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CONFLICTING INTERESTS AND THE EFFECT OF FIDUCIARY DUTY — EVIDENCE  
FROM VARIABLE ANNUITIES

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Conflicting Interests and the Effect of Fiduciary Duty — Evidence from Variable Annuities  
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**ABSTRACT**

We examine the drivers of variable annuity sales and the impact of a proposed regulatory change. Variable annuities are popular retirement products with over \$2 trillion in assets in the United States. Insurers typically pay brokers a commission for selling variable annuities that ranges from 0% to over 10% of investors' premium payments. Brokers earn higher commissions for selling inferior annuities, in terms of higher expenses and more ex-post complaints. Our results indicate that variable annuity sales are roughly six times more sensitive to brokers' financial interests than investors'. To help limit conflicts of interest, the Department of Labor proposed a rule in 2016 that would hold brokers to a fiduciary standard when dealing with retirement accounts. We find that after the proposed fiduciary rule, the sales of high-expense variable annuities fell by 52% as sales became more sensitive to expenses and insurers increased the relative availability of low-expense products. Based on our structural model estimates, investor welfare improved as a result of the fiduciary rule under conservative assumptions.

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# 1 Introduction

Variable annuities are one of the most popular retirement products in the United States. As of 2018, American households held \$2.2 trillion of assets in variable annuity accounts. Despite their prevalence, variable annuities have been criticized for having high expenses and are the most commonly cited financial product in brokerage customer complaints (Egan et al. (2019)).<sup>1</sup> Part of the criticism pertains to the distribution of variable annuities.<sup>2</sup> Variable annuities are sold through brokers who are typically paid a commission by the insurance company for selling its products. There is substantial heterogeneity in commissions, ranging from 0 to over 10% of the investment, which provides strong incentives for brokers to sell certain variable annuities over others and potentially creates conflicts of interest between brokers and their clients. Concerns over conflicts of interest in these types of retirement products prompted the United States Department of Labor (DOL) to propose a rule imposing fiduciary duty on brokers. The rule would obligate brokers to act in their clients' best interests when selling retirement products such as variable annuities. Although the rule was ultimately vacated in 2018, the annuity industry underwent many changes to comply with the rule starting in 2016.

This paper has two goals. First, we study the drivers of variable annuity sales and examine how sales respond to broker and investor incentives. We find that while investor incentives matter, broker incentives play a more important role in determining sales. Moreover, brokers' incentives conflict with their clients': brokers earn higher commissions for selling inferior annuities that have higher expenses, as well as fewer and worse-performing investment options. Second, we examine how the proposed fiduciary rule, which was intended to limit conflicts of interest, impacted the variable annuity market in the United States. We examine how the composition of variable annuities both offered by insurers and sold by brokers changed in response to the DOL rule. We find that the rule helped reduce conflicts of interest. In response to the rule, annuity sales flows became twice as sensitive to expenses and the sale of high-expense annuities fell by 52%. Moreover, the relative availability of high-expense products declined following the rule. To assess the overall implications of the proposed rule change, we build and estimate a structural model of variable annuity demand that allows us to quantify how the DOL fiduciary rule impacted investor surplus. On one hand, investors should benefit from the rule change, as it reduces conflicts of interest. However, on the other hand, investors may be hurt by the rule change if it reduces the supply of financial advice.

We construct a panel data set on variable annuity distribution using data on sales and product characteristics from Morningstar and regulatory filings. A key novel feature of our data set is that we observe the commission rate that insurers pay to brokers for selling variable annuities. This variable allows us to separate the effect of brokers' preferences from those of investors. Conditional on the risks and return characteristics of a variable annuity, investors should be indifferent towards

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<sup>1</sup>Examples: <https://www.investopedia.com/articles/financial-advisors/101915/variable-annuities-pros-and-cons.asp>;  
<https://www.wsj.com/articles/how-to-avoid-paying-high-fees-for-variable-annuities-1457001002>;  
<https://www.nytimes.com/2011/09/16/business/retirementspecial/variable-annuities-offer-higher-income-at-a-cost.html>

<sup>2</sup>See e.g. FINRA(<https://www.finra.org/sites/default/files/InvestorDocument/p125846.pdf>)

the associated brokerage commission. In addition to commissions, we also observe detailed characteristics of the variable annuity products (i.e. expense ratios, investment options, benefits/riders, etc.). We match commission rates and product characteristics with quarterly product sales data.

Our analysis consists of four parts. First, we study what factors drive the sales of variable annuities by analyzing how sales are related to product expense ratios, brokerage commissions, and other characteristics of the products. We find a strong negative relationship between expense ratios and sales, consistent with the notion that investors dislike high-expense products. We also find that brokerage commissions play a critical role in driving investment flows. Our estimates suggest that a one standard deviation increase in brokerage commissions is associated with a 17% increase in variable annuity sales. Our baseline estimates suggest that variable annuity sales are six times more sensitive to broker incentives than to investor incentives. These results are robust to accounting for a wide range of product characteristics including investment options and returns, availability of benefits and riders, and the insurance companies underwriting the products. We also exploit variation within the same product across share classes, where an insurer offers the same variable annuity with different expense ratios and commission rates, which helps mitigate concerns about omitted variables. We find similar patterns across share classes of the same variable annuity.

Second, we present evidence of conflicts of interest in the variable annuity market. We start by examining the types of variable annuities that brokers are incentivized to sell. We document that there is substantial heterogeneity in brokerage commissions. Commissions range from 0% to over 10% of the principal invested and the standard deviation is 2.32%. The level and heterogeneity in commissions could create conflicts of interest if they incentivize brokers to sell products that are not desirable for investors. Indeed, consistent with commissions creating conflicts of interest, we find that, on average, brokers are incentivized to sell higher-expense products and products with worse investment options, as measured by the variety and performance of the investment options. A one percentage point increase in expense ratios is associated with a 1.61 percentage point increase in brokerage commissions. Collectively, our results suggest that these high-powered broker incentives distort investment decisions for investors.

Furthermore, consistent with the idea that brokers are incentivized to sell inferior products, we find that products with high expenses—which tend to have high commissions—are associated with a greater number of investor complaints and higher rates of broker misconduct. To measure investor complaints, we utilize data from the Financial Industry Authority’s (FINRA) BrokerCheck website (see Egan et al. (2019) for a further description of the data). We observe the universe of investor complaints, including those pertaining to variable annuities.<sup>3</sup> Our findings suggest that ex-post, higher-expense variable annuities are worse for investors as indicated by more frequent investor complaints against brokerage firms that sell these products. This finding also helps rule out alternative explanations that higher-expense variable annuities have unobservable (to the econometrician) characteristics that make them more desirable for investors, which would potentially

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<sup>3</sup>By rule (FINRA 4530) brokerage firms are required to report all written investor complaints which includes letters, email, text messages, tweets, etc. within 30 days.

explain why insurers pay higher commission rates on these products. We also find that brokerage firms that sell higher-expense products have higher rates of customer complaints and regulatory offenses as measured as per Egan et al. (2019). These results on complaints and misconduct, together with the positive relationship between broker commissions and expense ratios, suggest that brokers are incentivized to sell products that are less desirable for investors, consistent with conflicts of interest in the market.

In the third part of our analysis, we study the effect of the proposed DOL fiduciary rule. The proposed fiduciary rule was intended to reduce conflicts of interest in retirement-related investment products such as variable annuities. In 2015, then-President Obama announced the fiduciary rule, which was issued by the DOL in 2016 and set to be enforced starting in early 2017. While enforcement of the rule was delayed in 2017 and the rule was ultimately vacated in 2018, survey evidence indicates that brokers and insurers started complying with the fiduciary rule during this proposal and implementation period. Our results suggest that the total variable annuity sales fell by roughly 19% year-over-year after the regulation was issued by the DOL in 2016. The drop in variable annuity sales was primarily driven by a decline in high-expense variable annuity sales; sales of low-expense variable annuities remained constant over this period. The results suggest that, in response to the proposal of the rule, brokers began complying with the rule by placing greater weight on investor interests. We also find that insurers responded to the rule by increasing the relative availability of low-expense products available for sale. Our findings are consistent with anecdotal evidence from annual reports of brokerage firms and insurers, where they reported changing their business practices in anticipation of the rule. These results imply that the regulatory change improved the distribution of products available to investors along the extensive margin, in terms of the annuities available for sale, as well as the intensive margin, in terms of the actual annuities sold by brokers. While the sales of variable annuities fell following the proposed rule change, we do not find any evidence that investors with less wealth were disproportionately served less by brokers following the DOL rule, as argued by the brokerage industry against the fiduciary rule.<sup>4</sup>

Lastly, we develop and estimate a structural model of variable annuity distribution to evaluate the normative implications of the proposed DOL fiduciary rule. An advantage in our setting is that we directly observe the alternative equilibrium we are interested in from the data. Thus, the objective of the model is to help quantify the observed effects of the rule change rather than to solve for a new equilibrium. In the model, investors access the annuity market through brokers such that demand for variable annuities is jointly determined by the preferences of investors and brokers similar to the framework in Robles-Garcia (2019). We use the model to recover the preferences of investors and evaluate how the proposed rule impacted investor returns. On one hand, investors should benefit from the fiduciary rule because it reduces conflicts of interest. On the other hand, some investors may be hurt by the rule if it raises the cost of providing financial advice, such

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<sup>4</sup><https://www.sifma.org/resources/news/state-fiduciary-rules-will-raise-costs-limit-access/>, <https://www.sifma.org/wp-content/uploads/2017/08/Deloitte-White-Paper-on-the-DOL-Fiduciary-Rule-August-2017.pdf>

that some investors are no longer serviced by brokers. We find that the proposed rule change increased the risk-adjusted returns of investors by up to 86 basis points (bps) per annum. Even after accounting for the fact that some investors may have been forced to leave the annuity market as a result of the rule, under conservative assumptions investor welfare still improved on net. While some investors were forced out of the market as a result of the proposed rule, our estimates suggest that the DOL rule increased investor surplus, on average, as long as the risk-adjusted returns of those investors who were forced out of the market did not fall by more than 16 percentage points per annum.

Our paper contributes to the literature on the role of brokers and intermediaries in household investment decisions. Consistent with this prior literature (e.g. Bergstresser et al. (2008); Chalmers and Reuter (2012); Christoffersen et al. (2013); Anagol et al. (2017); Guiso et al. (2018); Egan (2019); Robles-Garcia (2019)), we find evidence suggesting that brokers are incentivized to sell high-expense products as high-expense products carry higher commissions on average. We contribute to this literature by providing new evidence of similar conflicts of interest in a large (\$2 trillion) and important market, where information asymmetries between market participants, brokers and investors, loom large. The conflicts of interest in terms of the mean and standard deviation of brokerage commissions in the variable annuity market are substantially larger than those that have been studied in other settings. For example, whereas the median brokerage commission associated with mutual funds and retail bonds is roughly 2% (Christoffersen et al. (2013); Egan (2019)), the median commission in the variable annuities market is almost 7%.<sup>5</sup> One concern is that these conflicts of interest not only decrease investor returns, but that, perhaps more importantly, they also undermine trust in financial markets, which is critical to a well-functioning financial system (Guiso et al. (2008); Gennaioli et al. (2015)).

Our paper also contributes more generally to the literature on household investments. We find that there is substantial heterogeneity in annuity expenses, ranging from 0.38% to 4.33% per annum. Such price dispersion has been documented in other financial products, such as mutual funds (Christoffersen and Musto (2002); Hortaçsu and Syverson (2004); Choi et al. (2010)), mortgages (Woodward and Hall (2012); Agarwal et al. (2017); Bhutta et al. (2020)), life insurance (Brown and Goolsbee (2002)), and other retirement savings products (Duarte and Hastings (2012)). Price dispersion highlights the role of household sophistication in financial markets which provides insight into why brokers play a critical role in household investment decisions (Gennaioli et al. (2015); Foerster et al. (2017)) and why financial service providers often compete on dimensions other than price such as advertising and brokerage commissions (Gurun et al. (2016); Hastings et al. (2017); Roussanov et al. (2018)).<sup>6</sup>

Our paper also contributes to the literature on regulating consumer financial products (Camp-

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<sup>5</sup>Our work also relates to the growing literature on financial misconduct in the financial advice industry including: Qureshi and Sokobin (2015); Egan et al. (2017); Dimmock et al. (2018); Charoenwong et al. (2019); Egan et al. (2019); Gurun et al. (2019)

<sup>6</sup>A growing literature documents that financial services providers use strategic obfuscation, which may contribute to household's lack of financial sophistication (Carlin (2009); Carlin and Manso (2011); C el erier and Vall e (2017))

bell (2006); Agarwal et al. (2009); Campbell et al. (2010, 2011); Inderst and Ottaviani (2012a,b)). Specifically, we contribute new insight to this literature by evaluating the effects of an important regulatory tool, i.e. imposing a fiduciary duty on brokers. The DOL proposal provides a unique opportunity to study the effect of such a policy attempt, which can shed light on the effectiveness of subsequent and future policy efforts such as fiduciary standards that have been proposed since 2018 by various states including New Jersey, Nevada, and Maryland, and on Regulation Best Interest, which was adopted by the Securities and Exchange Commission in September of 2019. Our empirical analyses document that the fiduciary rule was effective in steering investment into lower-expense products, and the results from our structural model indicate that investors benefited on average from the proposed rule. These findings relate to other work on fiduciary duty. Egan (2019) develops a broker-intermediated search model and finds that holding brokers to a fiduciary standard could increase investor risk-adjusted returns by up to 95-120 basis points (bps). Our paper also builds on the work by Bhattacharya et al. (2020) which studies how cross-state variation in common law fiduciary duty impacts sales of variable and indexed annuities. The authors find that fiduciary duty increases risk-adjusted returns of annuity investors without decreasing sales. In contrast to Bhattacharya et al. (2020), we find that following the DOL's highly publicized fiduciary rule that applied to all states, sales of variable annuity products declined sharply, with the decline concentrated in products with high expense ratios. Bhattacharya et al. (2020) highlight how holding a broker to a fiduciary standard could increase the fixed costs of providing advice, which will reduce the supply of financial advice; however, they do not find strong evidence of the fixed cost channel in their state difference-in-differences setting. Also distinct from Bhattacharya et al. (2020), we document how brokerage commissions drive annuity sales and distort the investment decisions of households due to conflicts of interest.

Our paper also contributes to the literature on annuities. One strand of the literature tries to understand forces that affect annuity demand. For example, Finkelstein and Poterba (2004) find evidence of adverse selection in the UK market. Brown and Poterba (2006) find that high-income and high-net-worth households are more likely to own variable annuities using survey data. Koijen and Yogo (2018) develop and estimate an equilibrium model of the variable annuity market to quantify the underlying frictions in the market. The authors estimate a Berry et al. (1995)-type model to estimate investor demand for variable annuities and find that sales are sensitive to products' minimum return guarantee options and associated fees. Building on their framework, we provide new insights by highlighting that broker commission rates are a first-order factor in determining variable annuity sales. Our paper also relates to the growing literature on the regulatory implications surrounding insurers and their liabilities in the US (Koijen and Yogo (2016); Foley-Fisher et al. (2018); Sen (2019)).

The paper proceeds as follows. Section 2 offers the institutional background of variable annuity products and the marketplace, as well as the DOL fiduciary rule. Section 3 describes the data. Section 4 analyzes what factors drive variable annuity sales, with our focus on product expense ratios and commission rates. Section 5 documents evidence of conflicts of interest in the variable

annuity market. Section 6 studies the effects of the DOL fiduciary rule. Section 7 develops and estimates a structural model of variable annuity distribution. Section 8 concludes.

## 2 Institutional Details: Variable Annuities

In this section, we describe the institutional setting of the variable annuity market in the US. Section 2.1 provides an overview of what a variable annuity is, as well as the marketplace and distribution channels of variable annuity products in the US. Section 2.2 describes the context and details surrounding the proposal of the DOL fiduciary rule.

### 2.1 What are Variable Annuities?

Variable annuities are a common type of retirement savings products offered by life insurance companies and purchased by individual retail investors. Variable annuity products, like other types of annuities, consist of two phases. First, in the accumulation phase, the investor makes premium payments to the insurance company into her variable annuity account after expenses are deducted. Later, in the distribution phase, the investor receives payments from the insurance company at fixed intervals until her death or for a specified period or a lump-sum payout.<sup>7</sup>

**Product Structure** Variable annuities offer features similar to mutual funds and traditional fixed annuities. In the accumulation phase, variable annuity investors allocate the assets in their accounts among a set of investment options known as subaccounts. Each subaccount usually holds shares in a mutual fund or a fund of funds. Variable annuity products often offer multiple subaccounts for the investor to choose from, including a combination of government/corporate bond and equity funds spanning different industries with different investment objectives. Income and investment gains within the annuity account are tax-deferred.

In the distribution phase, variable annuities provide investors with menus of different payout plans. These options include life annuities with or without a refund at the annuitant's death, and with or without a guaranteed payout period. Instead of life annuities, the investor can also choose payouts for a specified period or a lump-sum payout. The payout can be a fixed periodic amount or a varying amount based on the performance of the subaccounts the investor selects.

Variable annuities can also offer different benefit options or riders for additional fees. These options include those that guarantee a minimum return on the assets (often referred to as a roll-up or step-up rate), while preserving the upside of the returns generated by the subaccounts selected

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<sup>7</sup>There are primarily two other types of annuity products: fixed annuities and indexed annuities. Fixed annuities grow at a predetermined fixed rate in the accumulation period and pay a pre-determined fixed rate in the distribution phase. Index annuities grow based on the performance of one or more benchmark indices, such as the S&P 500 and some pre-determined minimum rate. The payout in the distribution phase is determined by a combination of the performance of the index and the minimum rate.



by the investor.<sup>8</sup> These options all offer minimum returns on the assets but differ in their structures during the distribution period.

**Expenses** Variable annuity investors pay certain product- and subaccount-level expenses, which are assessed as percentages of the investors' account value. For brevity, we often refer to these expense ratios as expenses. There are two main types of product-level expenses. First, there is the mortality expense (M&E), associated with the death benefit in variable annuities, as well as various administrative charges. The second type of product-level expense is a surrender charge, which is assessed in the event of an early withdrawal of account assets during a pre-specified "lock-up" period. The surrender charge is usually a percentage of the amount withdrawn and can be up to 12% in the first year of the contract and declines yearly for a period of up to 10 years, after which there is no longer a surrender charge for withdrawals. For example, the surrender charge could be 12% in the first year, 10% in the second year, 8% in the third year, and so on until 0% in the seventh year and onwards. Investors also pay additional fees for the additional riders/benefit options mentioned above (e.g., GLWB). Subaccount-level charges are expenses assessed by mutual funds (i.e. subaccounts), which include distribution, administrative and other expenses. In our regressions, we consider the total expense ratio as the sum of the product expenses and subaccount expenses for each variable annuity product as all investors incur these expenses (unlike optional charges/fees, such as surrender charges and rider fees).

**Variable Annuity Investors and Market Size** Based on the Survey of Consumer Finances, variable annuity investors tend to be wealthy, older, and more educated (see Table A3 in the Appendix).<sup>9</sup> Annuities are common retirement products held by households in the US, accounting for roughly 10% (\$3.06 trillion) of retirement assets and 18% of mutual fund assets as of 2018.<sup>10</sup> Variable annuities make up the bulk of annuity assets, with roughly \$2.2 trillion held in variable annuities, and the market has grown steadily over the past fifteen years. Figures 1b and 1c display the variable annuity market growth in terms of both assets and sales over the period 1999-2019. Over the past fifteen years, variable annuity sales have averaged over \$138 billion per year. The sheer size of the variable annuities market makes it of first-order importance for both household finances and the financial health of large insurance companies and other financial institutions in the US.

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<sup>8</sup>Such options include Guaranteed Lifetime Withdrawal Benefits (GLWB), Guaranteed Minimum Income Benefits (GMIB), Guaranteed Minimum Accumulation Benefits (GMAB), and Guaranteed Minimum Withdrawal Benefits (GMWB). Among these benefit options, GLWBs are the most commonly offered. According to computations by Sen (2019), these guarantees have similar sensitivities to interest rate and equity risk exposure. For more detailed information on these guarantees, see Kojen and Yogo (2018) and Sen (2019) .

<sup>9</sup>In the Appendix we use data from the Consumer of Finances to explore the types of individuals that hold variable annuities following Brown and Poterba (2006).

<sup>10</sup>Investment Company Institute Factbook 2019: <https://www.icifactbook.org/> [accessed 3/17/2020].

**Distribution** Variable annuities are SEC-registered securities that are sold to households through registered brokers. The broker may be a direct employee of the insurer issuing the variable annuity (or its affiliates), or work for an unaffiliated broker-dealer.

Insurance companies typically compensate brokers for selling variable annuities with commissions. These commissions are paid directly by the variable annuity issuer (insurance company) to the broker, rather than being paid by the end investor to the brokerage company. This key feature of the data aids in identifying the effect of brokers' incentives on sales because, conditional on the characteristics of the variable annuities, investors are indifferent towards the commission the insurance company pays to the broker. The commission represents the profit split between the broker and the insurer.

The commissions insurers pay to brokers consist of two parts. The first part is a one-time commission, often referred to as an "upfront", that is usually a percentage of the initial premium payments paid in by the investor. The second part is a recurring commission paid quarterly or annually, which is referred to as a "trail." The trail is usually paid either as a percentage of the total asset values or as a percentage of the premium payments paid in by the investor during that quarter or year, beginning in the second year of the contract. The upfront commission paid on any given product can range up to 10% or more of the premium payments. In many cases, selling agents and selling firms may also have the option to receive lower upfront commissions in exchange for higher trail commissions, usually up to 1.25% annually.

## 2.2 DOL Fiduciary Rule

Conflicts of interest may arise as brokers receive commissions from insurers for selling annuities. Generally, brokers are not required to act as fiduciaries when selling variable annuities and can distort investors' decisions to increase their commission earnings.<sup>11</sup> In an investor alert, the Financial Industry Regulatory Authority (FINRA) states that "the marketing efforts used by some variable annuity sellers deserve scrutiny—especially when seniors are the targeted investors. Sales pitches for these products might attempt to scare or confuse investors".<sup>12</sup> In February 2015, then-President Obama announced a proposal to mitigate conflict of interests for brokers, insurance agents, and other advisers of retirement investors (we refer to them all as brokers hereafter). In essence, all advisers who deal with retirement investors should meet the fiduciary standard of putting the client's financial interest before their own interest. The regulation was formally issued by the US Department of Labor in April 2016, requiring initial compliance by April 10, 2017. The proposed rule faced significant opposition, both in Congress and by industry parties, which delayed enforcement of the rule. After several rounds of amendments, public solicitations of opinions, and legal challenges, the rule took partial effect in June 2017.<sup>13</sup> However, after further delays, the DOL indicated

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<sup>11</sup>See e.g. Wall Street Journal (<https://www.wsj.com/articles/dually-registered-investment-advisers-blur-the-broker-fiduciary-line-1427384699>)

<sup>12</sup><https://www.finra.org/sites/default/files/InvestorDocument/p125846.pdf> [accessed 1/27/2020]

<sup>13</sup>See e.g. New York Times (<https://www.nytimes.com/2017/06/08/your-money/now-your-financial-advisers-will-have-to-put-you-first-sometimes.html>); Wall Street Journal (<https://www.wsj.com/articles/deregulators-must-follow>)

there would be minimal enforcement until July 2019. In March 2018, the rule was vacated by the US Fifth Circuit Court of Appeals.

The key requirements of the fiduciary duty in the proposed rule included that brokers “must give prudent advice that is in the customer’s best interest, avoid misleading statements, and receive no more than reasonable compensation” (DOL 2016). Receiving commission payments for products sold is usually incompatible with fiduciary responsibility. However, the proposed rule allowed brokers to receive commissions if the brokers and a financial institution, either the firms that employ/retain them or the insurance company, satisfied a list of conditions as described in the Best Interest Contract Exemption rule. These conditions included acknowledging fiduciary duty to the investor, adhering to standards of impartial conduct, disclosing information about conflicts of interest, as well as adopting and publicly disclosing policies and procedures that mitigate conflicts of interest.

While the brokerage and financial advisory industry was lobbying aggressively against DOL’s fiduciary rule, it was also preparing to comply with the rule. In a survey by Deloitte published in March 2016, 78% of the surveyed brokerage and other intermediary firms had by then started planning or implementing changes to adhere to the new rule.<sup>14</sup> In another Deloitte survey published in August 2017, brokerage firms had undergone different changes: 19% of respondents limited or eliminated retirement rollover advice, which is a popular channel for selling annuities; 48% reduced the number of annuities and 43% reduced the number of annuity carriers (insurers) available for investors to choose from, partly as a result of performing due diligence on the annuity products.<sup>15</sup>

In addition to these survey responses, insurers and brokerage firms also reported updating their business practices in response to the DOL fiduciary rule starting in 2016. For example, in response to the DOL fiduciary rule, Voya stated that it “modified our sales and compensation practice.” A number of insurers, such as AXA Group, AIG, and Ageon, also reported that changes in sales practices due to the rule contributed to a decline in variable annuity sales. In its 2017 annual report, Ageon explicitly stated that their decline in annuity sales was caused by “lower market demand following the implementation of the Department of Labor Fiduciary Rule, in addition to not following competitors’ pricing changes for some products.” However, not all insurers reported decreased sales from the DOL rule. Lincoln Financial Group reported that in response to the Department of Labor Rule that it had “refreshed its core products and introduced new annuities.... As a result of these actions, [total (variable and other types of annuities)] annuity sales increased 6% in 2017, compared to an 8% decrease for the industry.”

The data suggests that investors also responded to the rule proposal. We parse through the universe of investor complaints from FINRA’s BrokerCheck website to identify fiduciary-duty-related

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<sup>14</sup><https://www2.deloitte.com/content/dam/Deloitte/us/Documents/regulatory/us-reg-dol-fiduciary-rule-industry-preparedness.pdf> [accessed 1/27/2020]

<sup>15</sup><https://www.sifma.org/wp-content/uploads/2017/08/Deloitte-White-Paper-on-the-DOL-Fiduciary-Rule-August-2017.pdf> [accessed 1/27/2020]

complaints. Figure 2 displays the share of investor complaints where the broker allegedly violated his/her fiduciary duty to the investor. The figure illustrates that the share of fiduciary-duty-related complaints effectively doubled in the years following the DOL proposal in 2015 and issuance in 2016. These results are consistent with the notion that the DOL's fiduciary rule increased investors' awareness of brokers' potential conflicts of interest.

## 3 Data

### 3.1 Data Sources

**Variable Annuity Characteristics and Sales** We use two datasets to extract information on variable annuity characteristics. The first one is Morningstar Principia, in the format of historical CD-ROM series, for each quarter from 2005 to 2012. The second dataset is Morningstar Annuity Intelligence, a web-based database offering additional information on variable annuity characteristics through mid-2019 (when we accessed the data). Both datasets contain information including the insurance company underwriting the product, expenses, sales, and asset size, as well as benefit options available (e.g. GLWB). For each policy, the datasets also provide characteristics of the subaccounts towards which the variable annuities policyholders can allocate their investments. Data on the subaccounts include names of the funds, their investment objectives, expense ratios, and historical returns. We describe how we use the two datasets to construct a time-series of product characteristics in Appendix B.

We also obtain quarterly sales data of variable annuities from Morningstar Annuity Intelligence from 1999Q3 to 2019Q2. The total variable annuity sales reported in our data for 2018 is \$92.9 billion, which represents 93% of the total \$100.2 billion of sales in the universe of variable annuity products in the US in 2018. Morningstar Annuity Intelligence also reports quarter-end assets of each product. The total assets held in variable annuity contracts covered by Morningstar at the end of 2018 is \$1.79 trillion, which represents 83% of the total \$2.16 trillion in assets in the universe of variable annuity products in the US.<sup>16</sup> Using the two Morningstar data sets we construct a quarterly annuity level panel data set from 1999Q3-2019Q2. We use the full data set to document several empirical facts regarding the distribution of variable annuities in Sections 4 and 5, and focus on the period 2013-2019 when studying the fiduciary rule in Sections 6 and 7.

**Variable Annuity Sales Commissions** We obtain information on sales commission rates for variable annuity products from the prospectuses and corresponding amendments filed with the SEC. Under the Securities Act of 1933 and the Investment Company Act of 1940, all insurance companies offering variable annuities must register the variable annuities products and file the prospectus of the products with the SEC. The prospectus contains basic descriptive information of the insurer underwriting the product; the investment options available to policyholders; expenses and restric-

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<sup>16</sup><https://www.iii.org/fact-statistic/facts-statistics-annuities> [accessed 7/9/2020]

tions; information on the subaccounts' returns. Prospectuses are filed with the SEC initially in the Form N-4 and updated through post-effective amendment Form 485BPOS filings, commonly at annual intervals. We access these filings through the SEC's EDGAR database. We match the filings by the product name and insurance company to the products in the Morningstar variable annuity dataset.

Insurance companies are required to disclose in the prospectuses and applicable amendment filings the commission rates paid to the selling agents and firms for each variable annuity product. In these filings, insurance companies disclose the maximum upfront commissions, as a percentage of premium payments, along with trail commissions, as a percentage of the annuity value, if applicable. We then extract by hand the commission data disclosed for each matched product each year. This gives us a panel data set of commissions at the annuity product by quarter level. To standardize across the different commission schedules, in our empirical analyses, we use the maximum upfront commission, which is almost always associated with zero trail commissions in compensation schedules.<sup>17</sup>

One caveat is that insurers are required to disclose the maximum upfront commission rate, and the variation in the maximum upfront commission rates disclosed by insurers could, theoretically, not reflect the variation in the average commission rate insurers pay. There are several reasons why we believe that these limitations do not significantly hinder interpretations of our findings. First, the commission rates we find are consistent with industry knowledge of the levels of both upfront and trail commissions that selling agents and firms receive. Second, there is substantial heterogeneity in the disclosed maximum upfront commission rates. Insurers offer different commission schedules across variable annuity products at the same time. There is also variation in the reported commission rate within a variable annuity over time. The heterogeneity across products of the same insurance company and within products over time suggest that the disclosed commission rates reflect meaningful variation in the compensations paid to brokers for different products. Third, for some annuities we observe the actual selling agreements between insurance companies and brokers and can confirm that the disclosed maximum upfront commission rate matches the contractual commission rate reported in the selling agreement. Fourth, insurers use longer lock-up periods to prevent losing money on commission payments when investors withdraw funds early. The maximum upfront commissions we capture are positively correlated with products' lock-up period length. Lock-up periods and the associated surrender charges are used to help prevent losses when investors withdraw early after insurers have paid commissions to brokers.<sup>18</sup> Finally, to the extent that the maximum rate contains measurement error in our explanatory variable, it would

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<sup>17</sup>For example, one insurance company offered three main commission options for the selling agents and firms: first, an upfront commission of 6.5% of the premium payments plus no trail commissions; second, an upfront commission of 5% of the premium payments plus trail commissions of 0.25% on an annual basis, which increases to 0.40% after surrender charges are no longer applicable to the premium; and third, an upfront commission of 2% of the premium payments plus trail commissions of 0.75% on an annual basis. If the variable annuity product is purchased by individuals above a certain age (usually 80 years of age or older), the insurance company may pay a different, often reduced, commission schedule.

<sup>18</sup><https://www.sec.gov/investor/pubs/sec-guide-to-variable-annuities.pdf> [accessed on 06/29/2020]

bias our results towards zero such that our results represent a conservative estimate of the impact brokerage commissions have in distorting investments.

### 3.2 Summary Statistics

Our dataset contains 2,435 different variable annuity products offered by 104 insurance companies from 1999Q3 to 2019Q2. Table 1 presents summary statistics of the product characteristics. The total assets held in each product averages \$2.4 billion. Quarterly sales average \$91 million.

Total expense ratios, including both contract expenses (M&E, administrative and distribution charges)<sup>19</sup> and average subaccount expenses, have a mean of 2.29% of assets annually and range from 0.38% to 4.33% in the sample (Figure 3a). The substantial dispersion in expense ratios provides prima facie evidence of potential distortions and frictions in this market. An investor would lower her annual expenses by roughly 50% (1pp) by moving from the 90th percentile to the 10th percentile in terms of expenses. In net present value (NPV), this amounts to a 12.46 percentage point increase in NPV relative to the principal invested, assuming a 5% discount rate and that the annuity is outstanding for 20 years.<sup>20</sup> Given the size of the annuity market (\$2.2tn), the dispersion in annual fees is economically meaningful.

Table 1 and Figure 4a display the distribution of variable annuity commissions. The average upfront commission is 6.09% of premium payments across all products. A key feature of the commissions is that there is substantial heterogeneity: the maximum disclosed upfront commissions range from 0% (no commissions paid) to 16% of premium payments. As such, brokers have strong monetary incentives to sell high-commission variable annuities over others. By moving from the 10th to the 90th percentile, a broker would almost triple the commission earned on making a sale (3% vs 8%).

Table 1 also presents summary statistics on the subaccounts associated with each product. The average variable annuity product has 66 subaccounts. The subaccounts for each variable annuity also have varying performances: the average net-of-expenses CAPM alphas on the subaccounts for each variable annuity product range from -1.52% to 1.23%. The average annual expense on each subaccount is 0.97% of the assets allocated to the subaccount.

Subaccounts also vary in their investment objectives. Table A1 reports the 20 most common subaccount investment objectives by the percentage of variable annuity products offering at least one subaccount with each objective. The objectives are identified according to the Morningstar prospectus objective classifications. Almost all variable annuity products have growth equity (97%), growth and income equity (95%), money market fund (91%), foreign stock (91%), and corporate bond (86%) investment options available.

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<sup>19</sup>Since investors do not necessarily incur withdrawal charges or rider/option fees are optional, we do not include these fees in the total expense ratio.

<sup>20</sup>In our sample, the median growth rate for annuities that are closed is -5% per annum. Assuming a constant hazard rate of 5%, this implies the average account is open for 20 years.

## 4 What Drives Variable Annuity Sales?

This section presents our analysis on the determinants of variable annuity sales. We study how variable annuity sales are driven by both the characteristics of the products themselves as well as the incentives offered to the agents who sell these products. We also examine how these characteristics and their influences on variable annuity sales vary across distribution channels. In this section we focus on documenting several reduced form relationships between annuity sales and annuity characteristics, while in Section 7 we estimate the causal structural parameters in a demand framework, accounting for potential endogeneity concerns.

### 4.1 Annuity Sales

We begin by empirically documenting the drivers of variable annuity sales. We are particularly interested in how investors and brokers trade off variable annuity expenses versus brokerage commissions.

We start with several simple cuts of the data. Figure 3b displays a binned scatter plot of variable annuity sales versus variable annuity expense ratios, controlling for commission rates. The corresponding relationship is negative and significant, suggesting that demand for variable annuities is decreasing in the expenses that investors pay. Figure 4b displays the relationship between variable annuity sales and commission rates, controlling for product expense ratios. The corresponding relationship is positive and significant, suggesting that broker incentives also affect variable annuity sales. The results suggest that both broker and investor incentives play an important role in driving sales flows.

We systematically examine drivers of variable annuity sales in the following regression specification:

$$\ln(\text{Sales}_{jkt}) = \alpha f_{jkt} + \gamma c_{jkt} + \beta X_{jkt} + \mu_{kt} + \epsilon_{jkt}. \quad (1)$$

Observations are at the variable annuity product-by-quarter level.<sup>21</sup> The dependent variable  $\ln(\text{Sales}_{jkt})$  is the log total sales of variable annuity  $j$  offered by insurance company  $k$  in quarter  $t$ .  $f_{jkt}$  is the average total expense ratio in percentage points corresponding to variable annuity  $j$  in quarter  $t$ . The term  $c_{jkt}$  is the maximum upfront commission rate paid to selling agents and is a percentage of premiums paid. We control for other variable annuity characteristics in the vector  $X_{jkt}$ , which includes the availability of each type of riders and benefits offered for the variable annuity product that quarter, such as death benefits, guaranteed lifetime withdrawal benefits, guaranteed minimum income benefits, purchase payment credits, or a long (above median) lock-up period; the number of different subaccounts that are open for investment in quarter  $t$ ; the number of distinct investment objectives offered by the subaccounts, such as large-cap growth stocks and high-yield debt; and

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<sup>21</sup>As discussed in Section 4.3 some variable annuities offer different share classes. We define a variable annuity product ( $j$ ) at the share-class level.

the historical performance on the investment options available, measured as the average net-of-expense alpha across subaccounts in the previous five years. In our most stringent specification, we also include insurer-by-quarter fixed effects ( $\mu_{kt}$ ) to control for time-varying insurer brand effects and insurer supply conditions.

Table 2 presents the results of the regression estimates corresponding to equation (1). We find evidence suggesting that investors are relatively price sensitive. In each specification, we estimate a negative and statistically significant relationship between annuity expenses and sales,  $\alpha$ . The results in column (5) indicate that a one percentage point decrease in expense ratios is associated with a 15% increase in sales. (For reference, the unconditional mean and standard deviation of expenses across all variable annuities are 2.29% and 0.42% respectively.) This relationship is economically and statistically significant in all our specifications.

In all specifications, the coefficient on commissions,  $\gamma$ , is positive and statistically and economically significant, suggesting that investors are more likely to purchase products in which the broker earns a high commission from the insurance company. The results in column (5) indicate that a one percentage point increase in brokerage commissions is associated with a 7.2% increase in variable annuity sales. The positive relationship between commission rates and sales is robust to controlling for variable annuity product characteristics and is positive both cross-sectionally as well as within time periods and within insurance companies. These results suggest that broker incentives play a critical role in driving the sale of variable annuities.

Turning to other product characteristics, the results suggest that investors purchase more variable annuities that have more subaccounts to invest in, have a wider range of investment options, and higher net-of-expense alphas on the subaccounts. These results are intuitive. The results in column (5) indicate that adding a new investment option/subaccount is associated with a 0.63% increase in variable annuity sales. A one standard deviation increase in average subaccount alpha (0.20%) is associated with a 19% ( $= 0.20 \times 0.96$ ) increase in variable annuity sales. We also find some evidence that the sales of variable annuities with longer lock-up periods (longer than median) tend to be higher. This may partially reflect the preferences of brokers who, as discussed in Section 2.1, often earn a trail-commission for each year the annuity is outstanding.

It is useful to compare how variable annuity sales respond to changes in broker commission rates and expenses. Commission rates are not explicitly paid by the investors, but are generally paid by insurance companies directly to the selling agent and the agent's brokerage firm. Contract expenses, on the other hand, are directly paid for by investors. Comparing how sales respond to expenses ( $\alpha$ ) vs commissions ( $\gamma$ ) helps us measure potential conflicts of interest in the market.

We use the estimates from Table 2 to construct a quick back of the envelope estimate of how investors and brokers trade off their financial interests in terms of expenses and commissions. One distinction between commissions and expenses is that commissions are a one-time upfront payment while expenses are charged annually. Thus, in order to make an apples-to-apples comparison, we need to calculate the net present value of a one percentage point increase in annual expenses. Assuming that a variable annuity is outstanding for 20 years, which is consistent with our sample,



and a 5% discount rate, the net present value of a one percentage point decrease in expenses is 12.46%, relative to the amount invested. The results in column (5) indicate that a one percentage point decrease in the net present value of future expenses is associated with a 1.20% ( $= 0.15/12.46$ ) increase in variable annuity sales. Conversely, a one percentage point increase in broker commissions is associated with a 7.2% increase in variable annuity sales. The results suggest that variable annuity sales are about six times more sensitive to the financial interests of brokers' than those of investors.<sup>22</sup>

As discussed in Section 2.1, variable annuities offer different benefit options or riders for additional expenses, such as a minimum guaranteed return/roll-up rate. Previous research from Kojien and Yogo (2018) and Sen (2019) highlights the importance of these roll-up rates from a risk perspective. As an additional robustness check, we also control for the availability of roll-up rates in column (6). We find a positive and statistically significant relationship between the availability of roll-up rates and variable annuity sales. In this additional specification, our inferences regarding how variable annuity sales are related to expenses and commissions remain unchanged.<sup>23</sup>

## 4.2 Heterogeneity Across Distribution Channels

We further analyze how the relationship between selling agents' incentives and sales differs across the distribution channels through which variable annuities are most commonly sold. While variable annuities must be sold by a registered securities broker, some of the brokers who sell annuities are direct employees of the insurer (captive brokers) while many others work independently from the insurer (non-captive).<sup>24</sup> These non-captive brokers can generally contract with any insurance company and can sell variable annuities issued by multiple insurance companies.

There are two main reasons why commissions and expenses may affect sales differently for captive brokers relative to non-captive brokers. First, insurance companies distributing variable annuities through non-captive brokerage firms leads to double marginalization: insurance companies and brokerage firms that have market power in their respective markets will each apply their own markup to the variable annuity products sold. Brokers will extract more commissions from insurers and, ultimately, insurers will extract higher expenses from investors. By contrast, captive brokers

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<sup>22</sup>As a robustness check, we calculate the NPV of a one percentage point change in expenses under the assumption that the variable annuity is outstanding for 10 years and discounting at a rate of 20%, which implies that the net present value of a one percentage point decrease in expenses is 4.19%, relative to the amount invested. Under these set of assumptions the results in column (5) indicate that a one percentage point decrease in the net present value of future expenses is associated with a 3.58% ( $=0.15/4.19$ ) increase in variable annuity sales. These results suggest that variable annuities are about twice as sensitive to brokers' financial interests relative to investors'.

<sup>23</sup>The estimates of the coefficients on commissions and expenses are similar in terms of magnitude and statistical significance if we replace the availability of roll-up rates with roll-up rates. We report the results using the availability of roll-up rates as we do not have the time-varying roll-up rates, but we do have the time-vary information on the types of benefit options offered by each variable annuity product.

<sup>24</sup>Non-captive brokers include (1) independent financial planners such as LPL Financial, M Financial Group, and Princi Financial Services, which are not affiliated with insurance companies; (2) regional broker-dealers such as Edward Jones, Oppenheimer, and Raymond James, which are large broker-dealer organizations that service many areas in the US, and (3) wire-houses such as Morgan Stanley Smith Barney, UBS, and Wells Fargo Advisors, which are the largest national financial services firms.

work for the insurance companies that underwrite the variable annuities and are vertically integrated, mitigating the problem of double marginalization. As such, products with higher expenses should be sold more across non-captive brokers than across captive brokers. Second, to the extent that selling a higher-commission or higher-expense product could create a reputational concern and threat of complaints or lawsuits against both the selling agent and the insurance company, the captive agent working exclusively for the insurance company may be more inclined to take the reputational concern of the insurance company into consideration, and thus is less likely to sell high-expense products.

To test this hypothesis, we repeat our analysis of equation (1), but decompose the independent variable, sales flow, into sales by non-captive brokers and sales by captive brokers separately. Table 3 reports the results of this analysis. Columns (1)-(3) report the coefficient estimates on sales by non-captive brokers and columns (4)-(6) for sales by captive brokers. The results suggest that captive and non-captive brokers respond differently to commissions and expenses. Captive brokers appear to be substantially more sensitive to expenses and less sensitive to commissions. The coefficient estimate on sales flow sensitivities to expenses for captive brokers ( $\alpha = -0.70$ ) (column 6) is almost four times as large as for non-captive brokers ( $\alpha = -0.19$ ) (column 3). Similarly, the results suggest that non-captive brokers are more sensitive to commissions ( $\gamma = 0.14$ ) than captive agents ( $\gamma = 0.06$ ), although the differences are not statistically significant. Taken together, the analysis suggests that captive brokers place a higher weight on their clients' incentives relative to non-captive brokers.

### 4.3 Share Classes Within Product Sets

The focus of our analysis so far has been to better understand how brokers and their client's interests affect sales. One potential concern with our analysis is that our measures of expenses and commissions are correlated with some unobserved product characteristics or that these measures do not accurately capture the incentives of brokers and investors. We exploit an institutional feature of the data where an insurer sells otherwise almost identical variable annuities with different expenses, commissions, and lock-up periods. In general, different share classes of the same variable annuity have the same underlying investment options, product features, benefits, and other characteristics.<sup>25</sup> This helps mitigate concerns that some unobserved product characteristics are driving our results.

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<sup>25</sup>This is sometimes noted in the prospectuses of the variable annuities. For example, one prospectus with multiple share classes states: "We may offer other contracts with features that are substantially similar to those offered in this contract and in this prospectus. These other contracts may be priced differently and may be offered exclusively to customers of one or more particular financial institutions or brokerage firms." The most common share classes sold are B, L, C, and X-shares. B-shares are the most commonly offered share classes and are characterized by lower contract expenses and a longer lock-up period compared to other share classes. L-shares, by contrast, have higher contract expenses and a shorter lock-up period. C-shares often have no lock-up period and contract expenses between B-shares and L-shares. X-shares often have the highest contract expenses and longest lock-up periods but offer bonus credits on the investment payments. The specific expense and surrender charge structures for each given share class may vary across products and across insurance companies and deviate from these general characterizations.

As an example, consider the Premier Retirement variable annuity offered for sale by Prudential. In 2012, the Premier Retirement variable annuity was offered in L- and C-share classes. Both share classes of the Premier Retirement product had investment options in the same 59 subaccounts, ranging from large-cap growth funds to emerging markets' sovereign debt funds. Both share classes had the same death benefit and living benefit options and other identical contract features. The difference between the two shares lies in the expense structure: L-shares charged an annual M&E risk charge of 1.55% and had a 4-year lock-up period with a maximum surrender charge of 7%, whereas the C-shares charged an annual M&E risk charge of 1.60% and did not have any surrender charges. The L-share of the product had sales of \$3.18 billion in the fourth quarter of 2012, whereas the C-share of the product had sales of \$240 million in that same time period. The two share classes also have different commission rates: the L-share, which had 93% of the total sales of the product, had an upfront commission rate of 5.5%, whereas the C-share, which had only 7% of the total sales, had an upfront commission rate of 2%.

We compare different share classes of the same product or similar products offered by the same insurer to study the role expenses and commissions may have on variable annuity sales. In the empirical analysis, we identify by name all products offered by the same insurer in the same year and quarter that are multiple share classes of the same product set. The share classes within a product-set differ in expense structures and commissions. In total, we identify 374 product set-quarter groups where each product set has at least two share classes both offered for sale in the same quarter. These 374 product set-quarter groups include 747 unique share class-quarter observations for which we have expense ratios, commissions, and product characteristics for all share classes in the product set.

To analyze what drives sales flows across share classes, we estimate an equation similar to our main analysis (eq. 1) on the subset of share class-quarter sets for which there are multiple share classes with different commission rates and expenses:

$$\ln(\text{Sales}_{jpt}) = \alpha f_{jpt} + \gamma c_{jpt} + \beta \text{LongLockUp}_{jpt} + \mu_{pt} + \epsilon_{jkt}, \quad (2)$$

where  $j$  denotes the share class,  $p$  denotes the product set for which there are multiple share classes and  $t$  denotes the year and quarter of the observation. Here, we include product set-quarter fixed effects  $\mu_{pt}$  which control for all variable annuity characteristics other than the share class specific characteristics: expense ( $f_{jpt}$ ), commission ( $c_{jpt}$ ), and whether the lockup is longer than median ( $\text{LongLockUp}_{jpt}$ ).

Table 4 reports the coefficient estimates. Across share classes of the same products, we find that the effect of commissions and expenses still persists in driving sales. Notably,  $\gamma = 0.042$ , which corresponds to a 4.2% increase in quarterly sales for a 1 percentage point increase in commissions across share classes (column 2). Similarly, we find that expenses are negatively correlated with sales. The results in columns (1) and (2) indicate that a one standard deviation increase in expenses (0.42%) is associated with a 48% ( $= 0.42 \times 1.15$ ) decrease in sales. Comparing our estimates of how brokers trade off expenses ( $\alpha$ ) versus commissions ( $\gamma$ ) suggests that brokers trade off a 1

percentage point decrease in commissions with a 0.45 percentage point decrease in the net present value of future expenses.<sup>26</sup> Overall, these results suggest that our earlier inference that annuity sales depend on both the broker’s and client’s interests are unlikely driven by omitted characteristics of the variable annuities.

## 5 Conflicts of Interest

Our results from Section 4 suggest that broker incentives play a critical role in determining which variable annuities investors purchase. In this section, we explore the types of variable annuities brokers are incentivized to sell, and the extent to which brokers’ financial interests conflict with their clients’. We first examine how annuity commissions vary with expenses and other product characteristics. We find that brokers are incentivized to sell high-expense products, as well as products with fewer and worse-performing investment options. We then examine how high-expense products, which offer higher commission incentives for brokers, relate to customer satisfaction, as measured using variable annuity investor complaint data from FINRA.

### 5.1 Broker Commissions and Variable Annuity Characteristics

In Section 4, we find that brokers have strong incentives to sell certain variable annuities over others and that brokers appear to respond to these incentives. In principle, these incentives do not directly harm investors. However, broker commissions may impact the types of variable annuities that a broker chooses to market to investors. One concern, which prompted the DOL fiduciary rule, is that brokers may be incentivized to market inferior and expensive products to investors. This creates conflicts of interest as the broker’s interest in higher commissions is in direct conflict with their investor’s desire for better-quality products.

We identify the types of variable annuities that brokers are incentivized to sell by examining how broker commissions vary with product characteristics in the following linear regression:

$$c_{jkt} = \theta f_{jkt} + \phi X_{jkt} + \lambda_t + \lambda_k + \epsilon_{jkt}. \quad (3)$$

Observations are at the variable annuity product-by-quarter level, where we restrict the sample to those variable annuities that are available for sale in a given quarter. The dependent variable  $c_{jkt}$  is the maximum upfront broker commission corresponding to annuity  $j$  offered by insurer  $k$  at time  $t$ . We examine how commissions vary with variable annuity expenses  $f_{jkt}$  and other variable annuity characteristics in the vector  $X_{jkt}$ . We include the same set of annuity control variables corresponding to our earlier analysis (eq. 1), which includes the availability of different benefits/riders

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<sup>26</sup>Assuming that a variable annuity is outstanding for 20 years and a 5% discount rate, the net present value of a one percentage decrease in expenses is in rates is 12.46. The results in column (2) indicate that a one percentage point decrease in the net present value of future expenses is associated with a 9.23% (= 1.15/12.46) increase in variable annuities sales. The results suggest that brokers behave as if they would trade off a 1 percentage point decrease in commissions with a 0.46% (= 4.2%/9.23%) decrease in net present value of future expenses.

and subaccount characteristics. The corresponding coefficients provide insight into which types of variable annuities have high commissions, or in other words, which types of annuities brokers are incentivized to sell. We also include year-quarter fixed effects ( $\lambda_t$ ) and insurance company fixed effects ( $\lambda_k$ ).

Table 5 displays the estimates. In each column we find a positive and significant relationship between commissions and expenses, suggesting that brokers are incentivized to sell high-expense products. The results in column (1) indicate that a one percentage point increase in expenses is associated with a 1.53 percentage point increase in commission rates. We also find some evidence suggesting that commissions are negatively correlated with the availability and performance of investment subaccounts. The results in column (4) indicate that a one standard deviation decrease in the number of available subaccounts (41) is associated with a 0.32pp ( $= 41 \times 0.0077$ ) increase in commissions. Similarly, a one percentage point decrease in average net-of-expense subaccount alpha is associated with a 0.66pp increase in commissions (column 4). Overall, the results suggest that brokers are incentivized to sell products with higher expenses and worse investment options.

## 5.2 Broker Misconduct and Product Expenses

In Section 5.1, we find evidence suggesting that brokers are incentivized to sell annuities with higher expenses and fewer and worse-performing investment options. While this evidence suggests that brokers have incentives to sell products that are worse for investors, high product expenses may still be positively correlated with some other unobserved variable annuity characteristic that is desirable for investors. To help address this alternative explanation, we further examine the relationship between variable annuity expenses and product quality by studying the relationship between expenses and variable annuity-related investor complaints. If products with high expenses are worse for investors, we would expect investors who end up buying high-expense products to complain about them more often.

We match our variable annuity sales data with complaints and broker misconduct records from FINRA and test whether brokers who are more likely to sell high-expense products receive more complaints and have higher rates of misconduct records. Because we do not have data on the specific products each broker sells and an independent broker may simultaneously work with multiple insurers, we focus on captive brokerage firms that are affiliated with specific insurers, as they will primarily sell products offered by the affiliated insurers. For each insurance company that sells variable annuities in the Morningstar variable annuities dataset, we identify all its affiliated brokerage firms registered with FINRA. For each brokerage firm, we compute the sales-weighted average expense ratios on all variable annuities created by the brokerage firm's insurance arm.

Using the FINRA data, we identify complaints associated with variable annuity sales as well as records of misconduct at each brokerage firm. We compute the following measures of complaints and misconduct for each brokerage firm that is affiliated with an insurance company: (1) the number of variable annuity-related complaints filed against the brokerage firm each year, (2) the total dollar amount of pecuniary damages/settlements paid to claimants against the brokerage

firm corresponding to variable annuity-related complaints each year, (3) among brokers affiliated with the brokerage firm each year, the percentage of brokers with any prior misconduct-related disclosures, and (4) the percentage who had any misconduct-related disclosure that given year.<sup>27</sup> The measures of (1) and (2) are specific to broker conduct arising from variable annuity sales. With (3) and (4), we identify misconduct related to all possible products and services, not just variable annuities, assuming that brokers' overall conduct is correlated with their variable annuity sales. All misconduct variables are rates scaled by the number of broker agents employed by the brokerage firm in each year, per 100 brokers. As reported in the last row of Table 6, the average brokerage firm in our sample, per 100 brokers employed each year, receives 0.19 complaints, pays out \$5,543 in pecuniary damages/settlements, has 1.78 brokers with misconduct records, and has 0.22 brokers who have a misconduct disclosure that year.

To estimate the relationship between product expenses and complaints or misconduct, we estimate the following equation:

$$Misconduct_{it} = \alpha + \beta \cdot Expenses_{it} + \gamma \cdot Z_{it} + \epsilon_{it}, \quad (4)$$

Observations are at the brokerage firm-by-year level.  $Misconduct_{it}$  is the complaint or misconduct variable of interest for brokerage firm  $i$  in year  $t$ . The independent variable of interest is  $Expenses_{it}$  which measures the sales-weighted average expense ratio of variable annuities sold by brokerage firm  $i$ 's affiliated insurer in year  $t$ .  $Z_{it}$  is a set of brokerage-level covariates for brokerage firm  $i$  in year  $t$  including the size of the brokerage firm, measured by the number of broker agents employed by the brokerage in a given year and the total amount of variable annuity assets under management by the insurance company for whom the brokerage firm sells variable annuity products.

Table 6 presents the results. The coefficient estimates on  $Expenses$  are all positive and statistically significant, indicating that brokers affiliated with insurers selling high-expense variable annuity products also have higher levels of complaints and misconduct. A one-standard-deviation increase in the sales-weighted average expenses is associated with 0.088 (=  $0.21 \times 0.42$ , 49% relative to the mean) more complaints, \$2,328 (63%) more in pecuniary damages awarded to complainants per 100 brokers per year, 0.75pp (14%) greater share of brokers with records of misconduct, and 9.2bp (24%) higher rate of misconduct incidents per year.

The results are consistent with the interpretation that brokers are incentivized to sell inferior products. We find that products with high expenses—which tend to have high commissions—are associated with a greater number of investor complaints and higher rates of broker misconduct. The positive relationship between variable annuity product expenses and broker misconduct could be driven by two explanations. First, brokers that are more likely to engage in misconduct may select themselves into selling high-expense products. Second, investors holding high-expense variable annuity products may be more likely to realize that these products are not desirable and, thus, file complaints against brokers. Both of these explanations are consistent with the notion that high-

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<sup>27</sup>Egan et al. (2019) define broker misconduct as any regulatory, customer-related, criminal, or internal event that resulted in discipline (i.e. termination, settlement, fine, etc.).

expense products are likely to be less desirable for investors. Since brokers on average have higher commission incentives to sell these products, as we document in the previous sub-section, the result here supports our argument that brokers face significant conflicts of interest.

## 6 Effects of the Department of Labor Fiduciary Rule

In this section, we analyze the impact of the proposal and partial implementation of the Department of Labor (DOL) fiduciary rule on the variable annuities market. As described in Section 2.2, the DOL fiduciary rule was proposed by then-President Obama in 2015, issued by the DOL in 2016, and with enforcement originally planned to start in 2017. The proposed rule would hold all brokers to a fiduciary standard when dealing with retirement investments. In this section, we document the empirical impact of the proposed rule on annuity sales, the types of annuities sold, and the types of annuities offered by insurers. We then assess the implications of the proposed rule on investor surplus in Section 7. We find that the DOL fiduciary rule coincided with a meaningful (19%) decrease in total variable annuity sales. The decline in sales was primarily driven by a decline in the sales of high-expense variable annuities while low-expense annuity sales remained relatively constant. In addition, we find that insurers decreased the total number of variable annuity products open for sale, especially those with high expenses. Consistent with the anecdotal evidence from insurer annual reports (Section 2.2), the empirical evidence suggests that the proposal of the DOL fiduciary rule led to a decline in the sales and availability of high-expense variable annuities.

### 6.1 Variable Annuity Sales and Expenses

We first document how the proposal of the DOL fiduciary rule impacted the sales of variable annuities. Figure 5a displays total variable annuity sales in the US over the period 2013-2019. We find that there was a significant decrease in total sales of variable annuities around the proposal of the fiduciary rule. Quarterly sales of all variable annuity products declined by 19% from \$32 billion in 2015Q1 to \$26 billion in 2016Q1. The decline in variable annuity sales was partially offset by an increase in fixed indexed annuity sales, which are typically considered less risky investments than variable annuities and, on average, have lower commissions;<sup>28</sup> together, fixed index and variable annuity quarterly sales fell by 5% YoY in 2016Q1 (Figure 5b). The decline in overall sales is consistent with the hypothesis that the DOL fiduciary rule significantly affected brokers' decisions to sell variable annuities. Furthermore, sales of variable annuities have not recovered to the pre-2016 levels even after the repeal of the DOL fiduciary rule in 2018. This persistent impact of the fiduciary rule suggests that many insurers kept the changes to their business operations that they initially implemented to comply with the DOL rule, potentially because they anticipate that regulators will

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<sup>28</sup>For example, FINRA, the regulator, describes equity indexed annuities as having less risk than a variable annuity. See <https://www.finra.org/investors/alerts/equity-indexed-annuities-complex-choice> [accessed on 07/09/2020]. As of 2016, the average commission paid on variable annuities was 6.36% vs. 5.50% for fixed indexed annuities.

revisit the rule in the foreseeable future.<sup>29</sup>

In Section 4, we find that sales respond negatively to variable annuity expenses, suggesting that investors dislike high-expense products. Section 5.2 documents that high product expenses are associated with more investor complaints and broker misconduct, suggesting that products with high expenses are worse for investors. Therefore, we hypothesize that the DOL rule should have a larger effect on these more expensive products. Figure 6 separately plots the total sales of high- and low-expense variable annuities (top/bottom quartile) over the period 2013-2019. The plot shows that sales for high-expense products decreased drastically around the proposal of the DOL rule by 52% from 2015Q1 to 2016Q1. By contrast, sales for low-expense products fell by only 9% over the same period. The difference in differences suggest that in response to the DOL rule, brokers curbed their sales of high-expense variable annuities.

We analyze how the relationship between variable annuity sales and expenses changed surrounding the DOL rule in the following difference in differences regression specification:

$$\ln(\text{Sales}_{jkt}) = \alpha f_{jkt} + \alpha^{DOL} f_{jkt} \times DOL_t + \gamma c_{jkt} + \beta X_{jkt} + \mu_t + \mu_k + \epsilon_{jkt}, \quad (5)$$

Observations are at the variable annuity product by quarter level over the period 2013-2019. We restrict the sample period to this window to measure the impact of the DOL rule. This regression specification mirrors our earlier specification (eq. 1), with the addition of the interaction term between expense ratio and post-DOL dummy,  $f_{jkt} \times DOL_t$ . The variable  $DOL_t$  is a dummy variable indicating whether the year is after 2015. Thus, the interaction term  $f_{jkt} \times DOL_t$  measures how the expense sensitivity of variable annuity sales changed surrounding the proposal of the DOL rule.

We present the estimates in columns (1)-(2) in Table 7. In each specification we estimate a negative coefficient on the term  $f_{jkt}$ , suggesting sales are negatively correlated with expenses prior to the DOL rule. The coefficient on the interaction term  $f_{jkt} \times DOL_t$  is negative and statistically significant indicating that sales became more sensitive to expenses after the DOL rule. The results in column (2) indicate that prior to the DOL proposal, a one percentage point increase in expenses is associated with a 15% decrease in sales. After the rule proposal, a one percentage point increase in expenses is associated with a 46% (=15%+31%) decrease in sales. This finding echoes the results displayed in Figure 6: the sales of high-expense variable annuities fell more relative to low-expense variable annuities after the proposal of the DOL rule.

In columns (3)-(6) of Table 7 we also include the interaction term between commission rates and the dummy  $DOL$  to measure how the sensitivity of sales with respect to commissions changed surrounding the proposed rule. The results confirm our earlier finding that sales are positively associated with commissions. We do not find that the commission sensitivity changed after the proposed rule. This is intuitive as the proposed DOL rule would penalize brokers for selling high-

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<sup>29</sup>Todd Giesing, director of annuity research at the LIMRA SRI, [...] notes that many of the changes insurers had to make to accommodate the DOL rule have remained in place. "Even with the vacated rule, we've heard from many annuity providers that they made changes that remain in place today due to the rule." Those changes include changes to business processes and practices, and disclosure policies, he says. See <https://www.morningstar.com/articles/930554/the-uptick-in-annuities> [accessed on 01/23/2020].



expense inferior investments, but not necessarily for selling high-commission products conditional on product expenses and other characteristics. Since we control for the expenses and quality of the variable annuities, we would not expect the sensitivity of sales with respect to commissions to change surrounding the proposal.

Overall, we find that the proposed rule led to a decline in total variable annuity sales. However, the rule differentially impacted sales of annuities. While the sales of high-expense variable annuities fell after the proposed rule, the sales of low-expense variable annuities remained relatively constant.

## 6.2 Insurers' Product Offerings: Expenses and Commissions

Insurers, in addition to brokers, also faced significant legal risks under the DOL fiduciary rule. The Department of Labor states that to keep the commission-based compensation structure, insurance companies must acknowledge fiduciary status and insulate brokers from incentives that violate the Best Interest standard when no other financial institution (such as a brokerage firm) acknowledges fiduciary status.<sup>30</sup> To limit their legal risks, insurers can decrease their offerings of products whose sales may violate the standard. It is plausible to assume that high-expense products are less likely to serve investors' best interests, as sales are negatively correlated with expenses and high-expense variable annuities are associated with more investor complaints. Thus, high-expense products can pose higher legal risks to insurers and insurers might decrease their offerings of high-expense products.

Figure 7a tests this hypothesis by plotting the time-series equal-weighted average expenses of products open for sale. The average expenses declined sharply from 2015Q1 to 2017Q1, consistent with the idea that insurers are reducing the net number of high-expense products. The average expenses from 2016 to 2018 are 12bps lower than those from 2013 to 2015. In untabulated results, we find that the decline in average expenses is mainly driven by the opening of new low-expense products: new products launched in 2016 or later have an average expense ratio of 35bps lower than those launched in 2013-2015. Figure 7b plots the sales-weighted average expenses which also shows a sharp decline in expenses around 2016, decreasing by 21bps from 2013-2015 to 2016-2018.

The equal weighted figure reflects the behavior of insurers as they changed the suite of available products, while the sales-weighted figure reflects the behavior of both insurers and brokers. Consequently, the sales-weighted decline in average expenses is larger than the equal-weighted decline in average expenses because it reflects the change in broker behavior. As illustrated in Section , annuity sales became more sensitive to expenses following the DOL rule. Figure 7b also indicates that the response of brokers to the DOL rule was immediate and sharp. In contrast, Figure 7a indicates that the response of insurers was immediate but more gradual as it potentially took longer for insurers to update their product set.

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<sup>30</sup>See <https://s3.amazonaws.com/public-inspection.federalregister.gov/2016-07925.pdf?1459955724>, page 243. [Accessed on 3/29/2020]

We can also visualize the change in the product space around the DOL fiduciary rule in a heatmap by expenses and commissions. For each region in the product space along these two dimensions, we compute the change in the average number of variable annuity products available for sale and average total sales in each quarter for the time period before (2013-2015) and the time period after (2016-2019Q2) the 2016 issuance of the DOL fiduciary rule. We measure both sales volume and number of products available for sale as shares of the entire variable annuities market, such that the changes in sales and product offerings reflect changes in the composition of the marketplace.

Figures 8a and 8b plot the changes in product offerings and sales, respectively. An increase (decrease) in the number or sales of products in each region is denoted in red (blue). Figure 8a shows that in terms of the number of products as a fraction of all products available, low-expense products experienced an increase. In particular, low-expense-low-commission products saw the largest increase, and high-expense-high-commission products, which potentially allow brokers to benefit the most at investors' expense, experienced the largest decrease. Figure 8b shows a similar pattern in sales: low-expense products gained, while high-expense products lost market share. In particular, low-expense-low-commission products experienced the largest increase, and high-expense-high-commission products experienced the largest decrease. These results suggest that following the DOL fiduciary rule, the variable annuity market shifted away from higher-expense inferior products and towards lower-expense products, in terms of both products offerings and sales.

### **6.3 Composition of Variable Annuity Investors**

One primary concern associated with the fiduciary rule is that holding brokers to a fiduciary standard would raise the fixed cost of providing financial advice which would reduce the amount of financial advice. In particular, it may no longer be profitable for brokers to sell variable annuities to investors with smaller accounts. Bhattacharya et al. (2020) develop a general theoretical model illustrating how this fixed cost channel impacts the market for financial advice. While we do not directly observe the wealth of individual variable annuity investors, we exploit variation in minimum purchase thresholds across variable annuities to examine whether smaller investor accounts were differentially impacted by the fiduciary rule.

Variable annuities have different minimum purchase thresholds that specify the minimum amount of premium payments that an investor must invest in the product. As such, the thresholds are a way to differentiate investors by the amount of funds to invest, as investors with lower funds to invest may not be able to purchase variable annuities with higher minimum purchase thresholds. Variable annuities differ widely in their minimum purchase thresholds. The median minimum threshold on purchases across all products is \$10,000 and ranges from \$0 (no minimum purchase) to \$1 million. Minimum purchase thresholds also differ significantly both across insurers and across products offered by the same insurer: the identity of the insurance company explains only 23% of the variation in minimum purchase thresholds.

We extend our baseline sales regressions (eq. 1) to examine how the sales of variable annuities changed surrounding the proposed rule change:

$$\ln(\text{Sales}_{jkt}) = \alpha f_{jkt} + \gamma c_{jkt} + \lambda \text{MinAmt}_{jkt} + \psi \text{MinAmt}_{jkt} \times \text{DOL}_t + \beta X_{jkt} + \mu_t + \mu_k + \epsilon_{jkt}. \quad (6)$$

Observations are at the product-by-quarter level over the period 2013-2019. The variable  $\text{MinAmt}_{jkt}$  measures the minimum purchase threshold for product  $j$  issued by insurer  $k$  at time  $t$ . The coefficient of interest is  $\psi$  which measures how the relationship between sales and minimum account sizes changed surrounding the DOL rule proposal.

Table 8 displays the corresponding estimates. We find some evidence that annuities with larger minimum purchase thresholds have lower sales. The results in column (3) indicate that a 1% increase in the minimum size threshold is associated with a 7% decrease in annuity sales. Importantly, we do not find any evidence suggesting that the relationship between annuity sales and minimum size thresholds changed surrounding the DOL rule proposal. The results suggest that the DOL rule proposal did not disproportionately hurt smaller investors and force them out of the market.

In addition, we use data from the Federal Reserve's Survey of Consumer Finances to analyze changes in the composition of variable annuity investors in Table A3, with the most recent six surveys, from 2001 to 2016. Columns (1)-(2) examine what investor characteristics are associated with variable annuity ownership. In columns (3) and (4), we interact investor characteristics with a dummy variable for the year being 2016. Columns (5)-(6) repeat (3)-(4) using only the two most recent surveys, 2013 and 2016. The results suggest that the least wealthy survey respondents (in the first and second quartiles in terms of wealth) did not experience a larger decrease in variable annuity ownership in 2016 compared to those in the third wealth quartile. These results echo the previous results that less wealthy investors were not disproportionately forced out of the variable annuity market following the proposed DOL rule.

## 7 Model of Variable Annuity Distribution

In Section 6 we find some positive implications of the DOL proposal: the proposal was associated with a decrease in high-expense variable annuity sales and a decrease in the availability of high-expense variable annuities. In this section we develop and estimate a model of variable annuity distribution that allows us to assess the normative implications for investors. An advantage in our setting is that we directly observe the alternative equilibrium we are interested in from the data. The objective of the model is to develop a simple demand framework that allows us to quantify the observed effects rather than solving for a new equilibrium.

## 7.1 Demand Framework

We model an investor's annuity investment decision as a discrete choice problem. Each investor wishes to invest a fixed amount of money in an annuity, and, with the aid of a broker, purchases one of the available annuities. Our framework is similar to the demand model used in Kojien and Yogo (2018). The key feature of the demand framework is that investors access the annuity market through brokers such that the total demand for variable annuities is jointly determined by the preferences of brokers and investors.

**Investors:** Investors value variable annuities based on their expenses and characteristics. The indirect utility of investor  $i$  purchasing product  $j$  is given by

$$u_{ij} = -f_j + X_j' \beta + \xi_j + \varepsilon_{ij}. \quad (7)$$

We normalize investors' preferences with respect to expenses  $f_j$  to  $-1$  such that the other preference parameters are in terms of annual return. The term  $X_j$  is a vector of variable annuity characteristics, such as the subaccount options and available riders, as accounted for in our baseline empirical analysis in Section 4, and  $\beta$  reflects how investors value these characteristics. The term  $\xi_j$  captures unobserved product characteristics/demand shocks associated with product  $j$ . Lastly, the term  $\varepsilon_{ij}$  is an investor-specific demand shock for product  $j$ , which introduces investor-specific heterogeneity in the model such that variable annuities are horizontally differentiated.

**Brokers:** Each investor  $i$  accesses the market for variable annuities through a broker  $b$ . Brokers earn commissions  $c_j$  for selling annuity  $j$  and incurs a broker-annuity-specific cost  $\eta_{bj}$  for selling the variable annuity such that the profit associated with selling variable annuity  $j$  is

$$\pi_{bij} = c_j - \eta_{bij}.$$

Following Robles-Garcia (2019), we assume that brokers maximize the joint surplus of investors and brokers. The broker's indirect utility  $\nu_{bij}$  of selling annuity  $j$  to investor  $i$  is then a weighted function of the investor's utility and brokerage commissions:

$$\nu_{bij} = \omega(\pi_{bij}) + (1 - \omega)(u_{ij})$$

The term  $\omega$  captures the weighting brokers place on their own financial incentives (commissions) versus the financial incentives/preferences of investors.

Each broker selects annuity  $j$  from the set of available annuities  $\mathcal{J}$  that maximizes the brokers' indirect utility

$$\max_{j \in \mathcal{J}} \nu_{bij}$$

As is standard in the demand estimation literature, we assume that the broker- and investor-specific

unobserved component of the utility function  $\zeta_{bij} = -\omega\eta_{bij} + (1 - \omega)\varepsilon_{ij}$  scaled by  $\sigma$  is distributed Type-1 Extreme Value (i.e.  $\frac{1}{\sigma}\zeta_{bij} \sim T1EV$ ). Under this assumption, the market share of annuity  $j$  has the standard multinomial logit form:

$$s_j = \frac{\exp\left(\frac{\omega}{\sigma}(c_j) + \frac{(1-\omega)}{\sigma}(-f_j + X'_j\beta + \xi_j)\right)}{\sum_{l \in \mathcal{J}} \exp\left(\frac{\omega}{\sigma}(c_l) + \frac{(1-\omega)}{\sigma}(-f_l + X'_l\beta + \xi_l)\right)}. \quad (8)$$

The above share equation is the heart of our estimation strategy as described below.

## 7.2 Estimation and Results

Our estimation strategy follows closely that of Berry (1994). Following eq. (8), we can write the log market share of product  $j$  at time  $t$  as

$$\ln(s_{jt}) = \frac{\omega}{\sigma}(c_{jt}) + \frac{(1-\omega)}{\sigma}(-f_{jt} + X'_{jt}\beta + \xi_{jt}) - \ln\left(\sum_{l \in \mathcal{J}} \exp\left(\frac{\omega}{\sigma}(c_{lt}) + \frac{(1-\omega)}{\sigma}(-f_{lt} + X'_{lt}\beta + \xi_{lt})\right)\right),$$

which we can estimate in a regression framework as

$$\ln(s_{jt}) = \underbrace{\gamma_1}_{\frac{\omega}{\sigma}} c_{jt} + \underbrace{\gamma_2}_{-\frac{(1-\omega)}{\sigma}} f_{jt} + X'_{jt} \underbrace{\Gamma}_{\frac{(1-\omega)}{\sigma} \beta} + \underbrace{\mu_t}_{\ln\left(\sum_{l \in \mathcal{J}} \exp\left(\frac{\omega}{\sigma}(c_{lt}) + \frac{(1-\omega)}{\sigma}(-f_{lt} + X'_{lt}\beta + \xi_{lt})\right)\right)} + \underbrace{v_{jt}}_{\frac{(1-\omega)}{\sigma} \xi_{jt}}, \quad (9)$$

where we define market shares at the year-quarter level. Using the estimated linear parameters  $\gamma_1$ ,  $\gamma_2$ , and  $\Gamma$ , we can solve for the structural parameters of interest  $\omega, \sigma$ , and  $\beta$ . We include time fixed effects  $\mu_t$  to absorb the nonlinear term  $\ln\left(\sum_{l \in \mathcal{J}} \exp\left(\frac{\omega}{\sigma}(c_{lt}) + \frac{(1-\omega)}{\sigma}(-f_{lt} + X'_{lt}\beta + \xi_{lt})\right)\right)$ , which allows us to estimate the model with a simple regression. It is also worth noting that, because we include time fixed effects, we do not need to specify the outside good or need to observe an investors' full consideration set  $\mathcal{J}$ .

A common challenge in the demand estimation literature is that expenses/prices are endogenous in eq. (9). If an insurance company observes its demand shock  $\xi_{jt}$  prior to setting product expense ratios, then expenses will be endogenous. For example, if an insurer experiences a positive demand shock  $v_{jt}$  it may find it optimal to charge a higher expense on its annuities. Consequently, one might expect that the endogeneity bias would cause our OLS estimate of  $\gamma_2$  to be biased upwards, such that our OLS estimates would suggest that investors are less sensitive to expenses than they actually are. For the same reason, one might also expect commissions to be endogenous. If an insurer experiences a positive demand shock  $v_{it}$ , it may find it optimal to offer a lower commission. This would cause our OLS estimates of  $\gamma_1$  to be biased downwards, such that our OLS estimates would suggest that brokers are less sensitive to commissions than they actually are. In general, the expenses and commissions associated with variable annuities appear relatively sticky in the data

and are infrequently updated, which helps mitigate the endogeneity concerns.<sup>31</sup>

Nonetheless, we address the endogeneity of expenses and commissions using instrumental variables. We construct instruments in the spirit of Berry et al. (1995) based on the product characteristics of other variable annuities available for sale at the time an annuity was launched. Consider variable annuity  $j$  that was introduced by insurer  $k$  in the market at time  $\tau < t$ . We construct the set of instruments corresponding to annuity  $j$  at time  $t$  as  $Z_{jkt}^{(1)} = [\bar{f}_{-k\tau}, \bar{c}_{-k\tau}, \bar{X}_{-k\tau}]$  where  $\bar{f}_{-k\tau}$  is the average variable annuity expense charged by other insurers (other than  $k$ ) at time  $\tau$  and  $\bar{c}_{-k\tau}$  and  $\bar{X}_{-k\tau}$  are defined analogously. Following Berry et al. (1995) we also construct a set of instruments corresponding to the average characteristics of the other variable annuities introduced by insurer  $k$  at time  $\tau$ ,  $Z_{jkt}^{(2)} = [\bar{f}_{-jk\tau}, \bar{c}_{-jk\tau}, \bar{X}_{-jk\tau}]$ , where  $\bar{f}_{-jk\tau}$  is the average variable annuity expense charged by insurer  $k$  on other annuities (other than  $j$ ) at time  $\tau$  and  $\bar{c}_{-jk\tau}$  and  $\bar{X}_{-jk\tau}$  are defined analogously. The rationale behind the instruments is as follows. First, these instruments satisfy the relevancy for expenses and commissions because (i) insurers are likely to initially set commissions and expenses based on the characteristics of other variable annuities available at time  $\tau$  and (ii) insurers infrequently change annuity expenses/commissions over time. Second, the instruments satisfy the exogeneity condition provided that the characteristics of the other variable annuities available when variable annuity  $j$  was launched at time  $\tau < t$  are uncorrelated with future demand shocks  $\xi_{jt}$ . The fact that many of the product characteristics of the variable annuities available for sale at time  $\tau$  were set years prior helps further alleviate concerns about the exogeneity of the instrument set  $Z$ . To this end, we drop observations in the year the variable annuity was launched to ensure that  $t > \tau$ . In our instrumental variables specifications, we include the set of instruments  $Z^{(1)}$  and  $Z^{(2)}$  as well as the quadratic term for each instrument. In each specification, the instruments yield F-statistics in excess of 90.

We estimate our simple demand framework using our variable annuity data set as described in Section 3. For estimation purposes, we define the market for annuities as total variable and fixed indexed annuity sales at the year-quarter level. We supplement our variable annuities data set with data on aggregate fixed indexed annuity sales from the Insurance Information Institute. To avoid conflating issues with the DOL rule issuance and because our primary objective is to estimate the utility parameters of the investor, we estimate the model over three periods: prior to 2016, post 2016 (inclusive of 2016), and the full sample.

We parameterize the investor's utility function corresponding to eq. (7). We control for the same set of variable annuity characteristics  $X_{jt}$  as in our main analysis in Section 4 which includes the types of benefits offered, subaccount characteristics, etc. We also include insurer-by-year fixed effects to capture investor preferences for different insurers. As of 2016, there were 317 different fixed index annuities open for sale.<sup>32</sup> We treat these fixed annuities as a homogeneous product and normalize their utility equal to zero.

We present our estimates in Table 9. The columns correspond to different samples and estima-

<sup>31</sup>The one-year auto-correlation for expenses and commissions is 0.96 and 0.99 respectively.

<sup>32</sup>See: <https://www.dolfiduciaryrule.com/portalresource/NAFAvDOL2016-08-10ECF33JtAppendix-Pt3B.PDF>

tion procedures. Columns (1)-(2) correspond to the full sample, columns (3)-(4) correspond to the pre-2016 sample, and columns (5)-(6) correspond to the post-2016 sample. We estimate the model using OLS in the odd columns (1, 3, and 5) and estimate the model using instrumental variables in columns (2, 4, and 6), instrumenting for commissions and expenses. We report the estimates corresponding to the reduced-form parameters  $(\gamma_1, \gamma_2, \Gamma)$  in the top half of Table 9 and report the corresponding structural parameters  $(\omega, \frac{1}{\sigma})$  below. Consistent with our prior estimates, we find that demand for variable annuities is increasing in brokerage commissions ( $\gamma_1 > 0$ ) and is decreasing in expenses ( $\gamma_2 < 0$ ). As expected, we find that our OLS estimates of  $\gamma_1$  and  $\gamma_2$  understate how responsive investors and brokers are to expenses. Using the instrumental variables, the estimate of  $\gamma_1$  becomes more positive and that of  $\gamma_2$  becomes more negative. Also consistent with our previous results, we find that demand became more sensitive to expenses after the DOL rule proposal such that the expense-sensitivity of investors effectively doubled after the proposal (column 4 vs. column 6).

In the bottom half of Table 9 we report the corresponding structural parameters. We estimate that prior to 2016,  $\omega = 0.34$  (column 4), which implies that brokers behave as if they are willing to trade-off a one percentage point increase in commissions, relative to the amount invested, with a 6.42 percentage point decrease in the net present value of the variable annuity.<sup>33</sup> These results suggest that brokers place about six-times as much weight on their own profit incentives relative to investors' incentives. Our estimates suggest that after 2016, brokers put more than twice as much weight on investor incentives. The results indicate that after 2016, brokers behaved as if they were willing to trade-off a one percentage point increase in commissions relative to the amount invested with a 2.4 percentage point decrease in investor NPV.

These estimates reinforce our earlier findings that (i) variable annuity sales respond to both brokers' and investors' incentives, (ii) brokers place substantially more weight on their own financial incentives relative to their clients', and (iii) following the 2016 DOL rule brokers placed about two times more weight on investor incentives than they had previously. The structural estimates also allow us to quantify how investor surplus changed as a result of the DOL proposal, which we explore in the next section.

### 7.3 Changes in Investor Surplus around the Proposed DOL Rule Change

We use our parameter estimates to calculate how investor surplus changed surrounding the proposed DOL rule change. We calculate utility as

$$\hat{u}_{jt} = -f_{jt} + X'_{jt}\hat{\beta} + \hat{\xi}_{j,2016Q1}. \quad (10)$$

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<sup>33</sup>In the context of our framework, brokers are willing to trade off a one percentage point increase in commissions with a  $\frac{\omega}{1-\omega}$  percentage point increase in annual expenses. Assuming that a variable annuity is outstanding for 20 years and a 5% discount rate, the net present value of a one percentage decrease in expenses in rates is 12.46. Consequently, our estimates suggest that brokers are willing to trade off a one percentage point increase in commissions with a  $\frac{\omega}{(1-\omega)} \times 12.46$  percentage point decrease in investor NPV.

Because the coefficient with respect to annual expenses is normalized to -1, we can interpret estimated utility in terms of risk-adjusted annual returns. A couple of features of our estimated utility merit further discussion. First, we use the utility parameter estimates  $\hat{\beta}$  in the post-2016 period to reflect the period when brokers place increased weight on investor incentives, but our results are robust to using estimates from the other samples. Second, we do not include the investor-specific demand shock,  $\varepsilon_{ijt}$ , in our utility formulation. Instead, we treat the investor-specific demand shock as an error term rather than utility as is often commonly done in the literature.<sup>34</sup> Lastly, we need to calculate the unobserved component of utility,  $\xi_{jt} = \frac{\sigma}{1-\omega} (\ln(s_{jt}) - \ln s_{0t} - (c_{jt} - c_{0t})\frac{\omega}{\sigma})$ . The term  $\xi_{jt}$  measures the unobservable component of the utility of product  $j$  relative to the utility of the outside good (fixed indexed annuities). Using data on fixed indexed annuity sales, we observe that as of 2016Q1 there were 317 fixed indexed annuities outstanding that paid an average commission of 5.5% and had average quarterly sales of \$50m. We use this average sales and commissions data to calculate the unobserved component of utility as of 2016, and assume that the unobserved component of utility remains constant over time. By keeping the unobserved product quality constant over time, our welfare analysis focuses on how the observable characteristics change in response to the DOL rule and how these changes impact investor surplus.

Figure 9 displays how the average annuity investor's risk-adjusted return has changed over time. Because of its arbitrary level, we normalize the risk-adjusted return in 2012 to 1.00% in the figure. The figure shows that after the regulation was announced in early 2015, there is a sharp increase in risk-adjusted returns. The results indicate that after the proposal, the types of variable annuities investors purchased offered an 86bp higher risk-adjusted return. Investors moving towards lower-expense products accounted for roughly one-quarter of the increase in risk-adjusted returns. As referenced previously, Figure 7b shows how the average expense paid by variable annuity investors fell by roughly 20bps following the DOL rule change. The remainder of the change in risk-adjusted returns comes from investor purchasing annuities with more desirable investment options and observable characteristics from the investor's perspective. Our estimates suggest that a large portion of the welfare gain also comes from investors switching from variable annuities to fixed indexed annuities, which we find that consumers prefer relative to the average variable annuity. Over the period 2015Q1 through 2019Q1, the market share of fixed indexed annuities almost doubled from 27% to 47%.

One thing omitted from our analysis is that total annuity sales (fixed-indexed and variable) declined by 5% in the years following the DOL rule. Without taking a strong stance on where these 5% of annuity funds flow to, it is difficult to calculate the overall change in investor surplus. To address this issue, we calculate the lower bound  $\Delta_r$  which indicates how much lower the risk-adjusted returns of those 5% of investors who no longer purchase annuities would need to be such that investors are, on average, equally well off after the rule change. Given that the risk-adjusted return of those 95% of investors who purchased annuities after the DOL rule increased by 86bp,

<sup>34</sup>This is because (a) presumably investors make some idiosyncratic mistakes when choosing annuities and (b) the variance of the investor-specific error term is not separately identified from the investor-broker-specific error term  $\eta_{ij}$ .



this implies that  $\Delta r = \frac{95\% \times 0.86pp}{5\%} \approx 16pp$ . These results suggest that the DOL rule change increased investor surplus, as long as the risk-adjusted returns of those 5% of investors who did not purchase annuities after the rule change did not fall by more than 16pp. Even just focusing on the changes in expenses alone, our results suggest that the DOL rule change increased investor surplus as long as the risk-adjusted returns of those 5% of investors who did not purchase annuities after the rule change did not fall by more than 4pp ( $\approx \frac{95\% \times 0.20pp}{5\%}$ ).

Overall, we find that the DOL rule had relatively large effects in terms of the composition of and total annuity sales. Given that enforcement of the DOL rule was delayed and the rule was never fully implemented, our results may reflect a lower bound on how the market would respond to a fiduciary standard. Regardless, consistent with anecdotal evidence from annual reports, our results indicate that the DOL rule had a substantial and persistent impact on the behavior of brokers and insurers in annuity markets.

## 8 Conclusion

We examine how households' investments in variable annuities are driven by both their own and brokers' incentives, and how the DOL fiduciary rule proposal changed these dynamics. Our paper has two main sets of results. First, we find that sales are higher for variable annuities with high broker commission rates and lower for products with high expenses, after controlling for a wide range of variable annuity product characteristics across insurers and time periods. Moreover, we find evidence of conflicts of interest where brokers are incentivized to sell higher-expense products that are plausibly worse for investors. We also find that high expenses are positively correlated with more complaints against associated brokers and more frequent broker misconduct, suggesting that high-expense products are indeed ex post less desirable to investors.

Second, we find that the DOL fiduciary rule had a large impact on broker and insurer behavior. Following the proposal, variable annuity sales declined by 19%. The decline in annuity sales was primarily driven by a decline in high-expense variable annuity sales. Sales of high-expense annuities fell by 43% more than low-expense annuities. Insurers also decreased the relative availability of high-expense products. The DOL fiduciary rule was effective in shifting the incentives of financial brokers and insurers and resulted in a 10% decline in average expenses paid by investors.

In addition to documenting how the market for variable annuities changed following the proposed fiduciary rule, we develop and estimate a structural model of variable annuity demand that allows us to quantify how the rule change impacted investor surplus. In response to the rule, we find that brokers more than doubled the weight they put on maximizing investor returns when selling annuities. We find that the rule change increased investors' risk-adjusted returns by up to 86 bps. Even after accounting for the decline in annuity sales and under conservative assumptions, our results suggest that investors, on average, benefited from the fiduciary rule. These results suggest that the proposed rule change helped mitigate conflicts of interest between brokers and investors. Given that enforcement of the rule was limited and that the rule was ultimately vacated, our esti-

mates may understate the impacts of fiduciary duty and the long term effects of the fiduciary policy remains a topic for future research. However, the DOL proposal provides a unique opportunity to study the effect of such a policy attempt, which can shed light on the effectiveness of related policies proposed since 2018 by various states and the Securities and Exchange Commission in 2019, as well as future policy efforts.

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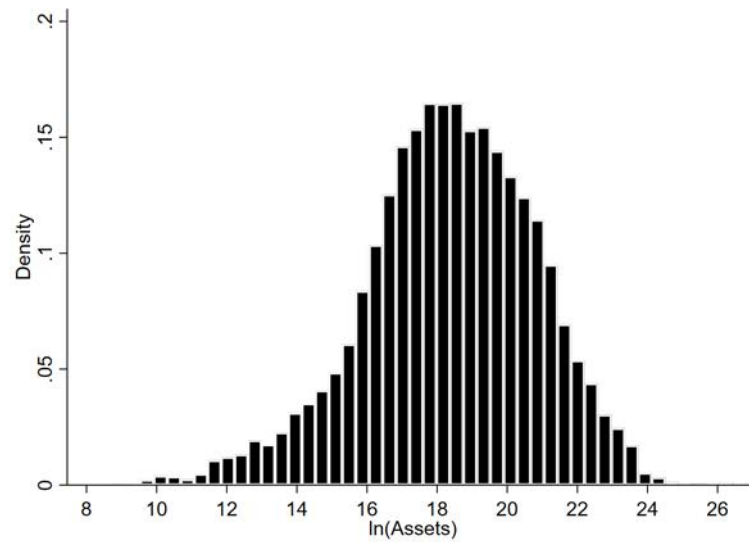
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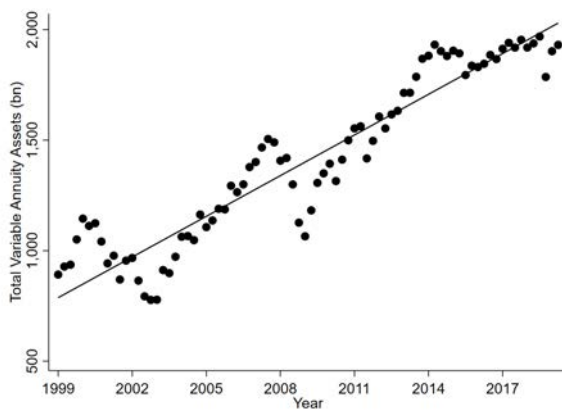
# Figures and Tables

Figure 1: Variable Annuity Assets

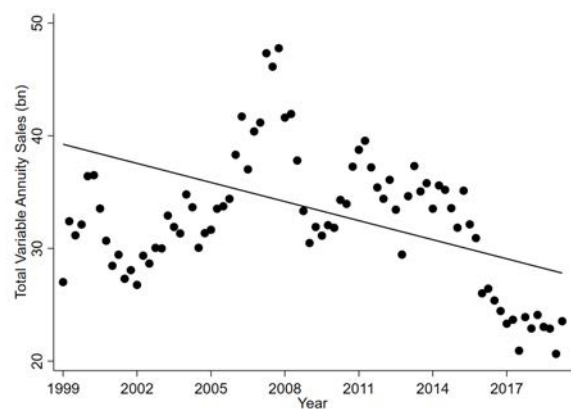
(a) Distribution of Variable Assets



(b) Total Variable Annuity Assets



(c) Variable Annuity Sales



Note: Figure 1a displays the distribution variable annuity assets. Observations are at the variable annuity by quarter level over the period 1999-2019.

Figure 1b displays a scatter plot of total variable annuity assets over the period 1999-2019.

Figure 1c displays a scatter plot of quarterly variable annuity sales over the period 1999-2019.

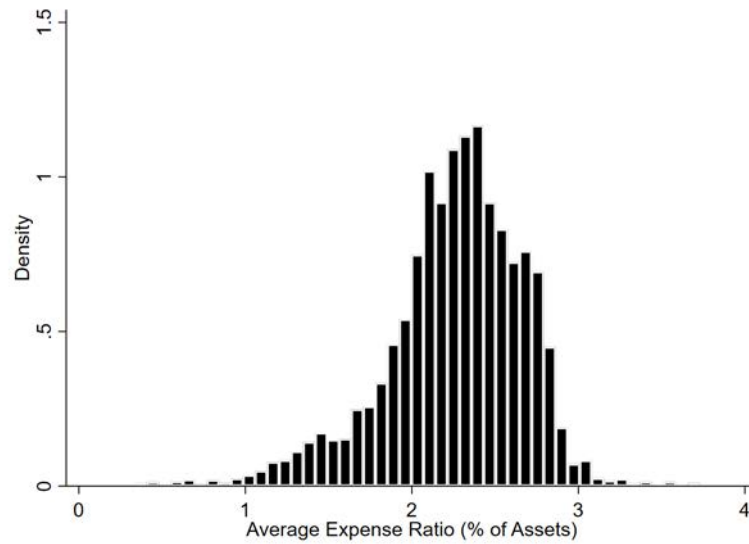
Figure 2: Fiduciary-Duty-Related Complaints



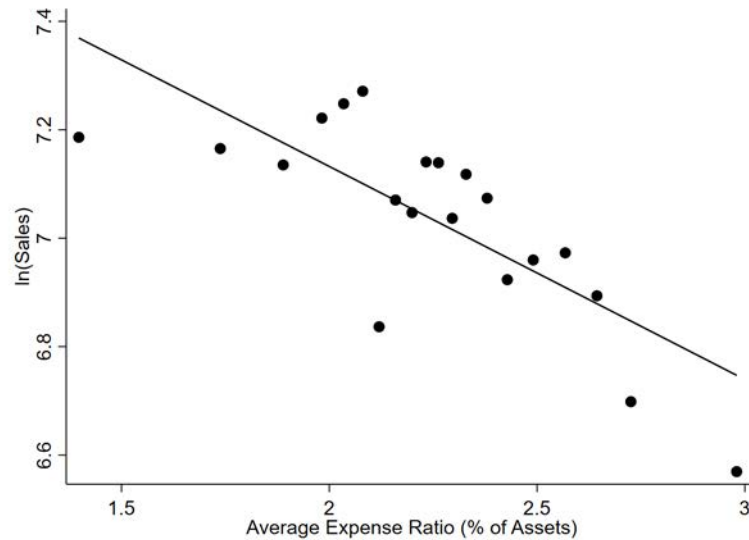
Note: Figure 2 displays the share of broker customer complaints related to the broker allegedly violating his/her fiduciary duty. The figure is constructed using data on the universe of investor complaints in the United States from FINRA's BrokerCheck website.

Figure 3: Variable Annuity Expense Ratios

(a) Distribution of Variable Annuity Expense Ratios



(b) Sales vs. Expense Ratios



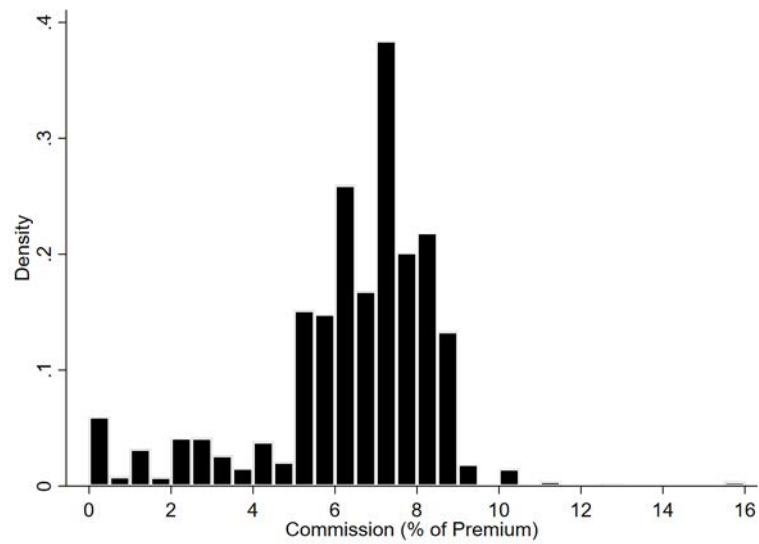
Note: Figure 3a displays the distribution of variable annuity expense ratios. Observations are at the variable annuity by quarter level over the period 1999-2019.

Figure 3b displays a binned scatter plot of quarterly variable annuity sales versus the average variable annuity expense ratios, controlling for commission rates. Observations are at the variable annuity by quarter level over the period 1999-2019.

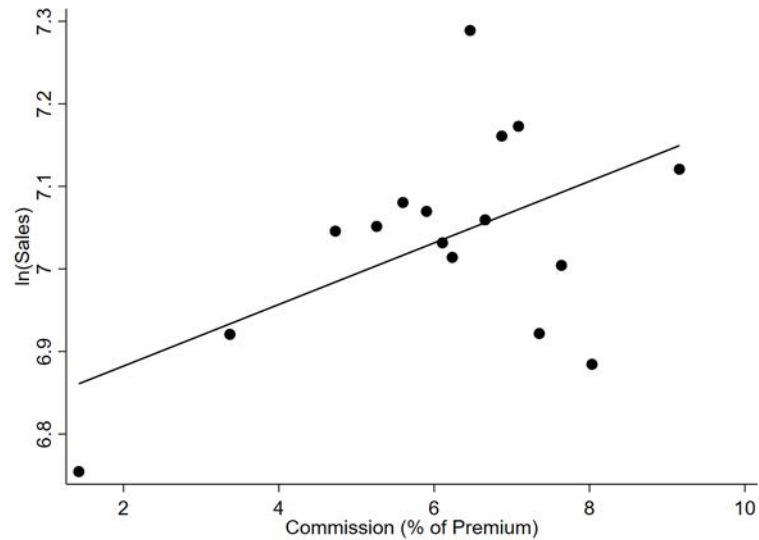


## Figure 4: Variable Annuity Commissions

(a) Distribution of Variable Annuity Commissions



(b) Sales vs. Commissions

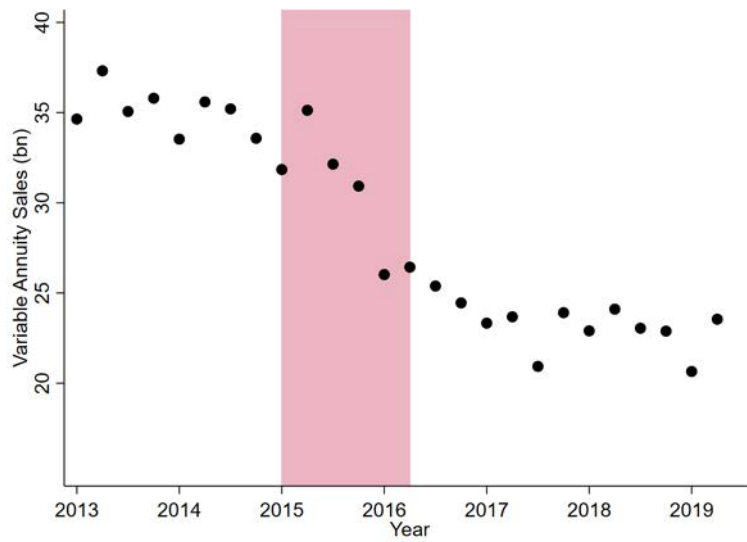


Note: Figure 4a displays the distribution of variable annuity commissions. Observations are at the variable annuity by quarter level over the period 1999-2019.

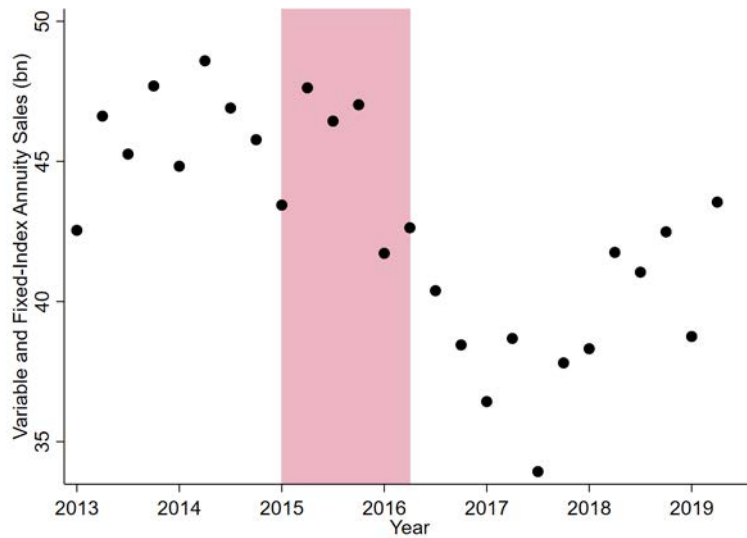
Figure 4b displays a binned scatter plot of quarterly variable annuity sales versus the associated variable annuity commission, controlling for product expense ratios. Observations are at the variable annuity by quarter level over the period 1999-2019.

Figure 5: Annuity Sales Around the DOL Fiduciary Rule

(a) Variable Annuity Sales

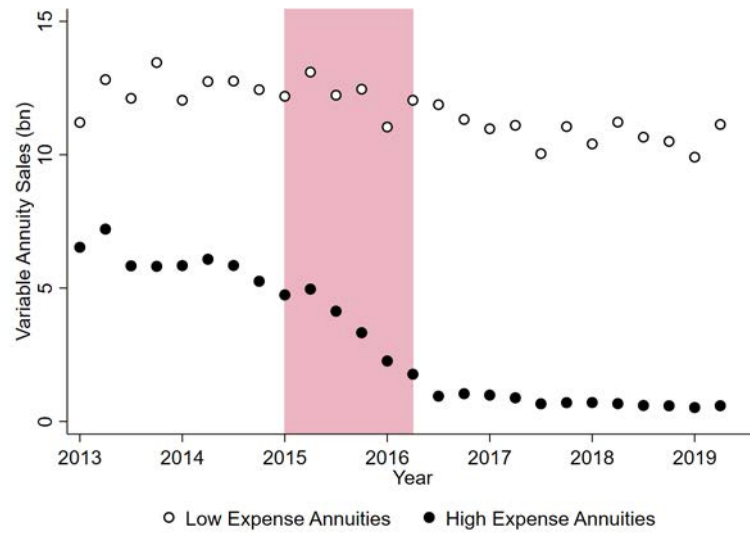


(b) Variable Annuity and Fixed Indexed Annuity Sales



Note: Figure 5a displays the time series of quarterly sales of variable annuities around the DOL fiduciary rule. Figure 5b displays the time series of quarterly sales of variable and fixed index annuities around the DOL fiduciary rule.

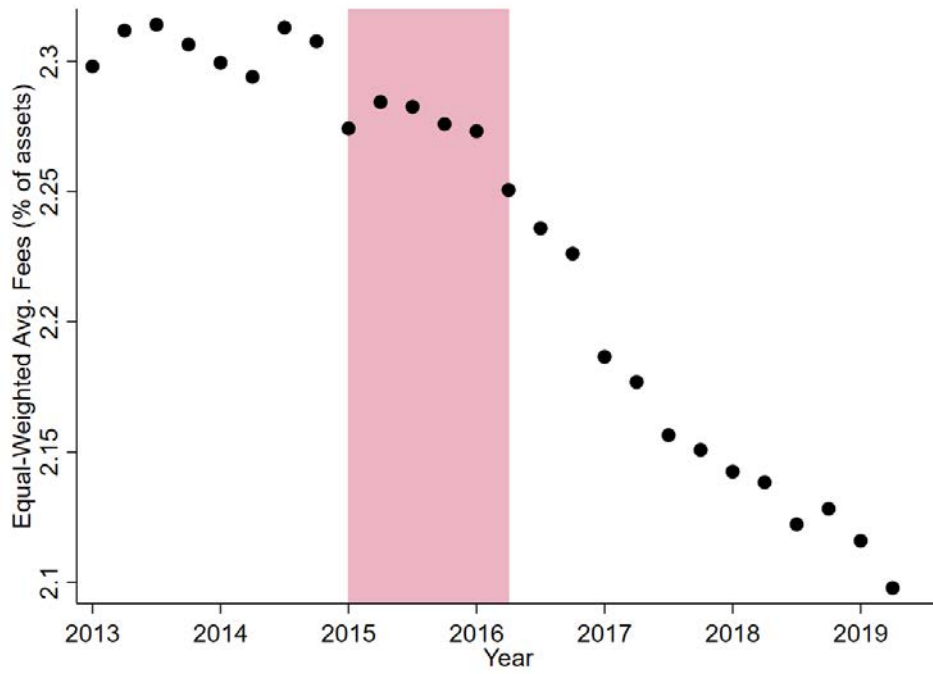
Figure 6: Sales around DOL Fiduciary Rule by High vs. Low Expense Ratios



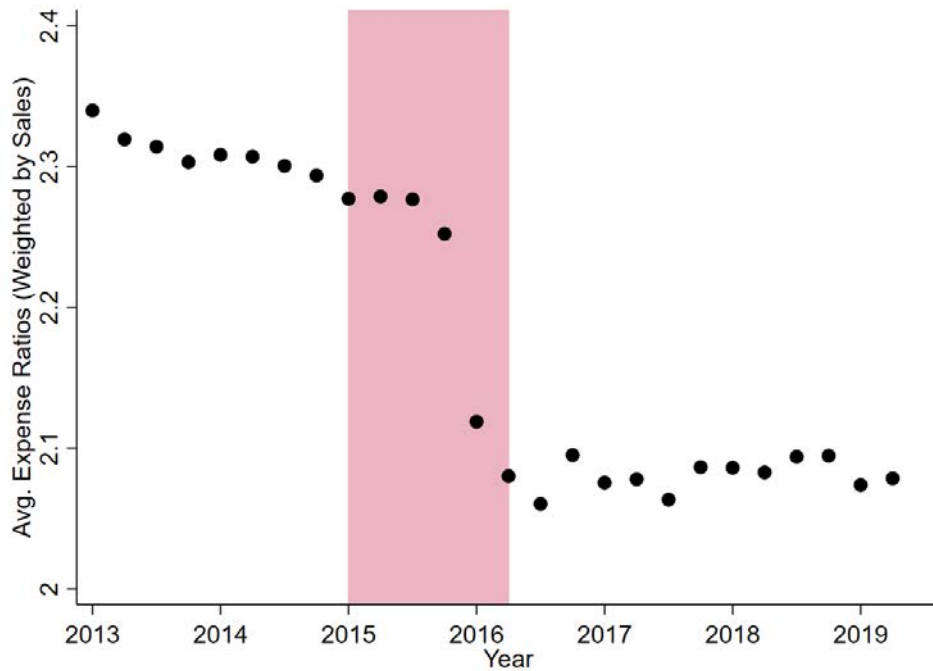
Note: Figure 6 displays the time series of quarterly variable annuity sales around the DOL fiduciary rule by expense ratios. High-expense variable annuities are defined as those with expense ratios that are in the top quartile of all variable annuities offered in each given quarter. Low-expense variable annuities are defined as those with expense ratios that are in the bottom quartile of all variable annuities offered in each given quarter.

Figure 7: Average Expense Ratios around DOL

(a) Equal-Weighted Average Expense Ratios around DOL



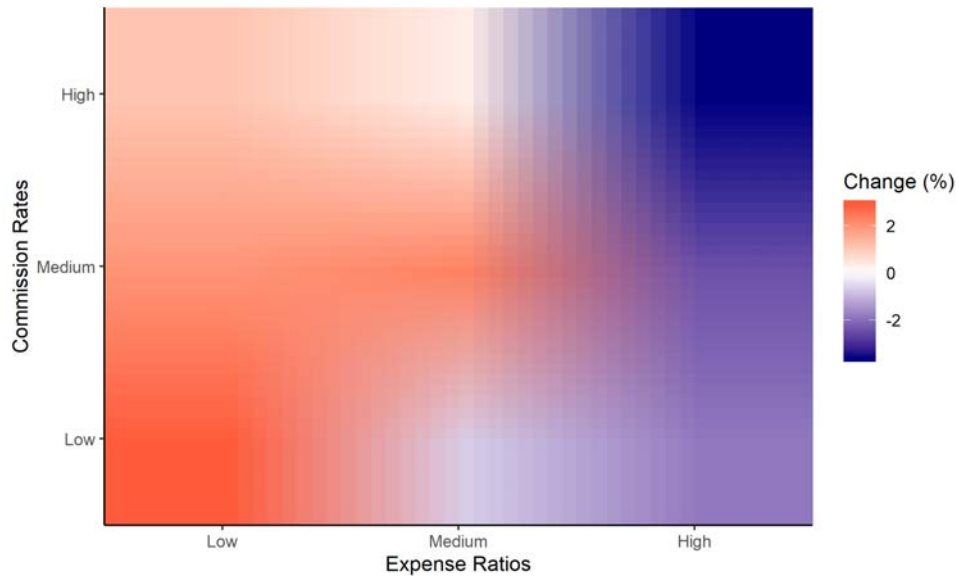
(b) Sales-Weighted Average Expense Ratios around DOL



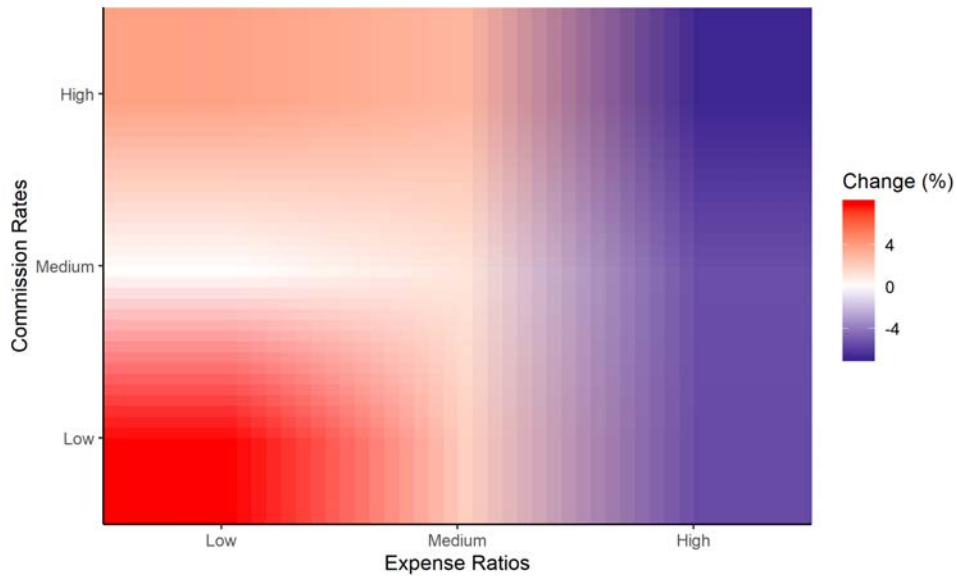
Note: Figure 7a displays the time series of the equal-weighted average expense ratios of open VA products around the DOL fiduciary rule, Figure 7b displays the sales-weighted average expense ratios.

Figure 8: Product Market Composition Change around DOL

(a) Changes in Number of Products Offered

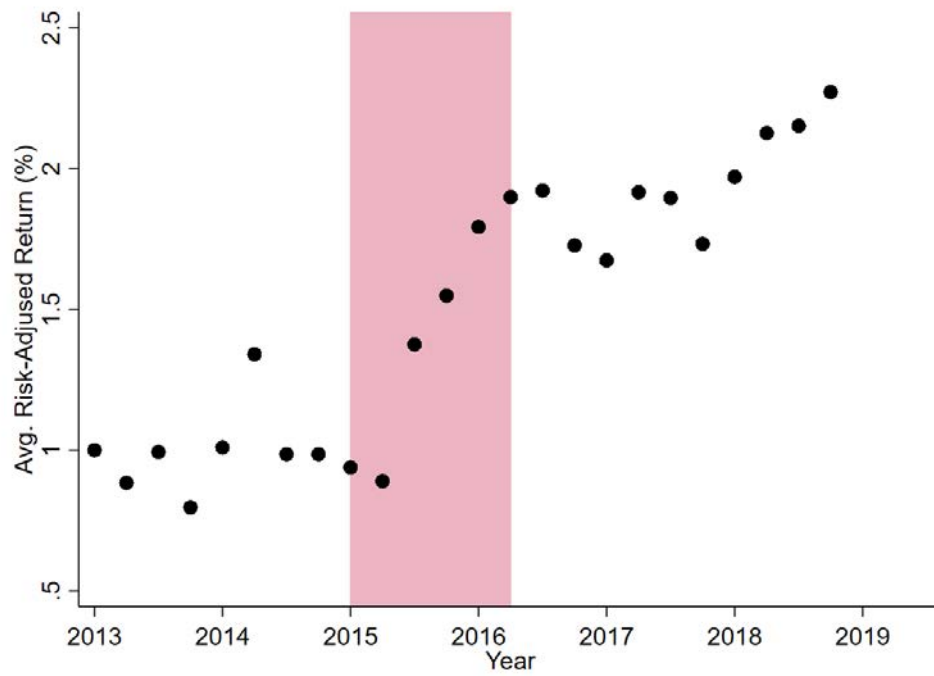


(b) Changes in Sales Volumes around DOL



Note: Figures 8a and 8b plot the changes in the number of products available for sale and the market shares in the time period before (2013-2015) and after (2016-2019) the issuance of the DOL fiduciary rule by commission rates and expense ratios. Number of products available for sale is defined as the total number of variable annuity products available for sale in each of the nine equally-spaced regions of the product space, where the expense ratio and commission rate cut-offs for each region are based on the 2013-2015 (pre-DOL) product space distribution, so changes represent shifts in the product space relative to the pre-DOL product space. Changes are measured in percentages relative to the pre-DOL levels. Increases are represented in red, decreases are represented in blue, and no change is represented by white.

Figure 9: Changes in Investor Risk-Adjusted Returns Surrounding the DOL Proposal



Note: Figure 9 displays how average annuity investor surplus, measured in terms of risk-adjusted returns, changed surrounding the Department of Labor fiduciary rule. We calculate the average annuity investor surplus among those investors who purchased annuities.

Table 1: Summary Statistics

	N	Mean	St.Dev.	Min	Max
	(1)	(2)	(3)	(4)	(5)
Quarter Sales (Millions)	15,725	91.1	269	0.00015	4,011
Policy Assets (Millions)	15,725	2,429	16,925	0	388,411
Captive Sales (Millions)	15,725	29.2	188	0	4,011
Non-Captive Sales (Millions)	15,725	49.1	160	0	3,005
Expense Ratios	15,725	2.29	0.42	0.38	4.33
Num. Subaccounts	15,725	65.7	40.8	1	460
Num. Objectives	15,725	12.8	6.81	1	34
Average Alpha	15,725	-0.091	0.20	-1.52	1.23
Commissions	15,725	6.09	2.32	0	16
Trailing Commission Rates	15,725	0.59	0.59	0	2.80

Note: Table 1 displays the summary statistics corresponding to the variable annuity database. Observations are at the variable annuity by quarter level over the period 1999Q3-2019Q2. Expense Ratios, Average Alpha, Commissions, and Trailing Commission Rates are measured in percentage points.

Table 2: Variable Annuities Sales

Dependent Variable	ln(Sales)					
	(1)	(2)	(3)	(4)	(5)	(6)
Expense Ratios	-0.35*** (0.083)	-0.27*** (0.088)	-0.35*** (0.099)	-0.16* (0.087)	-0.15* (0.092)	-0.15* (0.085)
Commissions	0.038** (0.015)	0.034** (0.015)	0.040** (0.019)	0.063*** (0.018)	0.072*** (0.019)	0.058*** (0.017)
Num. Subaccounts			0.0034*** (0.00096)	0.0055*** (0.00096)	0.0063*** (0.0012)	0.0054*** (0.00094)
Num. Objectives			0.013*** (0.0045)	0.0078** (0.0038)	0.0056 (0.0042)	0.0082** (0.0038)
Long Lock-Up			0.37*** (0.098)	0.33*** (0.088)	0.32*** (0.095)	0.33*** (0.088)
Average Alpha			0.54** (0.22)	0.90*** (0.18)	0.96*** (0.24)	0.89*** (0.18)
Has Roll-Up						0.20*** (0.060)
Observations	23,439	23,439	15,725	15,725	15,263	15,725
R-squared	0.019	0.052	0.134	0.364	0.469	0.368
Year-Quarter FEs		X	X	X		X
Other Controls			X	X	X	X
Insurer FEs				X		X
Insurer-Year-Quarter FEs					X	

Note: Table 2 displays the results corresponding to a linear regression model (eq. 1). Observations are at the variable annuity by quarter level. The dependent variable is log variable annuity sales. The independent variables, Expense Ratios, Commissions and Average Alpha are measured in percentage points. Has Roll-Up is a dummy variable equal to 1 if the variable annuity product offers a roll-up rate in the given quarter and 0 if not. Other Controls include the availabilities of benefits or riders. Standard errors are clustered at the variable annuity level and are in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .



Table 3: Variable Annuities Sales by Distribution Channel

Dependent Variable	Non-Captive Broker Sales			Captive Broker Sales		
	(1)	(2)	(3)	(4)	(5)	(6)
Expense Ratios ( $\alpha$ )	-0.092 (0.20)	-0.15 (0.24)	-0.19 (0.21)	-1.21*** (0.36)	-1.32*** (0.38)	-0.70* (0.37)
Commissions ( $\gamma$ )	0.066* (0.036)	0.088** (0.044)	0.14*** (0.044)	0.039 (0.068)	0.0056 (0.096)	0.060 (0.094)
Year-Quarter FE	X	X	X	X	X	X
Other Controls		X	X		X	X
Insurer FE			X			X
Observations	18,716	12,934	12,931	7,524	4,678	4,678
R-squared	0.050	0.158	0.380	0.058	0.161	0.546
Coefficient Tests (p-value)						
$\alpha^{Captive} - \alpha^{Broker} = 0$				0.01	0.01	0.20
$\gamma^{Captive} - \gamma^{Broker} = 0$				0.73	0.45	0.45

Note: Table 3 displays the results corresponding to a linear regression model (eq. 1). Observations are at the variable annuity by quarter level. The dependent variable is log variable annuity sales of non-captive brokers in columns (1)-(3) and log variable annuity sales of captive brokers in column (4)-(6). The independent variables Expense Ratios and Commissions are measured in percentage points. We test that captive and non-captive broker sales have the same relationship with respect to expense ratios and commissions and report the corresponding p-values. When testing the coefficients, we compare the columns with the same sets of controls (i.e. column (1) vs (4), (2) vs (5), and (3) vs (6)). Standard errors are clustered at the variable annuity level and are in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

Table 4: Variable Annuities Sales across Share Classes

Dependent Variable	ln(Sales)	
	(1)	(2)
Expense Ratios ( $\alpha$ )	-1.14*** (0.12)	-1.15*** (0.12)
Commissions ( $\gamma$ )	0.040** (0.018)	0.042** (0.018)
Long Lock-Up		0.077 (0.085)
Observations	747	747
R-squared	0.724	0.724

Note: Table 4 displays the results corresponding to a linear regression model (eq. 1) across share classes of the same product set. The dependent variable is the log quarterly sales total of each share class. Observations are at the share class by quarter level. A product set is defined as the set of all share classes of the same product. The independent variables Expense Ratios and Commissions are measured in percentage points. The variable Long Lock-Up is a dummy variable indicating that the product has an above average lock-up period. Standard errors are clustered at the product set level and are in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

Table 5: Broker Incentives: Commissions vs. Other Annuity Characteristics

Dependent Variable	Commissions			
	(1)	(2)	(3)	(4)
Expense Ratios	1.53*** (0.25)	1.61*** (0.26)	1.24*** (0.26)	0.62** (0.27)
Num. Subaccounts			-0.0026 (0.0028)	-0.0077*** (0.0023)
Num. Objectives			-0.0085 (0.0093)	-0.0030 (0.0078)
Long Lock-Up			0.75*** (0.19)	0.63*** (0.18)
Average Alpha			-0.67 (0.49)	-0.66* (0.36)
Constant	2.67*** (0.60)			
Observations	23,439	23,439	15,725	15,725
R-squared	0.080	0.088	0.192	0.496
Year-Quarter FEs		X	X	X
Other Controls			X	X
Insurer FEs				X

Note: Table 5 displays the results corresponding to a linear regression model (eq. 3). Observations are at the variable annuity by quarter level. The dependent variable is the commission rate paid to the broker and is measured in percentage points. The independent variables Expense Ratios and Average Alpha are measured in percentage points. The variable Long Lock-Up is a dummy variable indicating that the product has an above average lock-up period. Other Controls include the availabilities of benefits or riders. Standard errors are clustered at the variable annuity level and are in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

Table 6: Broker Misconduct and VA Product Expense Ratios

Dependent Variable	Complaint (1)	Damages Granted (2)	Misconduct (3)	Misconduct per year (4)
Expense Ratios	0.21*** (0.07)	5,543.50*** (1,748.44)	1.78*** (0.55)	0.22*** (0.06)
Firm Size	0.00** (0.00)	0.62* (0.31)	0.00* (0.00)	0.00*** (0.00)
Insurer AUM	0.05 (0.07)	-128.46 (1,814.77)	-0.21 (0.65)	-0.04 (0.07)
Observations	353	353	353	353
R-squared	0.19	0.09	0.12	0.18
Dep. Variable Mean	0.19	3696	5.35	0.38

Note: Tables 6 displays the results corresponding to eq. (4). Observations are at the brokerage firm by year level. The independent variable is the sales-weighted average expense ratios of all products a brokerage firm sells in a given year. The dependent variables are: the total number of variable annuity-related complaints against the firm each year in column (1); the pecuniary damages granted to complainants each year in column (2); the fraction of broker agents who have any prior misconduct disclosures in column (3); the fraction of broker agents who have had a misconduct disclosure in the given year in column (4). All dependent variables are divided by the number of broker agents the brokerage firm employs in the given year, per 100 brokers. Firm Size is the number of broker agents employed by the insurer in a given year. Insurer AUM is the log total VA assets under management by the insurance company in a given year. Dep. Variable Mean reports the mean of each dependent variable for comparison. Standard errors are clustered at the brokerage level and are in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

Table 7: Variable Annuities Sales around DOL Fiduciary Rule

Dependent Variable	ln(Sales)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Expense Ratios	-0.042 (0.15)	-0.15 (0.13)	-0.25* (0.15)	-0.31** (0.13)	-0.024 (0.15)	-0.12 (0.13)	-0.12 (0.13)
Expense Ratios × DOL	-0.39*** (0.14)	-0.31*** (0.11)			-0.43*** (0.16)	-0.37*** (0.12)	-0.37*** (0.12)
Commissions	0.060** (0.026)	0.097*** (0.025)	0.069** (0.027)	0.098*** (0.025)	0.052* (0.026)	0.085*** (0.024)	0.085*** (0.024)
Commissions × DOL			-0.020 (0.021)	-0.0027 (0.019)	0.016 (0.023)	0.027 (0.020)	0.027 (0.020)
Observations	5,835	5,834	5,835	5,834	5,835	5,834	5,834
R-squared	0.160	0.498	0.155	0.495	0.160	0.499	0.499
Year-Quarter FEs	X	X	X	X	X	X	X
Other Controls	X	X	X	X	X	X	X
Insurer FEs		X		X		X	X

Note: Table 7 displays the results corresponding to eq. (5). Observations are at the variable annuity by quarter level over the period 2013-2019. The dependent variable is the log quarterly sales total of each variable annuity. Other Controls include Number of Subaccounts, Number of Investment Objectives, Average Alpha, Long Lock-Up, and the availabilities of each benefit or rider. Other Controls in column (7) also includes the interaction terms of the availabilities of each benefit or rider with DOL. Standard errors are clustered at the variable annuity level and are in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

Table 8: Variable Annuities Sales around DOL Rule by Minimum Purchase Threshold

Dependent Variable	ln(Sales)		
	(1)	(2)	(3)
Expense Ratios ( $\alpha$ )	-0.31** (0.15)	-0.16 (0.16)	-0.31** (0.13)
Commissions ( $\gamma$ )	0.052* (0.028)	0.057** (0.027)	0.086*** (0.028)
ln(Min. Amount)	-0.071 (0.049)	-0.059 (0.051)	-0.071* (0.040)
ln(Min. Amount) $\times$ DOL	0.043 (0.035)	0.031 (0.036)	0.0051 (0.030)
Observations	5,825	5,506	5,505
R-squared	0.038	0.149	0.489
Year-Quarter FEs	X	X	X
Other Controls		X	X
Insurer FEs			X

Note: Table 8 displays the results corresponding to a linear regression model (eq. 6). Observations are at the variable annuity by quarter level over the period 2013-2019. The dependent variable is log variable annuity sales. The independent variables Expense Ratios and Commissions are measured in percentage points. The independent variable ln(Min. Amount) measures the minimum amount of dollars required to invest in a variable annuity. DOL is a dummy variable indicating that the year is equal to or greater than 2016 and corresponds to the issuance of the DOL fiduciary rule. Other Controls include Number of Subaccounts, Number of Investment Objectives, Average Alpha, Long Lock-Up, and the availabilities of each benefit or rider. Standard errors are clustered at the variable annuity level and are in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

Table 9: Demand Estimates

Dependent Variable	ln(Sales)					
	(1)	(2)	(3)	(4)	(5)	(6)
Reduced Form Parameters:						
Commissions ( $\gamma_1$ )	0.072*** (0.019)	0.11*** (0.026)	0.065*** (0.020)	0.11*** (0.027)	0.11*** (0.036)	0.083 (0.053)
Expense Ratios ( $\gamma_2$ )	-0.14 (0.093)	-0.23** (0.11)	-0.073 (0.097)	-0.21* (0.12)	-0.44** (0.19)	-0.44* (0.24)
Other Controls	X	X	X	X	X	X
Year-Quarter-Insurer FE	X	X	X	X	X	X
IV		X		X		X
F-Stat (IV)		170.49		139.75		93.31
Sample	Full	Full	Pre 2016	Pre 2016	Post 2016	Post 2016
Observation	14,899	10,284	12,043	8,220	2,856	2,064
R-squared	0.473	0.501	0.475	0.509	0.498	0.508
Structural Parameters:						
$\omega$	0.34	0.32	0.47	0.34	0.20	0.16
$1/\sigma$	0.21	0.34	0.14	0.32	0.55	0.52

Note: Table 9 displays the results corresponding to a linear regression model (eq. 9). Observations are at the variable annuity by quarter level. The dependent variable is log variable annuity sales. Columns (1)-(2) are estimated using the full sample, columns (3)-(4) are estimated using the pre-2016 sample, and columns (5)-(6) are estimated using the post-2016 sample. We estimate the model using OLS in the odd columns (1, 3, and 5) and estimate the model using instrumental variables in columns (2, 4, and 6), instrumenting for commissions and expense ratios. We construct instruments in the spirit of Berry et al. (1995) based on the product characteristics of other variable annuities available for sale at the time an annuity was launched as described in Section 7.2. Standard errors are clustered at the variable annuity level and are in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

## A Additional Figures and Tables

Table A1: Subaccount Investment Objectives

	Frequency
Growth	97%
Growth and Income	95%
Money Market	91%
Foreign Stock	91%
CorpBond - General	86%
CorpBond - High Yield	86%
Money Market - Government	83%
Balanced	81%
World Stock	78%
Government Bond - General	76%
Small Company	73%
Income	70%
Specialty - Real Estate	66%
Diversified Emerging Market	65%
Asset Allocation	64%
Aggressive Growth	59%
Worldwide Bond	58%
Equity Income	54%
World Bond	53%
Specialty - Utilities	51%

Note: Table A1 displays the top 20 most common investment objectives of subaccounts as defined by Morningstar. Frequency denotes the percentage of all variable annuity contracts that have at least one subaccount with the corresponding investment objective available for investment. Observations are at the variable annuity by quarter over the period 2006Q1-2019Q2.



Table A2: Broker Misconduct and VA Product Expense Ratios and Commissions

Dependent Variable	Complaint (1)	Damages Granted (2)	Misconduct (3)	Misconduct per year (4)
Expense Ratios	0.20** (0.08)	4,232.25* (2,209.32)	1.79* (1.05)	0.21** (0.08)
Commissions	-0.00 (0.02)	277.41 (332.78)	-0.07 (0.21)	0.00 (0.02)
Firm Size	0.00** (0.00)	0.68* (0.36)	0.00* (0.00)	0.00** (0.00)
Insurer AUM	0.06 (0.07)	-54.09 (1,839.99)	-0.15 (0.66)	-0.03 (0.07)
Observations	335	335	335	335
R-squared	0.20	0.09	0.11	0.18
Dep. Variable Mean	0.20	3819	5.45	0.38

Note: Table A2 displays the results corresponding to eq. (4) with both Expense Ratios and Commissions as control variables. Observations are at the brokerage firm by year level. Expense Ratios and Commissions are measured in percentage points. The dependent variables are: the total number of variable annuity-related complaints against the firm each year in column (1); the pecuniary damages granted to complainants each year in column (2); the fraction of broker agents who have any prior misconduct disclosures in column (3); the fraction of broker agents who have had a misconduct disclosure in the given year in column (4). All dependent variables are divided by the number of broker agents the brokerage firm employs in the given year, per 100 brokers. Firm Size is the number of broker agents employed by the insurer in a given year. Insurer AUM is the log total VA assets under management by the insurance company in a given year. Dep. Variable Mean reports the mean of each dependent variable for comparison. Standard errors are clustered at the brokerage level and are in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .

Table A3: Variable Annuity Ownership Across Demographic Groups

	2001	2004	2007	2010	2013	2016	Total
<b>Grouped by wealth deciles</b>							
1	0.00%	0.41%	0.00%	0.18%	0.00%	0.51%	0.19%
2	0.55%	0.78%	2.10%	0.89%	0.00%	0.63%	0.83%
3	0.35%	1.19%	1.33%	1.15%	0.58%	1.41%	1.01%
4	0.52%	4.56%	4.66%	2.36%	1.92%	2.53%	2.77%
5	1.17%	6.17%	4.27%	3.97%	2.32%	5.51%	3.93%
6	2.87%	5.16%	4.71%	4.26%	6.77%	4.04%	4.67%
7	5.23%	10.31%	6.75%	7.85%	6.55%	6.06%	7.11%
8	9.43%	13.60%	7.88%	7.78%	10.08%	6.79%	9.20%
9	9.53%	13.36%	8.34%	13.50%	6.67%	9.97%	10.19%
10	15.95%	14.49%	14.33%	13.70%	12.08%	13.82%	14.01%
<b>Grouped by income deciles</b>							
1	0.53%	1.97%	0.64%	1.71%	0.94%	0.85%	1.08%
2	1.72%	3.57%	4.29%	2.77%	2.44%	3.50%	3.05%
3	1.06%	7.78%	5.60%	4.33%	2.61%	4.03%	4.24%
4	3.67%	5.51%	5.32%	5.12%	3.96%	4.90%	4.76%
5	3.28%	6.43%	4.36%	6.04%	6.13%	5.31%	5.30%
6	6.01%	6.75%	5.75%	5.02%	3.26%	4.19%	5.11%
7	5.77%	6.63%	5.90%	6.30%	5.10%	5.74%	5.89%
8	6.68%	10.26%	4.76%	7.40%	8.52%	6.31%	7.27%
9	7.16%	10.82%	7.23%	6.71%	6.28%	7.16%	7.54%
10	10.25%	10.32%	10.99%	10.55%	8.27%	9.82%	10.01%
<b>Grouped by age</b>							
-34	1.74%	2.41%	0.40%	0.83%	0.73%	0.66%	1.12%
35-44	2.08%	2.23%	1.73%	1.85%	0.99%	1.27%	1.71%
45-64	5.67%	7.56%	5.28%	5.85%	4.71%	3.97%	5.45%
65+	8.43%	15.49%	14.28%	12.54%	10.86%	12.97%	12.45%
<b>Grouped by education</b>							
Less than high school	2.57%	3.32%	1.92%	3.52%	0.01%	2.37%	2.36%
High school	2.62%	5.16%	4.04%	4.36%	3.22%	3.55%	3.84%
Some college	3.94%	5.62%	5.72%	4.73%	3.82%	3.89%	4.64%
College	5.48%	8.97%	4.97%	7.12%	5.62%	6.83%	6.55%
More than college	11.94%	13.96%	12.21%	9.21%	10.47%	8.11%	10.85%
<b>Grouped by risk tolerance</b>							
Substantial risk	5.36%	5.44%	4.27%	4.10%	1.25%	4.20%	4.18%
Above average risk	6.21%	5.76%	5.85%	5.81%	4.71%	4.90%	5.54%
Average risk	6.53%	10.73%	7.15%	7.67%	6.96%	6.98%	7.66%
No risk	1.81%	4.19%	3.80%	4.01%	3.14%	3.55%	3.46%
<b>Total</b>	4.55%	6.99%	5.43%	5.56%	4.69%	5.12%	5.38%

Note: Table A3 displays the percentage of respondents that own variable annuities in different groups. We follow Brown and Poterba (2006) in defining variable annuity ownership: we identify respondents as owning variable annuities if they invest money in annuities in stocks, bonds, a mix of the two, or mutual fund/ETFs. Brown and Poterba (2006) also include real estate, which is mixed with other types of assets in the data available to us.

Table A4: Variable Annuity Ownership around 2016

	(1)	(2)	(3)	(4)	(5)	(6)
					2013 & 2016 Only	
	Logit	OLS	Logit	OLS	Logit	OLS
("Yr=2016 x Wealth Quartile 3" Omitted)						
Yr=2016 x Wealth Quartile 1			0.109 (0.450)	0.338 (0.949)	2.301** (1.082)	1.718 (1.130)
Yr=2016 x Wealth Quartile 2			0.509** (0.249)	1.936** (0.909)	1.104*** (0.342)	3.802*** (1.083)
Yr=2016 x Wealth Quartile 4			0.164 (0.182)	0.203 (0.911)	0.525** (0.227)	3.110*** (1.089)
("Yr=2016 x Income Quartile 3" Omitted)						
Yr=2016 x Income Quartile 1			0.595** (0.240)	1.806** (0.876)	0.427 (0.302)	1.919* (1.041)
Yr=2016 x Income Quartile 2			0.904*** (0.289)	2.355** (0.958)	0.827** (0.384)	2.047* (1.138)
Yr=2016 x Income Quartile 4			0.200 (0.260)	-0.221 (0.951)	0.272 (0.324)	0.404 (1.134)
("Yr=2001" Omitted)						
Yr=2004	0.494*** (0.116)	2.351*** (0.436)	0.491*** (0.116)	2.349*** (0.436)		
Yr=2007	0.194 (0.120)	0.767* (0.432)	0.190 (0.120)	0.763* (0.432)		
Yr=2010	0.190* (0.109)	0.798* (0.432)	0.188* (0.109)	0.791* (0.432)		
Yr=2013	-0.045 (0.113)	-0.265 (0.428)	-0.048 (0.113)	-0.272 (0.428)	("Yr=2013" Omitted)	
Yr=2016	-0.019 (0.111)	-0.086 (0.429)	-0.644** (0.253)	-1.675* (0.874)	-0.849*** (0.299)	-3.165*** (0.983)
("Wealth Quartile 3" Omitted)						
Wealth Quartile 1	-2.052*** (0.210)	-4.150*** (0.386)	-2.070*** (0.239)	-4.228*** (0.420)	-4.218*** (1.008)	-5.766*** (0.824)
Wealth Quartile 2	-0.580*** (0.104)	-2.523*** (0.353)	-0.676*** (0.118)	-2.875*** (0.389)	-1.242*** (0.262)	-4.787*** (0.776)
Wealth Quartile 4	0.384*** (0.075)	4.218*** (0.360)	0.358*** (0.083)	4.178*** (0.395)	-0.029 (0.161)	1.402* (0.790)
("3rd Income Quartile" Omitted)						
Income Quartile 1	0.420*** (0.100)	2.096*** (0.405)	0.325*** (0.109)	1.768*** (0.437)	0.482** (0.213)	1.884** (0.803)
Income Quartile 2	0.104 (0.116)	1.072*** (0.365)	-0.043 (0.129)	0.680* (0.399)	0.030 (0.282)	1.056 (0.809)
Income Quartile 4	0.076 (0.099)	-1.040*** (0.371)	0.049 (0.108)	-0.997** (0.408)	-0.039 (0.224)	-1.668** (0.817)

	<i>Continued</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
("Age<35" omitted)						
35-44	0.117 (0.188)	-0.416 (0.390)	0.113 (0.188)	-0.424 (0.390)	0.272 (0.370)	-0.138 (0.631)
45-64	1.146*** (0.157)	2.311*** (0.349)	1.145*** (0.157)	2.301*** (0.349)	1.544*** (0.308)	2.315*** (0.545)
65+	2.057*** (0.162)	8.799*** (0.455)	2.060*** (0.162)	8.786*** (0.455)	2.404*** (0.309)	8.428*** (0.691)
("Less than High School" omitted)						
High school	0.290 (0.199)	1.505*** (0.522)	0.306 (0.199)	1.614*** (0.524)	0.435 (0.337)	1.309* (0.755)
Some college	0.422** (0.204)	2.064*** (0.562)	0.426** (0.205)	2.126*** (0.563)	0.509 (0.341)	1.736** (0.814)
College	0.583*** (0.203)	2.938*** (0.576)	0.592*** (0.203)	3.026*** (0.578)	0.917*** (0.334)	3.443*** (0.802)
>College	0.844*** (0.205)	5.427*** (0.631)	0.853*** (0.206)	5.499*** (0.632)	0.982*** (0.340)	4.604*** (0.909)
(Amount of Risk Willing to Take, "Average Risk" omitted)						
Substantial risk	-0.205 (0.179)	-1.803*** (0.669)	-0.203 (0.179)	-1.813*** (0.669)	-0.330 (0.305)	-2.096** (1.048)
Above average risk	-0.221*** (0.084)	-1.781*** (0.369)	-0.229*** (0.085)	-1.806*** (0.369)	-0.255* (0.142)	-1.659*** (0.575)
No risk	-0.551*** (0.080)	-2.942*** (0.301)	-0.554*** (0.080)	-2.934*** (0.301)	-0.524*** (0.125)	-2.630*** (0.465)
Observations	32123	32123	32123	32123	12263	12263
Adjusted R-squared	0.1663	0.069	0.1681	0.069	0.1895	0.070

Note: Table A4 displays results regression an indicator variable of whether the respondent owns variable annuity on demographics and year dummies, using data from the Fed SCF survey. Columns (1)-(4) use data from surveys in 2001, 2004, 2007, 2010, 2013 and 2016. Columns (5)-(6) use data from surveys in 2013 and 2016 only. The demographics include wealth quartiles (based on financial wealth), income quartiles, education and the amount of risk the willing to take in financial investment when saving or making investments. The omitted categories are as follows: "Yr=2016 x 3rd Wealth Quartile" "Yr=2016 x 3rd Income Quartile" "Yr=2001" "3rd Wealth Quartile" "3rd Income Quartile" Age "<35" Education "Less than High School" Amount of risk willing to take "Average Risk". Standard errors are in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10.

## **B VA Dataset Construction**

In this appendix section, we describe the construction process of merging the Morningstar Principia and Annuity Intelligence datasets.

### **B.1 Dataset Overview**

We use two datasets to extract information on variable annuity characteristics. The first one is Morningstar Principia, in the format of historical CD-ROM series, for each quarter from 2005 to 2012. The second dataset is Morningstar Annuity Intelligence (“AnnuityIntel”), a web-based database offering the latest information on variable annuity products, which we extract between October and November 2019. Both datasets contain information including the insurance company underwriting the product, expenses and fees, sales and asset holdings, as well as benefit options available (e.g. GLWB). For each policy, the datasets also provide characteristics of the subaccounts towards which the variable annuity policyholders can allocate their investments. Data on the subaccounts include names of the funds, their investment objectives and fees. Each observation in the final dataset is a product-quarter observation, merged between the Principia dataset and the AnnuityIntel dataset.

### **B.2 Merging Process**

The merging process takes two steps. In the first step, we match variable annuities by name across the two datasets. In the second step, we construct the panel of product characteristics and sales information that we use in our analysis across the two datasets.

#### **B.2.1 Matching Contracts by Name**

We first match the variable annuities by name between Principia and AnnuityIntel. There are 2077 unique variable annuities in the Morningstar Principia dataset and 2356 in AnnuityIntel. Not all products are offered continuously throughout the coverage periods of Principia and AnnuityIntel, as there are products that are in Principia that are discontinued before October 2019, when we extracted the AnnuityIntel data. Likewise, there are products that are in AnnuityIntel that were opened for sale after 2013 and thus not in Principia. Furthermore, some products have different names between Principia and AnnuityIntel, and some products also have had name changes within each respective dataset. To address these issues, we matched the products by a hierarchical order of criteria as follows: (1) contract name, (2) insurance company, (3) RMSE of total net assets, and (4) open dates. We are able to match 1802 of the 2077 contracts (86.7%) in Principia with a corresponding contract in AnnuityIntel, and 2077 out of the 2356 contracts (88.2%) in AnnuityIntel with a corresponding contract in Principia.

### **B.2.2 Constructing Panel of Product Characteristics**

We then construct the characteristics and sales information of each product in each quarter as follows. First, for characteristics for which the Principia dataset recorded a value for the characteristic, we took the Principia value as the value for that product-quarter. Then, we backfilled earlier quarters (pre-2005 or the earliest Principia quarter) that each contract had Principia data on the characteristic for with the earliest Principia quarter's data. Then, we filled in quarters outside the Principia coverage range with historical product characteristics as follows. For product expenses, such as M&E fee and administrative fees, we manually collected information from Annuity Intelligence on the historical levels of these fees and a history of all their changes, where available. For subaccount expenses, we collect data on each individual subaccount from Annuity Intelligence and match each subaccount to the variable annuity products the subaccount is an investment option for. Since the availability of a subaccount as an investment option for each variable annuity product varies over time, we also collect data from Annuity Intelligence on the time periods over which each subaccount was offered as an investment option for each variable annuity product. We then construct a panel of subaccount characteristics, including the number of subaccounts open for investment and the expense ratios of each subaccount, and match it to the set of variable annuity products in our dataset. Finally, we compute the total expense ratio as the sum of the product expenses and subaccount expenses for each variable annuity product. For sales data, we used the AnnuityIntel data since AnnuityIntel provided a continuous time series of sales data for all products from 1999 to 2019.