-West lags of order three. Panel B reports pooled regressions in which time fixed effects are included and standard errors are clustered by fund. The t-statistics are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level of significance respectively.

Panel A: Fama-Macbeth Regressions

	Gross Fund Returns				Net Fund Returns			
	Market-Adj	Beta-Adj	3-Factor	4-Factor	Market-Adj	Beta-Adj	3-Factor	4-Factor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Hybrid Internal	0.067	0.048	0.018	0.010	0.063	0.046	0.016	0.006
	(1.30)	(0.82)	(0.37)	(0.19)	(1.24)	(0.79)	(0.32)	(0.13)
Hybrid External	0.134***	0.105**	0.073*	0.081**	0.132***	0.104**	0.072*	0.078**
	(3.28)	(2.06)	(1.93)	(2.18)	(3.22)	(2.05)	(1.88)	(2.10)
LOGTNA	-0.029**	-0.021*	-0.021*	-0.024**	-0.029**	-0.021*	-0.021*	-0.023**
	(-2.37)	(-1.93)	(-1.84)	(-2.11)	(-2.37)	(-1.93)	(-1.84)	(-2.06)
LOGFAMSIZE	0.017	0.010	0.001	-0.005	0.017	0.010	0.001	-0.005
	(1.29)	(0.99)	(0.09)	(-0.47)	(1.29)	(1.05)	(0.13)	(-0.45)
TURNOVER	-0.052	-0.044	-0.048*	-0.055**	-0.051	-0.043	-0.047*	-0.054**
	(-1.60)	(-1.58)	(-1.86)	(-2.48)	(-1.58)	(-1.53)	(-1.83)	(-2.47)
AGE	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.84)	(0.82)	(1.08)	(0.97)	(0.94)	(0.98)	(1.19)	(1.05)
EXPRATIO	0.111*	0.113*	0.027	-0.007	0.031	0.034	-0.052	-0.083
	(1.92)	(1.82)	(0.48)	(-0.14)	(0.53)	(0.56)	(-0.95)	(-1.56)
LAGFLOW	0.000*	0.000	0.000	0.000	0.000*	0.000	0.000	0.000
	(1.71)	(1.22)	(1.22)	(1.01)	(1.71)	(1.19)	(1.18)	(0.95)
CONSTANT	0.154	0.134	0.373	0.603*	0.148	0.109	0.354	0.573
	(0.47)	(0.44)	(1.15)	(1.68)	(0.45)	(0.35)	(1.09)	(1.62)
Observations	45346	45346	45346	45346	45346	45346	45346	45346
R^2	0.32	0.32	0.20	0.20	0.32	0.32	0.20	0.20

Panel B: Pooled Regressions

	Gross Fund Returns				Net Fund Returns			
	Market-Adj	Beta-Adj	3-Factor	4-Factor	Market-Adj	Beta-Adj	3-Factor	4-Factor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Hybrid Internal	0.070***	0.037	0.006	0.004	0.066**	0.033	0.003	-0.000
	(2.70)	(1.40)	(0.32)	(0.18)	(2.54)	(1.27)	(0.16)	(-0.01)
Hybrid External	0.119***	0.088***	0.049*	0.055**	0.116***	0.087***	0.047*	0.053**
	(3.89)	(2.81)	(1.94)	(2.11)	(3.81)	(2.75)	(1.87)	(2.02)
LOGTNA	-0.036***	-0.029***	-0.027***	-0.029***	-0.036***	-0.029***	-0.027***	-0.029***

	(-4.48)	(-3.63)	(-4.20)	(-4.28)	(-4.47)	(-3.61)	(-4.18)	(-4.24)
LOGFAMSIZE	0.018*	0.010	0.006	0.002	0.018**	0.010	0.006	0.002
	(1.95)	(1.04)	(0.77)	(0.26)	(1.97)	(1.08)	(0.82)	(0.27)
TURNOVER	-0.054***	-0.046***	-0.061***	-0.056***	-0.053***	-0.046***	-0.060***	-0.055***
	(-3.46)	(-2.93)	(-4.29)	(-3.78)	(-3.43)	(-2.89)	(-4.26)	(-3.79)
AGE	0.002**	0.002*	0.002***	0.002***	0.002**	0.002**	0.002***	0.002***
	(2.13)	(1.94)	(2.79)	(3.10)	(2.24)	(2.04)	(2.92)	(3.20)
EXPRATIO	0.103***	0.088***	0.009	-0.013	0.022	0.008	-0.071***	-0.092***
	(3.32)	(2.82)	(0.35)	(-0.50)	(0.72)	(0.26)	(-2.87)	(-3.42)
LAGFLOW	0.000**	0.000*	0.000	0.000	0.000**	0.000*	0.000	0.000
	(2.01)	(1.96)	(0.56)	(0.90)	(2.02)	(1.94)	(0.54)	(0.85)
CONSTANT	0.191	0.298	0.377**	0.504***	0.182	0.278	0.355*	0.489**
	(0.89)	(1.34)	(2.07)	(2.61)	(0.85)	(1.25)	(1.96)	(2.53)
Observations	45346	45346	45346	45346	45346	45346	45346	45346
R^2	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.15

Table 6: Bargaining Power of Management Company and Fund Performance - Fund Level Data

We regress fund performance measures on measure of firm bargaining power vis-à-vis insurance companies. For a given pair of fund management company and insurance company, the relative bargaining power of fund management company is defined as follows:

$$power = \frac{firm\_insu\_numfunds}{insu\_numfunds}$$

where firm_insu_numfunds is the number of funds that the management company manages for the specific insurance company and insu_numfunds is the total number of funds in the variable annuities of this insurance company. We utilize four different measures of fund performance – market-adjusted return, CAPM alpha, 3-factor alpha and 4-factor alpha. Each performance measure is calculated using net returns as well as gross returns of the funds. The sample is monthly observations from January 2001 to December 2011. Panel A reports Fama-Macbeth regressions in which the standard errors are adjusted for serial correlation using Newey-West lags of order three. Panel B reports pooled regressions in which time fixed effects are included and standard errors are clustered by fund. The t-statistics are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level of significance respectively.

Panel A: Fama-Macbeth Regressions, at fundid level

	Gross Fund Returns				Net Fund Returns			
	Market-Adj	Beta-Adj	3-Factor	4-Factor	Market-Adj	Beta-Adj	3-Factor	4-Factor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MEAN_POWER	-0.564***	-0.528***	-0.362***	-0.353***	-0.555***	-0.517***	-0.351***	-0.343***
	(-3.89)	(-3.59)	(-4.37)	(-5.41)	(-3.84)	(-3.53)	(-4.25)	(-5.31)
LOGTNA	-0.035***	-0.030***	-0.024***	-0.023**	-0.035***	-0.030***	-0.024***	-0.023**
	(-3.42)	(-2.93)	(-2.90)	(-2.47)	(-3.47)	(-2.95)	(-2.93)	(-2.50)
LOGFAMSIZE	0.009	0.010	0.003	0.003	0.009	0.009	0.002	0.002
	(1.53)	(1.65)	(0.47)	(0.44)	(1.44)	(1.56)	(0.39)	(0.36)
TURNOVER	-0.080***	-0.064**	-0.057***	-0.059***	-0.081***	-0.066**	-0.058***	-0.061***
	(-3.14)	(-2.13)	(-2.64)	(-2.93)	(-3.19)	(-2.19)	(-2.71)	(-3.02)
AGE	-0.000	-0.000	0.000	0.001	-0.000	-0.000	0.001	0.001
	(-0.21)	(-0.10)	(0.44)	(0.65)	(-0.17)	(-0.07)	(0.47)	(0.68)
EXPRATIO	0.132**	0.111*	0.031	0.022	0.068	0.046	-0.032	-0.041
	(2.22)	(1.92)	(0.55)	(0.37)	(1.15)	(0.81)	(-0.58)	(-0.70)
LAGFLOW	0.000*	-0.000	0.000	0.000	0.000**	-0.000	0.000	0.000
	(1.94)	(-0.09)	(1.27)	(0.88)	(2.01)	(-0.01)	(1.37)	(0.99)
CONSTANT	0.552**	0.411	0.417*	0.396*	0.552**	0.409	0.412*	0.394*
	(2.01)	(1.61)	(1.97)	(1.66)	(2.02)	(1.61)	(1.96)	(1.66)
Observations	90714	90714	90714	90714	90714	90714	90714	90714
R^2	0.26	0.27	0.15	0.14	0.26	0.27	0.15	0.14

Panel B: Pooled Regressions, at fundid level

	Gross Fund Returns				Net Fund Returns			
	Market-Adj	Beta-Adj	3-Factor	4-Factor	Market-Adj	Beta-Adj	3-Factor	4-Factor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MEAN_POWER	-0.337***	-0.358***	-0.223***	-0.242***	-0.328***	-0.348***	-0.213***	-0.233***
	(-4.31)	(-4.39)	(-3.36)	(-3.45)	(-4.21)	(-4.28)	(-3.22)	(-3.34)
LOGTNA	-0.032***	-0.032***	-0.020***	-0.025***	-0.032***	-0.032***	-0.021***	-0.025***
	(-6.09)	(-5.85)	(-4.39)	(-5.23)	(-6.21)	(-5.95)	(-4.48)	(-5.34)

LOGFAMSIZE	0.006*	0.008**	0.004	0.005	0.006	0.008**	0.003	0.004
	(1.66)	(2.35)	(1.04)	(1.38)	(1.57)	(2.24)	(0.92)	(1.24)
TURNOVER	-0.052***	-0.055***	-0.051***	-0.054***	-0.054***	-0.057***	-0.052***	-0.055***
	(-4.62)	(-4.47)	(-4.48)	(-4.61)	(-4.76)	(-4.62)	(-4.65)	(-4.77)
AGE	0.000	0.000	0.001	0.001**	0.000	0.000	0.001	0.001**
	(0.45)	(0.65)	(1.34)	(2.08)	(0.51)	(0.70)	(1.41)	(2.16)
EXPRATIO	0.143***	0.103***	0.041*	0.028	0.079***	0.039	-0.021	-0.035
	(5.13)	(3.69)	(1.90)	(1.24)	(2.89)	(1.44)	(-1.00)	(-1.55)
LAGFLOW	0.000**	0.000**	0.000**	0.000**	0.000***	0.000**	0.000**	0.000**
	(2.49)	(2.33)	(2.46)	(2.21)	(2.59)	(2.43)	(2.58)	(2.34)
CONSTANT	0.475***	0.456***	0.294**	0.359***	0.476***	0.454***	0.290**	0.358***
	(3.56)	(3.40)	(2.54)	(2.99)	(3.60)	(3.41)	(2.52)	(2.99)
Observations	90714	90714	90714	90714	90714	90714	90714	90714
R^2	0.14	0.14	0.11	0.11	0.14	0.14	0.11	0.11

Table 7: Instrumental Variable Regressions for Bargaining Power of Management Company and Fund Performance - Fund Level Data

We run instrumental variables regressions to estimate the relation between bargaining power and fund performance. We utilize four different measures of fund performance – market-adjusted return, CAPM alpha, 3-factor alpha and 4-factor alpha. Each performance measure is calculated using net returns as well as gross returns of the funds. *Mean_power* for a fund in a month is equal to the mean of the power of all fund-month observations in the subaccounts level disaggregated data. The instrumental variable for *mean_power* is *mean_relation_age*. *Mean_relation_age* for a fund in a month is equal to the mean of the *relation_age* of all fund-month observations in the subaccounts level disaggregated data Since first-stage regression for each regression specification is same, we report it only once in column (1). Columns (2)-(9) represent second-stage regressions. The sample is monthly observations from January 2001 to December 2011. The t-statistics are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level of significance respectively.

	First Stage Regression	Second Stage Regressions							
		Gross Fund Returns				Net Fund Returns			
	MEAN_ POWER	Market-Adj	Beta-Adj	3-Factor	4-Factor	Market-Adj	Beta-Adj	3-Factor	4-Factor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MEAN_RELATION_AGE	0.007***								
	(27.50)								
MEAN_POWER		-1.034***	-1.028***	-0.698***	-0.593***	-1.027***	-1.020***	-0.689***	-0.582***
		(-3.25)	(-3.44)	(-3.08)	(-2.63)	(-3.23)	(-3.41)	(-3.04)	(-2.58)
LOGTNA	-0.008***	-0.032***	-0.029***	-0.017*	-0.029***	-0.033***	-0.029***	-0.017**	-0.030***
	(-6.47)	(-3.50)	(-3.07)	(-1.92)	(-3.50)	(-3.56)	(-3.12)	(-1.97)	(-3.55)
LOGFAMSIZE	-0.003*	0.000	0.002	0.001	-0.000	-0.000	0.002	0.001	-0.001
	(-1.95)	(0.07)	(0.44)	(0.20)	(-0.08)	(-0.01)	(0.36)	(0.11)	(-0.18)
TURNOVER	0.010***	-0.026	-0.028	-0.031	-0.038*	-0.028	-0.030	-0.033	-0.039*
	(4.56)	(-0.93)	(-1.03)	(-1.33)	(-1.79)	(-0.98)	(-1.08)	(-1.40)	(-1.88)
AGE	-0.001***	-0.001	-0.002	-0.001	-0.000	-0.001	-0.002	-0.001	-0.000
	(-3.31)	(-0.96)	(-1.18)	(-1.38)	(-0.38)	(-0.94)	(-1.16)	(-1.34)	(-0.34)
EXPRATIO	-0.037***	0.146***	0.103*	0.007	-0.000	0.082	0.040	-0.056	-0.063
	(-6.59)	(2.68)	(1.85)	(0.14)	(-0.01)	(1.51)	(0.71)	(-1.15)	(-1.27)
LAGFLOW	-0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(-0.09)	(1.26)	(0.86)	(1.40)	(0.66)	(1.30)	(0.89)	(1.44)	(0.70)
CONSTANT	0.276***	0.691***	0.611**	0.393*	0.647***	0.692***	0.611**	0.391*	0.647***
	(7.27)	(2.85)	(2.55)	(1.78)	(3.04)	(2.88)	(2.57)	(1.78)	(3.06)
Observations	90714	90714	90714	90714	90714	90714	90714	90714	90714
R^2	0.48	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00