Do Investors Value Intermediaries' Diversification? Evidence from Insurers' Corporate Bond Portfolios

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Abstract

Financial intermediaries pool and diversify risk on their balance sheets, yet evidence that investors value this function is scarce. Studying insurers' bond investments, I provide evidence that investors value intermediaries' diversification when transaction costs constrain their ability to diversify. I document that small, constrained insurers acquire larger shares of financial intermediaries' bonds ("financial bonds") than of comparable non-financial bonds. For a causal interpretation, I show that this preference for financial bonds declines sharply after a regulatory reform expanded insurers' access to bond exchange-traded funds. These results support a central theme in financial intermediation theory: intermediaries create value through diversification.

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1 Introduction

Financial intermediaries are widely understood to serve a core function in the economy: pooling and diversifying risk on their balance sheets (Levine, 2005). Yet, empirical evidence that investors value this function is scarce. Studying U.S. insurance companies' investments in financial intermediaries' bonds ("financial bonds") around a regulatory reform expanding insurers' access to bond exchange-traded funds, I provide direct evidence that investors use intermediaries' securities as an alternative to directly building a diversified portfolio when transaction cost constraints prevent them from doing so. To the best of my knowledge, this paper offers the first causal evidence that investors value financial intermediaries' diversification, supporting a central theoretical argument for their existence (Diamond, 1984).

Empirically testing whether investors value the diversification of financial intermediaries raises two main challenges, which the insurance setup allows me to overcome. First, insurers primarily invest in corporate bonds to earn returns on collected premiums, effectively ruling out the possibility that their bond investments serve other functions, such as access to payment services. Second, until 2017, accounting rules limited insurers' access to bond exchange-traded funds (ETFs). These investment vehicles allow investors to hold a diversified portfolio at a low cost. Their practical unavailability prior to a regulatory change in 2017 forced insurers to directly acquire bonds, making it difficult to achieve exposure to a diversified portfolio due to high transaction costs in corporate bond markets – in particular for small investors (Edwards et al., 2007). Hence, this setting preserves the marginal value of intermediaries' diversification for insurers.

Within this setting, I document three novel stylized facts that motivate the paper's main hypothesis. First, I document that small insurers, whose limited number of holdings means each position on average accounts for up to 1.5%–2% of total assets, have a significant exposure to financial bonds, allocating over 40% of their corporate bond portfolios to them – 10 percentage points more than the market portfolio. In contrast, large insurers hold broad portfolios across various industry sectors, with financial bonds making up only 20% of their corporate bond portfolios. Second, comparing the shares of financial and non-financial bonds acquired by insurers of different sizes and controlling for bond characteristics such as yield and maturity, I show that small insurers acquire roughly twice the share of a financial bond compared to an equivalent bond of a non-financial corporation. This gap in small

insurers' demand for financial bonds versus non-financial bonds is stronger for long-term bonds, particularly among A-rated bonds, which make up the majority of insurers' corporate bond portfolios.

The third stylized fact offers a potential explanation for the first two: estimating the idiosyncratic volatility of corporate bonds using standard factor models (Fama and French, 1993; Dick-Nielsen et al., 2012), I find that financial bonds exhibit lower idiosyncratic volatility than non-financial bonds, even when controlling for bond characteristics and accounting for potential bailout expectations related to systemic importance. Again, the difference is larger for long-term bonds.

Taken together, these facts suggest that small insurers' *preference* for financial bonds, that is, their tendency to acquire a larger share of a financial bond issue than of an equivalent non-financial bond, resembles an approach to indirectly diversify through the balance sheets of financial intermediaries rather than through directly holding a broad portfolio – a cost-saving strategy prior to 2017.

A regulatory reform in 2017 that expanded insurers' access to bond ETFs (hereafter, the "2017 bond ETF reform") provides a natural experiment to identify whether diversification was a key motive for small insurers' investment in financial intermediaries' bonds. Before the reform, uncertainty regarding the regulatory treatment of bond ETFs made them unattractive for insurers. Implemented in 2017 after extensive discussion, the reform granted ETFs that invest exclusively in fixed-income securities a treatment equivalent to that of bonds, effectively making bond ETFs for insurers a viable, diversified alternative to direct holdings of corporate bond portfolios. Industry-level evidence indicates that insurers rapidly adopted bond ETFs, with aggregate ETF holdings doubling from 2016 to 2017. However, total investments plateaued around $6 billion and were concentrated in ETFs that invested exclusively in corporate securities or a mix of corporate and government securities.

Consistent with the main hypothesis that small insurers' preference for financial bonds was driven by diversification motives, I find that small insurers' preference for financial bonds relative to non-financial bonds declines sharply after the 2017 bond ETF reform, in particular for long-term bonds and A-rated bonds. Instead, smaller insurers held a larger share of their invested assets in bond ETFs after the reform, suggesting they shifted from financial bonds to bond ETFs. This evidence indicates that after gaining access to a low-cost diversified alternative, financial bonds lost their appeal for small insurers.

Cross-sectional evidence exploiting heterogeneities across insurers further supports the main hypothesis. First, I show that insurers' corporate bond portfolio share allocated to financial bonds strongly depends on whether they are part of an insurance group. Insurance groups pool investment management resources, scaling up transaction sizes and, thereby, providing easier access to diversified corporate bond portfolios. Consequently, insurers operating as insurance group affiliates should have a weaker preference for financial bonds. The cross-sectional evidence supports this hypothesis: insurance group affiliates invest significantly less in financial bonds than non-group insurers, particularly among smaller insurers. Consistent with the 2017 bond ETF reform alleviating transaction-cost constraints, the importance of group affiliation decreases after the reform, in particular for small insurers. Furthermore, I examine the impact of mergers and acquisitions on insurers' portfolio allocation to financial bonds. After a merger, insurers substantially reduce their portfolio share of financial bonds, especially if the insurer is small and was not part of an insurance group prior to the merger. Overall, these findings support the main hypothesis that financial bonds served as a diversification tool for constrained insurers.

Second, I zoom in on the composition of insurers' financial bond portfolios. If small insurers' exposure to financial bonds originated in diversification motives, they should have invested in bonds issued by large, diversified financial intermediaries. Leveraging information on lending activity on the syndicated loan market, I find that small insurers allocate a larger share of their financial bond portfolios to the most active lenders, i.e., broadly diversified intermediaries whose bonds exhibit lower idiosyncratic risk than comparable bonds issued by other financial intermediaries. This pattern attenuates after the reform, again suggesting that the importance of financial bonds as a diversification tool declined when diversification through bond ETFs became feasible.

Other potential drivers fail to explain the empirical patterns. First, transaction costs alone cannot explain small insurers' preference for financial bonds: bid-ask spreads on financial bonds are slightly higher than those on non-financial bonds among the most liquid issues, and comparable for small trade sizes. This finding suggests that small insurers do not consider transaction costs alone when acquiring financial bonds. Second, I rule out that small insurers' financial bond investments are motivated by trading-relationship dynamics with dealer banks in U.S. corporate bond markets, whose over-the-counter nature might force or make it attractive for small insurers to acquire dealers' own bonds. Analyzing insurers' transaction data, I find no differences in the likelihood of buying a bond whose

issuer is also the trade counterparty across insurers of different sizes. Investment banking relationships are also unlikely to explain the results, as only a minority of insurers in general, and small insurers in particular, report having borrowed funds or issued securities, services for which a relationship with an investment bank is typically needed. Lastly, I address concerns that intra-group holdings explain the pattern. The security-level data does not show subsidiaries systematically holding bonds of their larger affiliates (fewer than 20 observations out of 4.1 million over the entire sample period). Moreover, this explanation is unlikely, as mainly non-group insurers, which cannot hold affiliate bonds by design, invest strongly in financial bonds. Finally, insurance regulation often does not recognize investments in affiliates as assets, hence placing regulatory restrictions on intra-group holdings.

Finally, I rationalize these findings with a portfolio-choice model in which fixed transaction costs and risk aversion interact to shape insurers' allocation to financial bonds. In the model, an insurer chooses a portfolio of bonds carrying idiosyncratic risk. Motivated by previous results, the bond with the lowest idiosyncratic risk represents a financial bond. For each bond acquisition, the insurer pays a fixed transaction cost that decreases with the insurer's size. The insurer is risk-averse and acts as a mean-variance investor. Risk aversion, paired with the fixed transaction cost, creates a tradeoff: diversification eases the risk-aversion constraint, but it increases transaction costs because the portfolio contains more bonds. The optimal portfolio choice introduces a cutoff rule. The insurer first invests in the financial bond because it has the lowest idiosyncratic risk, then gradually adds non-financial bonds if the marginal benefit of diversification exceeds the additional transaction cost. Because of their size, small insurers face higher transaction costs, which reduce the number of bonds that satisfy the cutoff rule and thereby tilt insurers' portfolios toward financial bonds. The model therefore predicts that small insurers optimally concentrate their portfolios in financial bonds when transaction cost constraints are sufficiently high. Decreases in transaction costs, for example through the introduction of bond ETFs, relax this constraint and drive insurers to hold relatively fewer financial bonds, consistent with the empirical evidence.

Beyond the main contribution, the results illustrate how regulatory design can create or mitigate potential transmission channels for financial fragility by shaping institutional investors' portfolio choices. Prior to the 2017 bond ETF reform, small insurers' reliance on financial bonds posed a potential channel through which shocks to the financial sector

could have propagated to insurance markets and ultimately to policyholders. In fact, small non-group insurers, i.e., those insurers that show the largest reliance on financial bonds, experienced a similar portfolio drawdown during the peak of the financial crisis as the largest insurers (see Figure 1). Despite apparently lower asset-side risk, the financial sector's higher systematic risk exposure (Dick-Nielsen et al., 2025) led small insurers to face severe portfolio drawdowns. The 2017 bond ETF reform attenuated this channel by offering small insurers an alternative for low-cost diversification.

Related literature. This paper relates to several strands of the literature. First, this paper relates to the literature on the role of financial intermediaries in the economy. Previous seminal contributions have shaped our understanding of how financial intermediaries contribute to economic growth (Levine, 2005) by enhancing the processing of information (Boyd and Prescott, 1986; Greenwood and Jovanovic, 1990), monitoring creditors (Holmström and Tirole, 1997), enabling risk sharing (Diamond and Dybvig, 1983; Allen and Gale, 1997), and providing liquidity (Holmström and Tirole, 1998; Kashyap et al., 2002).[1] Diamond (1984) argues that financial intermediaries improve welfare by allocating funds to a diversified portfolio of investment projects, effectively minimizing idiosyncratic risk and, thereby, monitoring costs. While remaining silent on the specific mechanism that makes financial intermediaries diversified – e.g., the pooling of risks or the spreading of risk across different assets – this paper provides causal empirical evidence that investors view diversification as a key distinguishing feature of financial intermediaries relative to non-financial companies.

Second, this paper contributes to the literature exploring the determinants of insurers' investment behavior. Regulatory constraints (Becker and Ivashina, 2015; Ge and Weisbach, 2021; Becker et al., 2022; Koijen and Yogo, 2023; Sen, 2023), funding stability (Knox and Sørensen, 2026), macroeconomic conditions (Ozdagli and Wang, 2020), ownership structure (Kirti and Sarin, 2023), and accounting rules (Ellul et al., 2015; Sen et al., 2026) are important factors influencing insurers' investment choices.[2] The results in this

1 A strain of this literature has focused on banks' role, pointing out that their financing structure makes them particularly suitable to provide liquidity (Gorton and Pennacchi, 1990), to force diligent risk-taking behavior (Calomiris and Kahn, 1991; Flannery, 1994) and serves as commitment tool to long-term relationships with borrowers (Berlin and Mester, 1999; Diamond and Rajan, 2001b,a).

2 Other studies have focused on the implications of insurers' investment decisions on asset prices (Ellul et al., 2011; Fache Rousová and Giuzio, 2019; Chodorow-Reich et al., 2021), financial stability (Girardi et al.,

paper complement the existing literature by showing that constrained insurers also select investments based on the qualitative properties of issuers, which affect bonds' risk profiles but are not necessarily reflected in credit ratings or other bond characteristics.

Third, this paper adds to the growing literature on the interconnections between insurance companies and other financial intermediaries. A strand of this literature has focused on the role of insurers as a funding source for banks (Bosshardt et al., 2024) and, more recently, for private credit (Foley-Fisher et al., 2023; Meisenzahl et al., 2025; Bhardwaj et al., 2025; Fringuellotti and Santos, 2026), with the latter raising concerns about insurers' exposure to financial contagion. By showing that diversification constitutes a key motive for insurers' heterogeneous exposure to financial intermediaries' bonds, this paper contributes to the understanding of one potential channel of financial contagion.

The remainder of this paper is organized as follows. In Section 2, I provide an overview of the institutional background and describe the data sources and sample construction. Section 3 presents three novel stylized facts that motivate the paper's main hypothesis: small insurers viewed financial bonds as a means of diversification. Section 4 employs a difference-in-differences approach around the 2017 bond ETF reform to deliver causal evidence in favor of this hypothesis. In Section 5, I provide additional evidence and rule out alternative explanations. In Section 6, I illustrate the key mechanism in a model that generates predictions consistent with the empirical results. Section 7 concludes.

2 Institutional Background and Data

This section describes the institutional background of insurers' corporate bond investments and the data used in the empirical analysis.

2.1 Institutional Background

Insurance companies' core business is to assume risks from households and firms in exchange for premium payments. The premiums collected are invested in financial markets to generate returns until claims are paid.[3] Insurers allocate most of their investments to

2021; Ellul et al., 2022; Bini, 2024; Kubitza et al., 2025) and real economic activity (Massa and Zhang, 2021; Manconi et al., 2016; Liu et al., 2025; Coppola, 2025; Kubitza, 2026).

3 Warren Buffett, in his 2018 letter to the shareholders of Berkshire Hathaway, summarized insurers' business model: "This collect-now, pay-later model leaves P/C companies holding large sums – money we call

fixed-income securities, with corporate bonds accounting for the largest share – about 40 percent of total investments (see Appendix Figure B.1). Insurers' investment choices are strongly shaped by their liability structures (Knox and Sørensen, 2026) and by regulatory factors, most importantly, statutory accounting and risk-based capital (RBC) requirements (Becker and Ivashina, 2015; Ellul et al., 2015; Ge and Weisbach, 2021; Becker et al., 2022; Koijen and Yogo, 2023; Sen, 2023; Sen et al., 2026). Because insurers primarily invest in corporate bonds to earn returns on collected premiums, their portfolio allocations offer a clean setting to study investment motives, uncomplicated by other reasons for holding financial intermediaries' securities, e.g., access to payment services.

In the U.S., insurers are regulated at the state level, but state regulators coordinate through the National Association of Insurance Commissioners (NAIC) to define common statutory accounting principles. These rules determine permissible asset classes and their accounting treatment. Sparked by changes in financial markets, e.g., the rise of ETFs and other new investment vehicles, the NAIC frequently revises these principles to clarify classification and valuation methods. Later sections exploit one such reform – the 2017 change in the accounting treatment of bond ETFs – to identify whether financial bonds served insurers as a substitute tool for diversification.

Corporate bond markets are characterized by sizable transaction costs (Bao et al., 2011; Dick-Nielsen et al., 2012), which are particularly high for small trade sizes (Schultz, 2001; Edwards et al., 2007; Harris, 2015; Pintér et al., 2024). For example, Reichenbacher and Schuster (2022) estimate that transaction costs for small trades (around $10,000) are up to eight times higher than for block trades (above $5 million). These frictions make it particularly costly for smaller investors to diversify directly across a wide range of issuers. Against this background, bond ETFs dedicated to corporate bonds, or those that include corporate bonds to replicate the aggregate bond market, have grown rapidly, offering a low-cost diversification solution. The total outstanding amount of corporate bonds held by bond ETFs increased from $78 billion in 2011 to $533 billion by the end of 2019, with bond ETFs now holding 4 percent of total outstanding corporate bonds, up from less than 0.8 percent a decade earlier.[4]

"float" – that will eventually go to others. Meanwhile, insurers get to invest this float for their own benefit. Though individual policies and claims come and go, the amount of float an insurer holds usually remains fairly stable in relation to premium volume." (Buffett, 2019, p. 9)

2.2 Data

To study insurers' corporate bond investment behavior in this environment, I draw on the following data sources. The main data consist of insurers' end-of-year corporate bond holdings from 2011 to 2019, reported in annual filings with the NAIC. I access detailed security-level information on corporate bond portfolios from Schedule D Part 1, including the amount held and acquisition date. I merge these holdings with issue-level data from Mergent's Fixed Income Securities Database (FISD), which provides information on offering amounts, issuers' industry classifications, maturity dates, yields, and S&P credit ratings.[5]

From these sources, I build two complementary data sets. The first is an insurer-sector-year panel that tracks the composition of each insurer's corporate bond portfolio across industry sectors over time. Industry classifications follow the two-digit industry sector definitions of the North American Industrial Classification System (NAICS), where code 52 indicates the "Finance and Insurance" sector.[6] I drop bonds from the industry sector "Public Administration" (NAICS code: 92). For each insurer-year observation, I compute the share of the portfolio par value allocated to each industry. Using par values proxies best for insurers' actual bond demand, as it mutes changes in valuation. Additionally, I compute several other portfolio statistics, such as the number of securities held and portfolio concentration, measured by the Herfindahl-Hirschman index across sector holdings. I supplement this data with insurer-level financials, including total assets, the risk-based capital (RBC) ratio, return on equity, and leverage.

The second dataset is a bond-level sample of all issuances between 2011 and 2019. The dataset focuses on two key variables: (1) the share of each bond issue acquired by insurers, *Issue share*, and (2) the bond's idiosyncratic risk, $\sigma(\hat{\varepsilon})$. First, following Becker et al. (2022), I compute the *Issue share* by aggregating insurers' holdings from Schedule D in the year of issuance and dividing by the bond's offering amount. The *Issue share* is computed

4 Source: Financial Accounts of the United States - Z.1, Series LM563063003 ("Exchange-traded funds; corporate and foreign bonds; asset") and FL893163005 ("All sectors; corporate and foreign bonds; liability").

5 To ensure that the analysis considers only bonds from corporate issuers, I apply two filtering steps. First, I identify insurers' corporate bond holdings in the NAIC Schedule D data, which requires separate reporting sections for bonds issued by U.S. government agencies, e.g., government-sponsored enterprises. Second, I use the bond type variable in Mergent FISD and keep only bonds issued by corporate entities.

6 In Appendix D, I provide details on the NAICS definition of the financial industry and the key issuers in this sector during the sample period.

separately across seven insurer-size groups based on total assets, with breakpoints at $50 million, $100 million, $500 million, $1 billion, $5 billion, and $10 billion.

Second, I estimate bonds' idiosyncratic risk utilizing a factor model following Fama and French (1993). More specifically, I regress monthly excess returns for each bond, constructed from bond prices (TRACE)[7] and coupon information (Mergent), on three factors: the market excess return from Ken French's website and the term and default spreads from Welch and Goyal (2008). The standard deviation of the estimated residuals, $\sigma(\hat{\varepsilon})$, serves as a measure of idiosyncratic risk. To ensure reliable estimation, I calculate idiosyncratic risk only for bonds with at least 12 months of return data and exclude return observations from the final year before maturity. Appendix A.1 provides detailed information on the estimation of bonds' idiosyncratic risk.

The final bond-level dataset includes further issue-level information, e.g., yield spreads, maturity, and is merged with firm-level fundamentals from Compustat.[8] Additionally, I use the Financial Stability Board's annual lists of globally systemically important financial institutions (SIFIs) to identify issuers (or their parents) designated as SIFIs at least once between 2011 and 2019.[9]

Table 1 reports summary statistics for the main variables of both datasets.[10] All continuous variables are winsorized at the 1% and 99% levels. The median insurer holds about $120 million in total assets. For a given industry sector, the majority of insurers do not invest in it at all – the median portfolio share is 0 percent – though insurers allocate, on average, more than one-third of their bond portfolios to financial bonds. In the bond-level sample, the average bond issuance totals roughly $670 million, and approximately 29 percent of issuances originate from financial entities. Insurers acquire a substantial share of the average bond issue, with larger insurers naturally accounting for a greater share. Finally, the average bond exhibits an idiosyncratic return volatility of about 1.67 percent over its lifetime.

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7 I clean the TRACE Enhanced data set following Dick-Nielsen (2009) and Dick-Nielsen (2014).

8 To calculate yield spreads, I use reported offering yields from Mergent FISD and maturity-matched Treasury yields calculated using Svensson (1994)'s formula for zero-coupon spot rates with parameter estimates from the Federal Reserve (federalreserve.gov).

9 Global systemically important financial institutions are large banks and insurers that pose "greater risks [...] to the global financial system" (Financial Stability Board, 4 November 2011). For a complete list of the systemically important financial institutions, see fsb.org.

10 Appendix Table C.1 provides additional summary statistics for the other variables.

3 Stylized Facts

This section documents three new stylized facts that motivate this paper's main hypothesis: small insurers invested in financial bonds as a substitute for direct diversification. First, small insurers concentrate their corporate bond holdings in a few financial bonds, while large insurers hold broadly diversified portfolios across many industries. Second, small insurers display a strong preference for financial bonds, that is, they acquire a larger share of a financial bond than of an otherwise comparable non-financial bond, with the gap being larger at longer maturities. Third, financial bonds carry lower idiosyncratic risk than comparable non-financial bonds, with the gap again being larger at longer maturities. Taken together, these facts are consistent with small insurers using financial bonds to indirectly diversify – a hypothesis I test causally in Section 4 by exploiting a 2017 regulatory reform that expanded insurers' access to low-cost bond ETFs.

3.1 Fact 1: Small Insurers Have a Large Exposure to Financial Bonds

As one of the largest investor groups in the U.S. corporate bond market, insurers collectively hold a considerable share of bonds issued by nearly every major U.S. corporation.[11] This aggregate importance, however, masks considerable heterogeneity among insurers, with the majority holding only a limited number of securities. Figure 2 shows that smaller insurers typically hold only a few securities in their corporate bond portfolios (black graph), translating into a higher exposure to the single position for smaller insurers (blue graph). The smallest insurers hold fewer than 20, whereas large insurers maintain portfolios spanning hundreds of securities. Because the share of assets allocated to corporate bonds is stable across insurer size (see Appendix Figure B.3), this narrower security count leads directly to concentrated position sizes: among small insurers, the average bond position accounts for 1.5 percent or more of total assets.

This concentration of small insurers' holdings in a few securities does not necessarily reflect an under-diversified portfolio, as small insurers could simply hold one or two bonds from each industry sector. Therefore, I examine the industry composition of insurers'

11 Insurers held around 13 percent of the outstanding amount of the financial sector's corporate bond debt between 2011 and 2019 (see Appendix Figure B.2). These investments represented more than 4 percent of the insurance industry's total assets.

portfolios across size. Focusing first on insurers' allocation to the financial industry, Figure 3 plots the average portfolio share of financial bonds relative to their share in the corporate bond market portfolio for different insurer sizes.[12] The figure suggests that small insurers' portfolios are strongly focused on financial bonds. The smallest insurers overweight financial bonds by 10 percentage points relative to the market, whereas the largest insurers underweight them by almost 10 percentage points. As financial bonds consistently represent around 30 percent of the overall market (see Appendix Figure B.4), the smallest insurers, on average, allocate roughly 40 percent of their corporate bond portfolios to financial issuers.

The documented overweighting of financial bonds could reflect a broader tendency of small insurers to concentrate in the largest industries, rather than a unique tilt toward financial bonds. To test whether this pattern is unique to financial bonds, I estimate the following regression:

$$\text{Portfolio share}_{i,s,t} = \sum_{s} \beta_s \, \mathbf{1}(\text{Industry})_s \times \text{Log(Assets)}_{i,t} + \boldsymbol{\gamma} \boldsymbol{X}_{i,t} + u_{i,s} + v_t + \varepsilon_{i,t}. \qquad (1)$$

The dependent variable, *Portfolio share*$_{i,s,t}$, is the share, in par values, of insurer i's corporate bond portfolio invested in bonds from industry sector s in year t. $\mathbf{1}(\textit{Industry})_s$ is an indicator variable that takes the value of 1 if the portfolio share pertains to industry sector s. *Log(Assets)*$_{i,t}$ denotes the size of insurer i in year t. $\boldsymbol{X}_{i,t}$ is a set of control variables that include insurers' leverage, return on equity, RBC ratio, and the Herfindahl-Hirschman index across sector-level bond holdings. $u_{i,s}$ and v_t denote insurer-industry and year fixed effects. Standard errors are clustered at the insurer level to account for serial correlation in insurers' financials and investment behavior.

The coefficients β_s measure the relationship between insurer size and portfolio share for each industry s. Figure 4 plots these estimates with their corresponding 95% confidence intervals. Only the coefficient for financial issuers is statistically significant and economically meaningful: a 1 percent increase in insurer size is associated with a 2.4-basis-point decrease in the portfolio share of financial bonds. Put differently, an insurer twice as large allocates roughly 2.4 percentage points less of its corporate bond portfolio to financial issuers.

12 To construct the corporate bond market portfolio, I proxy the outstanding amount in each industry sector using offering amounts from Mergent FISD and track the portfolio of active bonds. I include only those bonds that appear at least once in the cleaned TRACE data set.

Notably, larger insurers do not favor any specific industry; instead, they spread their portfolios more evenly across sectors.

Appendix Table C.2 shows that the substantial heterogeneity in insurers' investment in financial bonds remains robust across a wide range of specifications, using different combinations of fixed effects. Across all specifications, the negative relationship between insurer size and the portfolio share allocated to financial bonds remains highly significant, with an economic magnitude of roughly 2.4–2.8 basis points per 1 percent increase in total assets. Appendix Table C.3 further demonstrates that this relationship extends beyond the corporate bond portfolio to insurers' overall balance sheets by varying the denominator of the dependent variable. As the denominator broadens – from total fixed income holdings in columns (1) and (2), to total invested assets in columns (3) and (4), and total assets in columns (5) and (6) – the estimated effect size decreases, yet the negative relationship remains robust and economically meaningful.

Taken together, these results show that small insurers hold narrow corporate bond portfolios that systematically concentrate on financial bonds – a pattern that extends beyond the corporate bond portfolio to insurers' overall balance sheets. These findings lead to the first stylized fact.

Fact 1. *Insurers' exposure to financial bonds is inversely related to their size. Notably, small insurers hold narrow corporate bond portfolios, concentrated in securities issued by financial intermediaries ("financial bonds"), which represent a sizable fraction of their assets.*

3.2 Fact 2: Small Insurers Prefer Financial Bonds

Small insurers' substantial exposure to financial bonds raises the question of what drives their reliance on financial bonds. One potential explanation for small insurers' tilt toward financial bonds is that these securities may offer higher yields for a given level of regulatory risk (Becker and Ivashina, 2015) or maturities that better match the duration of small insurers' liabilities. To test whether differences in bond characteristics drive insurers' heterogeneous investment patterns, I estimate the following regression across size groups:

$$\text{Issue share}_b = \beta\, \mathbf{1}(\text{Financial})_b + \boldsymbol{\gamma} \boldsymbol{X}_b + u_{m,r,t} + v_{SIFI,t} + \varepsilon_b. \tag{2}$$

The dependent variable, *Issue share*$_b$, is the share of bond issue b acquired by insurers. The main independent variable, $\mathbf{1}(\textit{Financial})_b$, is an indicator variable that takes the value of 1

if bond b is a financial bond, that is, bond b's issuer belongs to the financial industry (NAICS code: 52 "Finance and Insurance"). $\boldsymbol{X}_b$ includes bond-level controls, i.e., the yield spread, log maturity, and indicators for credit enhancement and callability. Furthermore, I include granular maturity-rating-issuance year fixed effects, $u_{m,r,t}$, with maturity buckets defined as: less than 3 years, between 3 and 5 years, between 5 and 7 years, between 7 and 10 years, between 10 and 20 years, and greater than 20 years. Standard errors are clustered at the parent-year level.

As financial intermediaries might be particularly compelling to investors due to their systemic importance, I control for bailout expectations using the definition of SIFIs. SIFIs are perceived as too important to fail and, therefore, may enjoy an implicit government guarantee.[13] To account for implicit bailout expectations, I include $v_{SIFI,t}$, an indicator variable for SIFI-issued bonds, interacted with the year of issuance.

The coefficient β captures insurers' demand for financial bonds relative to non-financial bonds. If differences in observable bond characteristics explained the earlier results, β should be close to zero. Figure 5 shows the estimates of β by size group. To make the estimates comparable, I scale them by the mean of the dependent variable; for example, the coefficient for insurers with assets below $50 million is divided by 0.1, the mean of this variable (see Table 1). Panel (a) reveals that β is positive and significant for small insurers, near zero for mid-sized insurers, and negative for large ones. The smallest insurers acquire twice as much of financial bonds as of comparable non-financial bonds, while large insurers acquire about 20 percent less. Panel (b) shows that this pattern is even more pronounced for A-rated bonds, which were particularly attractive for insurers until 2020 due to coarse regulatory capital requirements (Becker and Ivashina, 2015).[14] Among these bonds, the smallest insurers acquire more than twice as much of financial bonds as of non-financial bonds.

13 Ueda and Weder di Mauro (2013) and Warburton et al. (2022) show that SIFIs' funding costs and credit spreads still reflect investors' expectations of an implicit government guarantee. However, Berndt et al. (2025) document a decline in the probability of a government bailout for banks after the global financial crisis and, in turn, a decrease in the value of the implicit guarantee.

14 Until 2020, the NAIC defined security-level risk weights based on six categories, NAIC Designations 1–6, that bundled several granular credit ratings (see Appendix Table C.4). Becker and Ivashina (2015) show that this coarse regulation incentivized insurers to target the lower bound of credit ratings within an NAIC designation. Consistent with this, A-rated bonds account for 30 to 45 percent of insurers' corporate bond holdings in my sample, with smaller insurers investing relatively more in A-rated bonds than larger insurers (see Appendix Figure B.5).

These results indicate that small insurers prefer financial bonds over non-financial bonds, even when accounting for observable bond characteristics. Next, I examine whether the preference varies with bond maturity. As insurers typically hold bonds to maturity and use them only in the case of severe liquidity needs (Ge and Weisbach, 2021; Liu et al., 2025), a bond's maturity determines the time horizon over which insurers are exposed to that bond. I interact the financial bond indicator with standardized $Log(Maturity)_b$ in Table 2, replicating in column (1) the baseline result from Panel (a) of Figure 5 before introducing the interaction in column (2). The positive and significant coefficient on the interaction term indicates that small insurers' preference for financial bonds intensifies with maturity, and the magnitudes are economically meaningful. At the average bond maturity (around 8 years), small insurers acquire roughly twice as much of a financial bond as of a non-financial bond with the same characteristics, and a one-standard-deviation increase in maturity (around 4 years) widens this gap by an additional 40 percent. Column (3) of Table 2 shows that this pattern is even more pronounced for A-rated bonds, where small insurers acquire 157 percent more of a financial bond than a non-financial bond with the same average maturity and characteristics, with a one-standard-deviation increase in maturity widening the gap by a further 66 percent. Columns (4) to (6) show a comparable, though smaller, effect for insurers with total assets between $50 million and $100 million.

Appendix Table C.5 confirms the robustness of the main results for small insurers. First, I include additional bond-level controls for liquidity, measured as the bid-ask spread at issuance, as well as issuer-level controls, i.e., company leverage, EBIT margin, and cash balance, for both the full sample of bonds, columns (1) and (2), and bonds rated between A+ and A-, columns (3) and (4). Second, in columns (5) and (6), I implement propensity score matching within rating-maturity buckets, based on bonds' yield spread, log maturity, and indicators for credit enhancement and callability to ensure comparability across bonds. Columns (7) and (8) repeat the analysis, including the additional controls after matching. Finally, columns (9) and (10) combine the matching approach and additional controls for the subsample of bonds rated A+ to A-. Across all specifications, small insurers' preference for financial bonds remains robust, and this preference is particularly pronounced for bonds with longer maturities.

I summarize the previous findings in the second stylized fact.

Fact 2. *Small insurers display a strong preference for financial bonds, acquiring a larger share of a financial bond than of an otherwise comparable non-financial bond. This preference intensifies with bond maturity.*

3.3 Fact 3: Financial Bonds Exhibit Lower Idiosyncratic Risk

Since observable bond characteristics do not explain small insurers' preference for financial bonds, this preference likely reflects some other feature of financial bonds. In contrast to non-financial companies, financial issuers are intermediaries that pool and diversify risk (Diamond, 1984). Consequently, their securities should exhibit lower idiosyncratic risk. Figure 6 plots the median idiosyncratic risk, measured as the standard deviation of the residuals estimated from Fama and French (1993) two-factor models enhanced with market risk, across all two-digit NAICS industries. Consistent with the notion that financial intermediaries diversify risk, their bonds exhibit the lowest idiosyncratic risk.

To formally test whether financial bonds exhibit lower idiosyncratic risk than non-financial bonds, I estimate the following regression model:

$$\sigma(\hat{\varepsilon})_b = \beta \; \mathbf{1}(\text{Financial})_b + \boldsymbol{\gamma} \boldsymbol{X}_b + u_{m,r,t} + v_{SIFI,t} + \varepsilon_b. \tag{3}$$

The dependent variable, $\sigma(\hat{\varepsilon})_b$, is the standard deviation of bond b's residuals estimated from the augmented Fama-French two-factor model. The controls $\boldsymbol{X}_b$ include the same set of bond characteristics as in Equation (2), plus the bond's log issue size and median lifetime bid-ask spread as proxy for liquidity (Han and Lesmond, 2011; Han et al., 2015). $u_{m,r,t}$ now denotes maturity-rating-issuance year fixed effects, with the rating being the highest rating over the bond's lifetime. All other variables are defined as in Equation (2).

The coefficient β captures the difference in idiosyncratic risk between financial and non-financial bonds. Table 3 presents the results of Equation (3) and confirms the suggestive evidence from Figure 6. Controlling for bond characteristics, financial bonds exhibit significantly lower idiosyncratic risk than non-financial bonds. Column (1) indicates that financial bonds have, on average, a 0.129 percentage point lower idiosyncratic risk than comparable non-financial bonds. Column (2) interacts the financial bond indicator with standardized *Log(Maturity)*$_b$, revealing that this difference is concentrated among long-term bonds. While short-term bonds exhibit only slight differences in idiosyncratic risk, the gap between financial and non-financial bonds increases with maturity. This finding aligns with

the intuition that idiosyncratic risk plays a more important role for long-term bonds, for which issuer characteristics matter more. Columns (3) and (4) replicate the analysis for bonds rated between A+ and A-, yielding similar results. Although financial bonds generally exhibit lower idiosyncratic risk, the maturity effect is stronger among A-rated bonds than in the full sample.

Appendix Table C.6 shows that the main results are robust across a wide range of alternative specifications. Columns (1) and (2) use credit ratings at issuance instead of the highest rating. Columns (3) and (4) add issuer-level controls consisting of company leverage, EBIT margin, and cash balance, to the baseline specification. In columns (5) and (6), I apply propensity score matching within rating-maturity buckets, based on bonds' yield spread, log issue size, log maturity, and bid-ask spread, and indicator variables for credit enhancement and callability. Columns (7) and (8) combine the matching approach with the additional controls. Finally, in columns (9) and (10), I re-estimate idiosyncratic risk using a four-factor model that augments the baseline three-factor model with the liquidity factor from Dick-Nielsen et al. (2012). Across all specifications, long-term financial bonds consistently exhibit lower idiosyncratic risk than comparable non-financial bonds, with the difference being particularly pronounced among A-rated issues. Finally, Appendix E provides further robustness checks showing that the difference in idiosyncratic risk is not driven by the definition of financial bonds used in the analysis.

I summarize the third stylized fact as follows:

Fact 3. *Financial bonds exhibit lower idiosyncratic risk than bonds issued by other industries, and this difference intensifies with maturity.*

3.4 Interpretation

Taken together, the first two facts reveal an apparent paradox. Although small insurers have lower risk-taking capacity (Ge and Weisbach, 2021) and should have stronger incentives to diversify, they instead concentrate their corporate bond portfolios in a narrow set of financial issuers.[15] Differences in yields, liquidity, maturities, or ratings cannot explain this pattern. The third fact, that is, financial bonds exhibit lower idiosyncratic risk, could explain this

15 Consistent with their lower risk-taking ability, small insurers report lower average portfolio yields than large insurers, indicating a more conservative investment approach (see Appendix Figure B.6). This pattern holds for both their overall corporate bond portfolios and their financial bond portfolios.

paradox. Because transaction costs in corporate bond markets are disproportionately high for small investors, building a diversified portfolio is costly for small insurers. Concentrating in the bonds of financial intermediaries – whose own portfolios are diversified – allows them to indirectly reduce exposure to idiosyncratic risk at lower cost. Put differently, small insurers appear to have used financial bonds as a means to access a diversified portfolio at lower cost – a hypothesis I test in the next section by exploiting variation in insurers' access to bond ETFs.

4 The 2017 Reform of Bond ETFs' Regulatory Treatment

This section exploits a regulatory reform enacted in 2017 to provide causal evidence that diversification motives drive small insurers' investments in financial bonds. The reform clarified the regulatory treatment of bond ETFs, effectively giving insurers for the first time access to low-cost vehicles for holding diversified portfolios of corporate bonds. I show that small insurers' preference for financial bonds declined sharply after the reform, consistent with these bonds having served as a substitute for direct diversification.

Prior to 2017, insurers faced substantial challenges when investing in bond ETFs. Although the NAIC included bond ETFs in their definition of bond securities since 2004, allowing insurers to report a set of pre-approved bond ETFs as part of their fixed income holdings, state regulators and insurers alike lamented the lack of clear guidance on accounting and valuation of bond ETFs (National Association of Insurance Commissioners, 2013).[16] This lack of clarity created significant uncertainty for insurers and effectively prevented insurers from using bond ETFs as an investment vehicle to access a diversified (corporate) bond portfolio.[17] In response to these and similar issues with other emerging investment vehicles, the NAIC initiated the "Investment Classification Project" in 2013 to

16 Originally, the NAIC classified bond ETFs as equities, since investors in ETFs acquire shares of a fund. With this regulatory treatment, insurers had to apply fair value accounting and the same risk weights as for equities, which made an investment in a diversified portfolio of triple-A-rated bonds through a bond ETF substantially more costly than investing in the same portfolio of bonds directly, i.e., 30 percent vs. 0.3 percent risk weight.

17 During the process of revising the NAIC's regulatory guidance on bond ETFs, BlackRock reached out to insurers that were already investing in bond ETFs eligible for reporting in the fixed income holdings schedule under the existing guidance. BlackRock reported that, despite existing provisions, most insurers were unaware of them and treated the bond ETFs as equity investments, applying fair-value accounting and equity risk weights (National Association of Insurance Commissioners, 2015).

provide necessary clarification to the regulatory guidance. As part of this project, the NAIC discussed a revised definition of bond securities and a new statutory accounting treatment for bond ETFs in the years 2014–2016, which were eventually adopted on April 8, 2017 (National Association of Insurance Commissioners, 2017a). Most importantly, insurers could now apply the "systematic value" approach for a list of pre-approved bond ETFs published by the NAIC. The systematic value approach is a "look-through" valuation method resembling the amortized cost accounting of individual bonds, which substantially reduces book value volatility compared to fair-value accounting.[18]

Forty-seven states and the District of Columbia adopted the NAIC's reform of insurers' regulatory treatment of bond ETFs, effectively leveling the regulatory treatment of bonds and bond ETFs and granting insurers access to a diversified investment vehicle without additional regulatory cost. Three states – New York, Iowa, and Virginia – did not adopt the reform when it was introduced. New York and Iowa adopted it later, while Virginia has not adopted it as of mid-2026.[19] In the adopting states, the change significantly reduced the transaction costs that insurers faced in over-the-counter bond markets.[20] Aggregate evidence clearly shows that the reform had a considerable impact on the insurance industry's use of bond ETFs. Figure 7 shows that insurers' bond ETF investments rose sharply from roughly $3 billion to more than $6 billion in 2017. This growth was concentrated in ETFs investing in corporate securities or mixed corporate-government portfolios, whereas government-only ETFs saw minimal inflows from insurers. Despite the sharp increase, aggregate bond ETF holdings remained modest, plateauing around $6 billion. The limited

18 Appendix Figure B.7 compares the systematic value and fair value approaches. For details on the calculation of an ETF's systematic value, see State Street Global Advisors (2021).

19 New York adopted the reform in December 2021 (Masters, 2023). Iowa revised its investment rules for life insurers in 2023 – Iowa Code Title XIII, Subtitle 1, Chapter 511.8 – aligning its law with NAIC model regulation (Tam et al., 2023). Virginia's investment law for insurers – Code of Virginia Title 38.2, Chapter 14 – does not mention bond exchange-traded funds as of July 2026.

20 During the drafting process, industry representatives emphasized the low-cost diversification benefits of bond ETFs. For instance, BlackRock argued that "insurance companies using fixed income ETFs to access a low cost diversified portfolio of bonds should not be penalized for holding substantially the same portfolio of bonds inside an ETF 'wrapper' vs. a larger company with access to the same portfolio of bonds outside of the ETF" (National Association of Insurance Commissioners, 2017a, p. 10-254). The National Association of Mutual Insurance Companies similarly highlighted that the "widely-acknowledged benefits of ETFs could offer smaller companies greater opportunity to invest in a diversified portfolio of fixed income investments at lower costs" (National Association of Insurance Commissioners, 2017a, p. 10-234). In a similar spirit, SAGE Advisors stressed that small- and mid-size insurance companies "would benefit most from an ETF alternative to the limitation of accessing the bond market solely through the purchase of individual securities" (National Association of Insurance Commissioners, 2017a, p. 10-232).

aggregate increase partly reflects regulatory frictions. Other investment regulations, such as caps on investments in a single entity, constrained insurers' ability to fully take advantage of the reform, as lamented by industry participants, see, e.g., Earley et al. (2017). At the same time, the pattern suggests that small insurers – who collectively account for a small share of total assets – were driving the growth in bond ETF investments.

To formally test whether diversification motives explain small insurers' earlier preference for financial bonds, I exploit the 2017 reform in a difference-in-differences approach. If small insurers previously relied on financial bonds as a means of diversification in otherwise costly corporate bond markets, the reform – by offering low-cost diversification through ETFs – should have reduced their preference for financial bonds. Using the bond-level sample, I estimate the following specification:

$$\text{Issue share}_b = \beta_{Post}\mathbf{1}(\text{Post})_t \times \mathbf{1}(\text{Financial})_b + \beta_{Pre}\mathbf{1}(\text{Financial})_b + \boldsymbol{\gamma}\boldsymbol{X}_b + u_{m,r,t} + v_{\text{SIFI},t} + \epsilon_b. \quad (4)$$

The dependent variable, *Issue share*$_b$, is the share of bond b acquired by insurers with total assets below \$50 million. In the main specification, I only consider insurers domiciled in adopting states. The indicator variable $\mathbf{1}(\textit{Post})_t$ equals one for years 2017 and onward. All other variables are defined as in Equation (2). The coefficients β_{Pre} and β_{Post} capture small insurers' preference for financial bonds over comparable non-financial bonds before the reform and the subsequent change in this preference, respectively. The main specification focuses on bonds rated A+ to A-, where this preference was strongest.

Importantly, the difference-in-differences design helps rule out a supply-side explanation for the observed preference for financial bonds. Instead of small insurers actively seeking financial bonds for diversification, the documented pattern in the second stylized fact could reflect underwriters preferentially allocating financial bonds to small insurers for reasons unrelated to their demand. Because the reform altered insurers' access to diversified investment vehicles and did not affect underwriting or issuance practices, this explanation would predict no change in small insurers' relative demand for financial bonds after the reform. A decline in the gap in the share of financial bonds acquired by small insurers after the reform ($\beta_{Post} < 0$) is therefore inconsistent with a supply-driven pattern and instead points to small insurers reducing their preference for financial bonds once low-cost diversification through bond ETFs became available.

Table 4 presents the estimates of Equation (4). Column (1) shows a significant decline in small insurers' preference for financial bonds after the reform. Economically, the decline is sizable: small insurers acquired 132% more of a financial bond than of a comparable non-financial bond before the reform; this preference declined to 74% after the reform, a reduction of 58 percentage points. Column (2) interacts the main variables with bond maturity, indicating that the decline was strongest among long-term bonds, where this preference had been most pronounced. To illustrate the magnitude of this effect: Before the reform, small insurers acquired a roughly four times larger share of a 15-year financial bond than of a comparable non-financial bond (see Appendix Figure B.8). This gap almost entirely disappeared after the reform. Columns (3) and (4) of Table 4 show a weaker but statistically insignificant pattern for insurers with assets between $50 million and $100 million, and no effect for larger insurers with assets between $100 million and $500 million, consistent with the reform primarily benefiting small insurers.

Figure 8 plots the yearly coefficients for a version of Equation (4) with year-specific interactions. The figure reveals a clear break in small insurers' preference for financial bonds following the reform. Prior to 2017, small insurers favored financial bonds, but this preference ceased to exist after the reform, with the combined coefficients becoming insignificant.

Appendix Table C.7 presents several robustness checks to Equation (4). In columns (1) and (2), I examine the effect of the reform on small insurers domiciled in the non-adopting states as a placebo test. While there is a significant preference for long-term financial bonds before the reform (column 1), the diff-in-diff specification yields only insignificant coefficients (column 2), suggesting that the reform had no effect in states that did not adopt the reform. Column (3) excludes the 2014–2016 period, during which the reform was extensively discussed at the NAIC, while column (4) adds the bond liquidity and firm-level controls. Columns (5) and (6) implement propensity score matching within rating-maturity buckets, based on bonds' yield spread, log maturity, and indicators for credit enhancement and callability to ensure comparability across bonds; column (6) further includes the additional controls. Across all these specifications, the estimated decline in small insurers' preference for (long-term) financial bonds after the reform remains robust. Columns (7) and (8) look at different sample splits by credit quality, distinguishing NAIC 1-rated (AAA through A-) from NAIC 2- and lower-rated (BBB+ and below) bonds. The reform effect is concentrated among higher-rated issues and absent among lower-rated bonds. These

results are consistent with financially weaker intermediaries being less suitable vehicles for diversification; in addition, Appendix Figure B.5 shows that small insurers largely avoid such bonds due to risk-based capital and accounting constraints, limiting the power to detect an effect in this subsample. Appendix E presents further robustness checks, narrowing the definition of financial bonds to the key subsectors of the financial industry, comprising the most diversified financial intermediaries.

To complement the bond-level evidence, I examine insurers' investments in bond ETFs after the reform. If small insurers previously relied on financial bonds for diversification, they should have substituted toward bond ETFs once these instruments became available at similar regulatory cost. For the post-reform period 2017–2019, I identify bond ETF investments in insurers' fixed-income holdings using the NAIC's 2017–2019 lists of bond ETFs eligible for bond-like treatment (National Association of Insurance Commissioners, 2017b, 2018, 2019). I classify these bond ETFs into the categories "Corporate", "Mixed", "Government", and "Other" based on publicly available information on the ETFs' investment universe from the web.[21] With this data, I estimate the following specification:

$$\frac{\text{Bond ETFs}_{i,t}}{\text{Invested assets}_{i,t}} = \beta \text{ Log(Assets)}_{i,t} + \boldsymbol{\gamma} \boldsymbol{X}_{i,t} + v_{d,t} + \epsilon_{i,t}. \tag{5}$$

The dependent variable, $\frac{\text{Bond ETFs}_{i,t}}{\text{Invested assets}_{i,t}}$, is the share of insurer i's invested assets allocated to bond ETFs that hold only corporate or a mix of corporate and government bonds in year t. As in Equation (1), *Log(Assets)*$_{i,t}$ denotes insurer size, while $\boldsymbol{X}_{i,t}$ is a set of control variables that include insurers' leverage, return on equity, and RBC ratio. The specification includes insurer domicile-year fixed effects, $v_{d,t}$, and focuses on the post-reform period 2017–2019. β captures the relationship between insurer size and bond ETF investments during this period.

Table 5 reports the estimates of Equation (5) for two separate groups of insurers. First, focusing on insurers located in states that adopted the reform, columns (1) and (2) show that smaller insurers allocated a larger share of their total invested assets to bond ETFs in the post-reform period – a relationship that is even stronger when ETF holdings are measured relative to total fixed income investments, as shown in column (3). Second, columns (4) to (6) examine insurers located in non-adopting states. There is no significant

21 For details on the classification, see Appendix A.2.

relationship between insurer size and bond ETF investments in these states in the post-reform period, corroborating the idea that the reform drove small insurers' shift toward bond ETFs. These results complement the bond-level evidence. After the reform, small insurers shifted away from financial bonds toward bond ETFs once these became feasible.

5 Additional Evidence

This section presents additional empirical evidence consistent with the interpretation that insurers regarded financial bonds as a means of achieving portfolio diversification, when transaction cost constraints complicated direct holdings in a diversified portfolio. First, I show that size is a less important determinant of insurers' financial bond holdings among insurance group affiliates, consistent with group affiliates having better access to corporate bond markets through pooled investment management. Moreover, insurers reduce the financial bond share in their portfolio after a merger, in particular if they were not part of an insurance group before the merger. Second, I examine the composition of insurers' financial bond portfolios and show that smaller insurers invest more in bonds issued by large, diversified intermediaries. Lastly, I rule out several alternative explanations that could drive the documented patterns.

5.1 Insurance Group Affiliation and Financial Bond Investments

Insurers can either be affiliates of an insurance group ("group affiliates") or operate independently ("non-group insurers"). A substantial number of insurers in the sample, also among the smallest insurers, were not part of an insurance group (see Appendix Figure B.9). Group affiliates typically have better access to corporate bond markets than their non-group counterparts as insurance groups pool asset management resources, creating economies of scale in transactions. For instance, at the end of 2019, the Metropolitan Group, better known as MetLife, consisted of 14 individual insurers and reported over $436 billion in assets to the NAIC, which were managed by MetLife Investment Management, the asset management subsidiary of MetLife. As group affiliates are less constrained by transaction costs in corporate bond markets, they should invest less in financial bonds than insurers operating outside insurance groups, particularly among smaller insurers.

To formally test the relationship between insurance group membership and financial bond investments, I estimate the following specification:

$$\begin{aligned}\text{Financial bond share}_{i,t} =& \beta_1 \, \mathbf{1}(\text{Affiliate})_{i,t} \times \text{Log(Assets)}_{i,t} + \beta_2 \, \text{Log(Assets)}_{i,t} \\ &+ \beta_3 \, \mathbf{1}(\text{Affiliate})_{i,t} + \boldsymbol{\gamma} \boldsymbol{X}_{i,t} + u_i + v_{d,t} + \varepsilon_{i,t}.\end{aligned} \tag{6}$$

The dependent variable, *Financial bond share*$_{i,t}$, is the share, in par values, of insurer i's corporate bond portfolio invested in financial bonds in year t. *Log(Assets)*$_{i,t}$ is the natural logarithm of insurer i's total assets in year t. $\mathbf{1}(\textit{Affiliate})_{i,t}$ is an indicator variable that takes the value one if insurer i is an affiliate of an insurance group in year t. $\boldsymbol{X}_{i,t}$ is a set of control variables that include insurers' leverage, return on equity, RBC ratio, corporate bond log portfolio maturity, and portfolio rating. u_i and $v_{d,t}$ denote insurer and domicile-year fixed effects, respectively.

Table 6 presents the results. Column (1) confirms previous results on insurer size as a key determinant of financial bond investments, serving as a benchmark for the interactions introduced in subsequent columns. Consistent with the results from Section 3, larger insurers allocate significantly less of their corporate bond portfolios to financial bonds, with the magnitude of the coefficient similar to before. In column (2), I introduce the interaction with insurance group membership. The coefficient on $\mathbf{1}(\textit{Affiliate})_{i,t}$ is highly statistically significant and negative, indicating that group affiliates allocate less of their corporate bond portfolio to financial bonds, on average, more than 23 percentage points less than non-group insurers. Moreover, insurer size is a significantly less important determinant of financial bond holdings for group affiliates, as the coefficient on the interaction term is positive and significant. These results support the hypothesis that group affiliation – giving better access to corporate bond markets through pooled asset management – reduces insurers' reliance on financial bonds for diversification.

In column (3), I add interaction terms with a post-reform indicator, $\mathbf{1}(\textit{Post})_t$. While the previous results remain qualitatively unchanged, the size-investment relationship weakens for non-group insurers after the reform, as indicated by the positive and significant coefficient on the interaction between the post-reform indicator and size. Column (4) shows that these results are robust when interacting the affiliate indicator with the insurer characteristics, controlling for potential heterogeneities in other determinants of financial bond holdings across group affiliates and non-group insurers.

To further investigate the impact of insurance group membership on financial bond investments, I next use information on changes in insurance group membership, primarily driven by mergers and acquisitions (M&A). Each year during the sample period, more than 50 insurers changed their insurance group affiliation, mostly due to M&A activity in the insurance industry (see Appendix Figure B.10).[22] M&A activity creates variation in insurers' access to insurance group resources, allowing me to examine whether changes in insurance group affiliation lead to changes in financial bond holdings.

Using insurance group identifiers from NAIC regulatory filings, I track changes in insurers' group affiliations over time and mark the years in which an insurer changes its affiliation. Then, I re-estimate Equation (6), substituting the affiliate indicator variable with $\mathbf{1}(\textit{Post-merger})_{i,t}$, an indicator variable that takes the value one if insurer i experienced a merger event in year t or prior. In the analysis, I exclude insurers that were part of multiple merger events during the sample period.

Table 7 shows the results of this specification. Column (1) offers two important findings. First, insurers significantly reduce their financial bond holdings after a merger. The magnitude of the effect is large: an insurer reduces its allocation to financial bonds in its corporate bond portfolio by 17 percentage points post-merger. Second, the size-investment relationship weakens significantly after a merger, indicating that insurer size is less relevant for bond holdings. In column (2) of Table 7, I introduce further variation, comparing the effect for insurers that were operating outside of an insurance group prior to the merger and insurers that were already part of an insurance group, represented by the indicator variable $\mathbf{1}(\textit{Pre-merger affiliate})_i$ that takes the value one if insurer i was already an insurance group affiliate prior to the merger.[23] While the latter should not experience a significant change in access to corporate bond markets, the former might enter from a situation with severely limited access to corporate bond markets. Consistent with this idea, I find that the reduction in financial bond holdings after a merger event becomes substantially larger, 28 percentage points on average, while this effect is less pronounced if the insurer was already an insurance group affiliate prior to the merger. Moreover, the triple interaction coefficient shows that a merger has little additional effect on the role of size for these insurers, consistent

22 A change in the insurance group affiliation can also be caused by insurance groups splitting up, such as Equitable's spinoff from AXA in 2018 (see axa.com).

23 During the sample period, some large-scale mergers took place, e.g., ACE Limited's acquisition of Chubb in 2015–2016 (see marketwatch.com). Each of these two groups consisted of multiple affiliates.

with size already playing a smaller role for group affiliates prior to the merger, as indicated by the positive coefficient on the interaction $\mathbf{1}(\textit{Pre-merger affiliate})_i \times \textit{Log(Assets)}_{i,t}$. In column (3), I match each insurer that is part of a merger in the year prior to the merger to an insurer in the same state that is not part of a merger, using the control variables and insurer size to further control for observable differences in insurer financials and portfolio characteristics. Applying this matching methodology, the previous results documented in column (2) become even stronger.

Taken together, these results support the hypothesis that insurers regarded financial bonds as a means of achieving low exposure to idiosyncratic risk while saving on diversification-related transaction costs. As insurance groups give their affiliates better access to corporate bond markets through pooled investment management, they rely less on financial bonds for diversification, which is particularly important for small insurers facing substantial difficulties directly building a diversified portfolio. The evidence from mergers – events that likely improve access to corporate bond markets – corroborates this interpretation, as insurers reduced their financial bond holdings after a merger, especially small insurers that were operating outside of an insurance group prior to the merger.

5.2 Issuers' Diversification and Financial Bond Portfolios

Whether a financial bond offers low idiosyncratic risk depends on the issuer's own diversification. Financial intermediaries that engage in a broad range of services and lend to a diversified set of borrowers tend to have more stable returns than specialized intermediaries.[24] Therefore, if small insurers invested in financial bonds for diversification purposes, they should have favored bonds issued by more diversified financial intermediaries.

Figure 9 provides the first supporting evidence for this notion. The figure shows estimates for the relationship between insurer size and investments in financial bonds within the financial sector, i.e., the coefficients for Equation (1) using the 4-digit subsectors of the financial industry. Notably, the strongest negative relationship is observed for bonds issued by traditional banks (NAICS 5221). The other subsectors exhibiting a significant negative relationship are similarly dominated by widely diversified financial intermediaries,

24 In the banking literature, asset-side diversification has been linked to lower funding costs (Levine et al., 2021), reduced risk (Acharya et al., 2006; Goetz et al., 2016), greater stability (Doerr and Schaz, 2021; Gelman et al., 2023) and higher profitability and valuations (Deng and Elyasiani, 2008; Goetz et al., 2013).

such as Citigroup and JP Morgan Chase in NAICS 5239 ("Other Financial Investment Activities"), Morgan Stanley and Goldman Sachs in NAICS 5231 ("Securities and Commodity Exchanges"), and the financial services arm of car companies in NAICS 5222 ("Nondepository Credit Intermediation").

Next, I identify financial bond issuers that are the most active lenders in the U.S. syndicated loan market using data from Schwert (2018). I merge issuer identities across DealScan and Mergent using the matching table from Fang (2025).[25] The syndicated loan market represents a major segment of corporate lending (Ivashina and Scharfstein, 2010; Chodorow-Reich, 2014), and active participants in this market typically engage in a broad range of financial activities beyond traditional banking (Neuhann and Saidi, 2018; Bittner et al., 2026). Estimating Equation (3) for the subsample of financial bonds, I find that bonds issued by active lenders exhibit significantly lower idiosyncratic risk than other financial bonds – up to 0.118 percentage points across specifications with the gap widening for longer maturities – consistent with these issuers being more diversified (see Appendix Table C.8). This evidence supports the interpretation that such issuers are better diversified, making their bonds particularly attractive to insurers seeking to diversify their portfolios through financial intermediaries' balance sheets.

For each insurer-year, I aggregate the total amount of financial bonds held whose issuers are active lenders in the syndicated loan market. Using this data, I estimate the following specification:

$$\text{Diversified share}_{i,t} = \beta \,\text{Log(Assets)}_{i,t} + \boldsymbol{\gamma} \boldsymbol{X}_{i,t} + u_i + v_{d,t} + \varepsilon_{i,t}. \tag{7}$$

The dependent variable, *Diversified share*$_{i,t}$, is the share, in par values, of insurer i's financial bond portfolio in year t allocated to bonds of diversified financial intermediaries, where a financial intermediary is classified as diversified if it is an active lender in the syndicated loan market, following Schwert (2018). In addition to the control variables utilized in Equation (6), I include the log maturity and rating of insurers' financial bond investments. All other variables are defined as in Equation (6).

Table 8 reports the estimates of Equation (7). In column (1), the coefficient on insurer size is negative and significant. On average, an insurer of double the size invests 1.5

25 Schwert (2018) defines the most active lenders as having acted as lead arranger on at least 50 loans or at least $10 billion in volume.

percentage points less of its financial bond portfolio in diversified issuers. Motivated by the previous results on the importance of insurance groups, I split the sample into non-group insurers and group affiliates in columns (2) and (3), and find that non-group insurers drive the previously observed pattern. Among group affiliates, the coefficients are smaller and only significant at the 10% level.

Taken together, the evidence presented in this section and the previous one shows that small, independently operating insurers – those facing the largest difficulties when directly building a diversified portfolio of corporate bonds – relied on financial bonds, particularly those issued by diversified intermediaries, to diversify their portfolios. Following the 2017 bond ETF reform, this reliance diminished, as ETFs offered a lower-cost alternative for achieving diversification.

5.3 Alternative Explanations

In this section, I discuss three other potential drivers that could explain the documented size-investment relationship. First, financial bonds could be the least costly to trade, allowing investors to save on transaction costs compared to other bonds. Second, small insurers might invest in financial bonds issued by their dealer to secure access to over-the-counter corporate bond markets. Lastly, small insurers might be investing in bonds issued by larger affiliates. Overall, I find no evidence supporting these alternative explanations.

5.3.1 Differences in transaction costs

A potential alternative explanation for small insurers' preference for financial bonds is that these bonds are simply the least costly to trade, reflecting cost savings rather than a diversification motive, that is, small insurers' sole concern could be economizing on transaction costs. For this explanation to hold, one would expect financial bonds to be the least costly bonds available on the market.

However, comparing transaction costs, proxied by the bid-ask spread, for the most liquid financial bonds and for similarly liquid bonds issued by non-financial firms, I do not find evidence supporting this notion. Over the entire sample period, the most liquid financial bonds were more expensive to trade than the most liquid bonds from other industries. In fact, in the period shortly after the financial crisis, the gap between the bid-ask spread of financial bonds and of bonds from other industries was considerably larger than at

the end of the sample period (see Panel (a) of Appendix Figure B.11). A similar picture emerges for small trade sizes – trades of less than $100,000 in par value, the size most relevant for small insurers: the bid-ask spread of financial bonds was comparable to that of non-financial bonds even at the beginning of the sample period, when small insurers' preference for financial bonds was strongest (see Panel (b) of Appendix Figure B.11). This evidence suggests small insurers could not have saved on transaction costs by investing in financial bonds.

5.3.2 Client-dealer relationships

Due to the over-the-counter structure of corporate bond markets, relationships with dealers play a central role in corporate bond transactions (Hendershott et al., 2020). As the majority of investors rely on only a few dealers (O' Hara et al., 2018), maintaining a good relationship with these is crucial for accessing the corporate bond market. Dealers may exploit this reliance by offering investors bonds the dealer is trying to offload, including bonds issued by the dealer itself or its affiliates. Alternatively, investors could deliberately buy such bonds in hopes of receiving better trading conditions for other trades.

To rule out that insurers' preference for financial bonds stems from relationship dynamics in over-the-counter bond markets, I examine whether small insurers are more likely than large insurers to trade with a counterparty that is simultaneously the issuer of the bond being traded. I identify such dealer-issuer matches by string-matching counterparty names reported in insurers' transaction data to bond issuer names, either directly reported in the NAIC data or taken from Mergent.[26] Generally, dealer-issuer matches are rare in the data – less than 5% of all trades involve a dealer that is also the issuer of the bond being traded – and the share of such trades is similar across insurer size (see Appendix Figure B.12).[27] This evidence suggests that relationship dynamics in corporate bond markets do not drive the observed preference for financial bonds.

Beyond client-dealer relationships in over-the-counter corporate bond markets, insurers might invest in the bonds of financial intermediaries with which they maintain broader business relationships, such as the provision of loans or investment banking services.

26 For a detailed description on the string matching procedure, see Appendix A.3.

27 Appendix Table C.9 formally tests whether insurer characteristics predict such transactions. Only the coefficient on the RBC ratio is statistically significant, but the magnitude is negligible.

Small insurers might purchase debt issued by intermediaries that supply these services to strengthen or maintain such ties. However, only 10% of small insurers report issuing capital or surplus notes or holding any borrowed funds (see Appendix Figure B.13). In contrast, 30% of the largest insurers report such liabilities, consistent with more interactions with other financial intermediaries beyond corporate bond investments. This evidence further speaks against relationship-based explanations for small insurers' preference for financial bonds.

5.3.3 Intra-group bond investments

Another potential explanation is that small insurers are simply purchasing bonds issued by affiliated financial intermediaries – such as larger insurers, banks, or private equity firms. Such intra-group holdings could explain smaller insurers' concentration in financial bonds rather than a diversification motive.

However, several facts speak against it. First, the results from the previous section show that the preference for financial bonds is strongest among small insurers that are not part of a larger insurance group. In addition, the post-reform decline in financial bond holdings was concentrated among small, non-group insurers – those least likely to be affiliated with larger financial intermediaries. Second, a case study of insurers' investments in other insurer bonds does not show significant bond holdings across affiliates of the same group. Out of more than 4.1 million insurer-bond-year observations between 2011 and 2019, only 17 involve an insurer holding the bond of an affiliated insurer. Third, existing insurance regulations make it difficult for small insurers to maintain portfolios heavily concentrated in affiliated bonds. Insurers are subject to investment rules that limit the amount of assets that can be held in securities issued by a single entity.[28] Investments in affiliated companies are subject to even stricter limitations and, in many cases, are not admissible under regulatory accounting rules (Kraham and Pierce, 2023). Lastly, if financial intermediaries were to use insurers as a financing vehicle for other business ventures, e.g., as private equity firms have done in recent years (Foley-Fisher et al., 2023; Kirti and Sarin, 2023; Meisenzahl et al., 2025),[29] small insurers would likely be the least suitable candidates due to their limited capital and tighter regulatory constraints.

28 See the NAIC's comparison of state insurance laws on limitations on insurers' investments for more details (naic.org).

Taken together, the presented evidence suggests that these alternative explanations – transaction costs, dealer relationships, or intra-group holdings – fail to account for small insurers' preference for financial bonds, reinforcing the interpretation that this preference reflects a demand for diversification.

6 Model

This section presents a model that rationalizes the empirical findings by explaining insurers' investment behavior as the outcome of a tradeoff between transaction and regulatory costs. This tradeoff is stronger for small insurers because of the fixed nature of transaction costs in bond markets. Financial bonds with their lower idiosyncratic risk provide a solution, enabling small insurers to minimize idiosyncratic risk while avoiding the high fixed costs of building a broad portfolio. The model's key predictions fit the evidence presented in the empirical sections.

6.1 Setup

The model features two periods, $t = 0, 1$. At $t = 0$, an insurer that is endowed with assets A has to choose its bond portfolio. There are two types of bonds. First, there are N bonds issued by non-financial firms. Each bond $n = 1, \ldots, N$ earns a stochastic return,

$$\tilde{R}_n = \mu + \tilde{\varepsilon}_n \tag{8}$$

with μ being the expected return and $\tilde{\varepsilon}_n$ an idiosyncratic shock with mean zero and variance σ_n^2. By their nature, the shocks $\tilde{\varepsilon}_n$ are independent across bonds. Moreover, there is a financial bond, which earns a stochastic return,

$$\tilde{R}_F = \mu + \tilde{\varepsilon}_F \tag{9}$$

with $\tilde{\varepsilon}_F$ being an idiosyncratic shock with mean zero and variance σ_F^2. $\tilde{\varepsilon}_F$ is independent from all other shocks $\tilde{\varepsilon}_n$. Consistent with the results from the third stylized fact, I assume

29 Due to the preferential capital treatment of collateral loan obligations (CLOs) (Fringuellotti and Santos, 2026), private equity firms acquired large portions of insurance companies that complement the financing structure of CLO deals (Foley-Fisher et al., 2023).

that the financial bond's idiosyncratic risk is lower than that of the non-financial bonds, i.e., $\sigma_F^2 < \sigma_n^2$ for all n. The insurer has to allocate its assets A across the N non-financial bonds and the financial bond. Let $w_n \in [0, 1]$ denote the portfolio weight of non-financial bond n and w_F the portfolio weight of the financial bond. The weights must satisfy the budget constraint $w_F + \sum_{n=1}^{N} w_n = 1$. When investing in a bond, the insurer incurs a fixed transaction cost $c(A) > 0$ that depends on the insurer's size A. The transaction cost function $c(\cdot)$ is strictly decreasing, i.e., larger insurers face lower fixed transaction costs per bond.

The insurer is a mean-variance investor with a risk aversion $\gamma > 0$. This assumption reflects insurer's exposure to risk-based capital regulation, which penalizes risk-taking.[30] Additionally, internal risk management mandates force insurers to take a prudent approach and avoid high volatility.[31] As all assets have the same expected return μ, the insurer chooses a portfolio that balances the variance of returns and transaction costs. Formally, the insurer's optimization problem is given by:

$$\min_{\{w_n\}_{n=1}^{N}, w_F} \frac{\gamma}{2} \left(w_F^2 \sigma_F^2 + \sum_{n=1}^{N} w_n^2 \sigma_n^2 \right) + c(A) \left(\mathbf{1}_{\{w_F > 0\}} + \sum_{n=1}^{N} \mathbf{1}_{\{w_n > 0\}} \right). \tag{10}$$

As the transaction costs are fixed, the insurer's optimization problem is two-fold. First, the insurer must decide which bonds to include in the portfolio; second, given the selected bonds, the insurer must choose portfolio weights.

6.2 Optimal Portfolio Choice

To solve this problem, I first derive the optimal portfolio weights for a given bond, assuming the insurer invests a positive amount in that bond. The first-order condition for any

30 The standard risk-based capital regulation requires insurers to maintain adequate levels of capital based on the riskiness of their assets, see, e.g., the "Risk-Based Capital (RBC) for Insurers Model Act" (naic.org). Depending on the severity of the capital shortfall, regulators can mandate the insurer to work out recapitalization plans, intervene in the insurer's operations, or even liquidate the insurer.

31 Originally, the NAIC planned to require fair value accounting for all bond ETFs. In response to this proposal, small- and medium-sized insurers argued that a fair value accounting would make bond ETFs' book values more volatile, effectively making them less accessible to those insurers because the "potential for this volatility (particularly when conducting risk / investment projections) may cause small and medium-size insurers to liquidate these investments, based on their investment policy requirements" (National Association of Insurance Commissioners, 2017c).

non-financial bond n included in the portfolio is given by:

$$\gamma w_n \sigma_n^2 - \lambda = 0 \quad \Leftrightarrow \quad \hat{w}_n = \frac{\lambda}{\gamma \sigma_n^2} \tag{11}$$

where λ is the Lagrange multiplier associated with the budget constraint. Analogously, for the financial bond, the first-order condition is:

$$\gamma w_F \sigma_F^2 - \lambda = 0 \quad \Leftrightarrow \quad \hat{w}_F = \frac{\lambda}{\gamma \sigma_F^2}. \tag{12}$$

The weights $\hat{w}_n$ and $\hat{w}_F$ represent the optimal portfolio weights conditional on the insurer investing in the respective bonds. The multiplier λ is pinned down by plugging the optimal portfolio weights for the given set of selected bonds and the financial bond into the budget constraint. Assuming that the insurer includes a set $\mathcal{S} \subseteq \{1, \ldots, N\}$ of non-financial bonds and the financial bond in the portfolio, λ can be derived from the budget constraint as:

$$\frac{\lambda}{\gamma \sigma_F^2} + \sum_{n \in \mathcal{S}} \frac{\lambda}{\gamma \sigma_n^2} = 1 \quad \Leftrightarrow \quad \lambda = \frac{\gamma}{\frac{1}{\sigma_F^2} + \sum_{n \in \mathcal{S}} \frac{1}{\sigma_n^2}}. \tag{13}$$

Therefore, the optimal portfolio weights for a given set of selected bonds $\mathcal{S}$ are:

$$\hat{w}_F(\mathcal{S}) = \frac{1}{\sigma_F^2} \cdot \frac{1}{\frac{1}{\sigma_F^2} + \sum_{n \in \mathcal{S}} \frac{1}{\sigma_n^2}} \quad \text{and} \quad \hat{w}_n(\mathcal{S}) = \frac{1}{\sigma_n^2} \cdot \frac{1}{\frac{1}{\sigma_F^2} + \sum_{n \in \mathcal{S}} \frac{1}{\sigma_n^2}} \quad \text{for } n \in \mathcal{S}. \tag{14}$$

As the insurer incurs a fixed transaction cost of $c(A)$ per bond acquired, it must decide which bonds to include in the portfolio. The insurer will start with the financial bond because it has the lowest idiosyncratic risk, i.e., $\sigma_F^2 < \sigma_n^2$ for all n. The insurer will further acquire a non-financial bond n if the additional diversification benefits from having the bond in the portfolio outweigh the additional transaction cost of acquiring it. The optimal choice thus induces a sorting of bonds by idiosyncratic risk, which the cutoff rule below makes precise. More generally, considering an arbitrary pre-chosen set of bonds $\mathcal{S}$, the insurer will acquire the non-financial bond $k \notin \mathcal{S}$ if:

$$V(\hat{w}_F(\mathcal{S} \cup \{k\}), \{\hat{w}_n(\mathcal{S} \cup \{k\})\}_{n \in \mathcal{S} \cup \{k\}}) \leq V(\hat{w}_F(\mathcal{S}), \{\hat{w}_n(\mathcal{S})\}_{n \in \mathcal{S}}), \tag{15}$$

with $V(\cdot)$ denoting the value of the insurer's objective function from (10) evaluated at a given set of portfolio weights. Plugging in the optimal portfolio weights, this condition

prescribes a cutoff for a non-financial bond's idiosyncratic risk, σ_k^2, for the bond to be included in the portfolio. More precisely, the insurer will acquire the non-financial bond k if:

$$\sigma_k^2 \leq \bar{\sigma}_k^2 := \frac{1}{\phi(\mathcal{S})}\left[\frac{\gamma}{2c(A)\phi(\mathcal{S})} - 1\right] \tag{16}$$

where $\phi(\mathcal{S}) = \left(\frac{1}{\sigma_F^2} + \sum_{n\in\mathcal{S}} \frac{1}{\sigma_n^2}\right)^{-1}$. These results are summarized in the following proposition.

Proposition 1. *The insurer's optimal portfolio allocation to financial bonds w_F is given by:*

$$w_F^* = \frac{1}{\sigma_F^2} \cdot \frac{1}{\frac{1}{\sigma_F^2} + \sum_{n\in\mathcal{S}^*} \frac{1}{\sigma_n^2}} \tag{17}$$

with $\mathcal{S}^* = \{k : \sigma_k^2 \leq \bar{\sigma}_k^2\}$ and $\{\bar{\sigma}_k^2\}_{k=1}^N$ being characterized by expression (16).

Proof. See derivation above. □

6.3 Comparative Statics and Discussion

Having derived the insurer's optimal portfolio choice for financial bonds, I examine the model's comparative statics, which map onto the paper's three main empirical results: the relationship between insurer size and financial bond holdings (Section 3), the effect of the 2017 bond ETF reform (Section 4), and the role of financial bond issuers' diversification (Section 5.2). First, I analyze how the insurer's allocation to financial bonds changes as its size A increases. The following corollary summarizes this result.

Corollary 1. *The insurer's portfolio allocation to the financial bond w_F^* is weakly decreasing in the initial assets A, i.e., $\frac{\partial w_F^*}{\partial A} \leq 0$.*

Proof. Consider the first derivative of the cutoff $\bar{\sigma}_k^2$ in expression (16):

$$\frac{\partial \bar{\sigma}_k^2}{\partial A} = -\frac{1}{\phi(\mathcal{S})}\frac{\gamma}{2c(A)^2\phi(\mathcal{S})}\underbrace{\frac{\partial c(A)}{\partial A}}_{<0} > 0. \tag{18}$$

As $\frac{\partial \bar{\sigma}_k^2}{\partial A}$ is increasing in A, the number of non-financial bonds for which $\sigma_k^2 > \bar{\sigma}_k^2$ is weakly decreasing in A, implying that the insurer includes more non-financial bonds in $\mathcal{S}^*$ as A increases. As the insurer diversifies more, the portfolio share of the financial bond w_F^* decreases. □

Larger insurers have lower fixed transaction costs $c(A)$. Lower transaction costs make diversification cheaper and, hence, including a non-financial bond in the portfolio becomes more attractive. Therefore, larger insurers include more non-financial bonds in their portfolio, reducing the portfolio share w_F^* of the financial bond. In contrast, small insurers face tighter transaction-cost constraints, making broad diversification costly and the financial bond relatively more attractive, as it has the lowest idiosyncratic risk. In turn, small insurers maintain concentrated portfolios with a larger share of financial bonds. This result is consistent with the stylized facts documented in Section 3.

Next, I analyze how an insurer's allocation to financial bonds changes with a shift in the fixed transaction cost, that is, $c(A)$ increases for all A, summarized in the following corollary.

Corollary 2. *The insurer's portfolio allocation to the financial bond w_F^* is weakly increasing in the fixed transaction cost $c(A)$, i.e., $\frac{\partial w_F^*}{\partial c(A)} \geq 0$.*

Proof. The first derivative of the cutoff $\bar{\sigma}_k^2$ in expression (16) with respect to the fixed transaction cost $c(A)$ is:

$$\frac{\partial \bar{\sigma}_k^2}{\partial c(A)} = -\frac{1}{\phi(\mathcal{S})} \frac{\gamma}{2c(A)^2 \phi(\mathcal{S})} < 0. \tag{19}$$

As $\frac{\partial \bar{\sigma}_k^2}{\partial c(A)}$ is decreasing in $c(A)$, the number of non-financial bonds for which $\sigma_k^2 > \bar{\sigma}_k^2$ is weakly increasing in $c(A)$, implying that the insurer includes fewer non-financial bonds in $\mathcal{S}^*$ as $c(A)$ increases. Hence, the portfolio share of the financial bond w_F^* increases. □

Analogous to an increase in the insurer's assets A, a parallel downward shift in the fixed transaction cost $c(A)$ increases the number of non-financial bonds for which $\sigma_k^2 > \bar{\sigma}_k^2$ holds. If the transaction cost constraint is relaxed, the insurer optimally includes more non-financial bonds in the portfolio to reduce the idiosyncratic risk. At the extreme, if transaction costs were to vanish, an insurer would always buy a fully diversified portfolio, no matter its size. The 2017 bond ETF reform presented in Section 4 reduced the fixed transaction cost constraint. The empirical evidence is consistent with the model's prediction that, for small insurers, the reform effectively relaxed the transaction cost constraint and reduced their demand for financial bonds.

Additionally, this prediction is consistent with the evidence on the impact of access to corporate bond markets via insurance group affiliation, which effectively reduces the transaction-cost constraint for group affiliates (see Section 5.1). Moreover, looking at the

derivative of expression (19) with respect to A:

$$\frac{\partial^2 \bar{\sigma}_k^2}{\partial c(A) \partial A} = \frac{1}{\phi(\mathcal{S})} \frac{\gamma}{c(A)^3 \phi(\mathcal{S})} \frac{\partial c(A)}{\partial A} < 0, \tag{20}$$

one can see that the relationship between the financial bond share w_F^* and insurer size A is weaker among insurers facing lower transaction costs. Consistent with this result, size was a stronger determinant among insurers not part of an insurance group, and changes in insurance group membership reduced allocations to financial bonds, especially for small insurers.

Lastly, the model generates a prediction on the relationship between the diversification of the financial bond issuer and the insurer's portfolio weight on financial bonds.

Corollary 3. *The insurer's portfolio allocation to the financial bond w_F^* is weakly decreasing in the financial bond issuer's idiosyncratic risk, i.e., $\frac{\partial w_F^*}{\partial \sigma_F^2} \leq 0$.*

Proof. The first derivative of the optimal portfolio weight with respect to the financial bond's idiosyncratic volatility σ_F^2 is:

$$\frac{\partial w_F^*}{\partial \sigma_F^2} = -\frac{1}{(\sigma_F^2)^2} \phi(\mathcal{S}^*) + \frac{1}{\sigma_F^2} \frac{\partial \phi(\mathcal{S}^*)}{\partial \sigma_F^2} = -\frac{1}{(\sigma_F^2)^2} \phi(\mathcal{S}^*) \left[1 - \phi(\mathcal{S}^*) \frac{1}{\sigma_F^2} \right]. \tag{21}$$

The second term in the brackets is at most 1, since it is the optimal portfolio weight for the financial bond, which is at most 1. Therefore, the first derivative is negative, and the insurer's portfolio allocation to the financial bond, w_F^*, is weakly decreasing in the financial bond issuer's idiosyncratic risk, σ_F^2. Intuitively, a larger idiosyncratic risk of the financial bond induces the insurer to reallocate funds from the financial bond to the non-financial bonds included in the portfolio. If there are no other bonds in the portfolio, e.g., because the transaction cost constraint is very tight, nothing changes. □

While the model features a single financial bond for tractability, this comparative static can be interpreted as insurers' choice among financial bonds that differ in issuer diversification. This result is consistent with the relationship documented between insurer size and the composition of the financial bond portfolio. Bonds of active lenders in syndicated loan markets exhibit lower idiosyncratic risk, consistent with the idea that these financial intermediaries are more diversified. The results in Section 5.2 show that small insurers, which allocate a larger share of their portfolio to financial bonds, concentrated

their financial bond holdings in these diversified issuers, but only when they were not part of an insurance group. Therefore, the empirical evidence confirms the model's predictions.

Overall, the model rationalizes the empirical findings by characterizing insurers' portfolio choices as the solution to a tradeoff between transaction costs and diversification benefits. Due to this tradeoff, small insurers optimally invest a larger share of their corporate bond portfolio in financial bonds. A reduction in transaction costs, induced by the 2017 bond ETF reform, relaxes this constraint for small insurers, leading them to reduce their allocation to financial bonds. Moreover, the model predicts that insurers invest more in financial bonds of more diversified issuers. All these predictions are consistent with the empirical evidence documented in this paper.

7 Conclusion

Financial intermediaries theoretically create value by diversifying idiosyncratic risk on investors' behalf (Diamond, 1984), yet direct evidence that investors actually value this function has remained scarce. The corporate bond investments of U.S. insurers offer a setting to study the value of financial intermediaries' diversification to investors. First, insurers invest in corporate bonds only to generate returns on the collected premiums. Second, due to the illiquidity of corporate bond markets, insurers differ markedly in their ability to acquire a diversified portfolio of securities – a constraint that a 2017 regulatory reform relaxed by expanding access to diversified bond ETFs.

This paper provides evidence that investors do value the diversification role of financial intermediaries. I document that small insurers show a strong preference for bonds issued by financial intermediaries, which exhibit lower idiosyncratic risk than those of non-financial issuers. Exploiting the regulatory reform that effectively gave insurers access to diversified bond ETFs, I show that small insurers' preference for financial bonds declines once this low-cost diversification vehicle became available. Cross-sectional evidence from insurers' group affiliation and the diversification of their financial bond portfolios further indicates that small insurers invested in financial bonds for diversification purposes. A portfolio-choice model with risk-averse insurers and fixed transaction costs that fall disproportionately on small insurers rationalizes these findings.

The results demonstrate that investors value financial intermediaries' diversification role when transaction costs make direct diversification costly. On a practical level, the findings

illustrate how regulatory design shapes the portfolio choices of institutional investors and, in doing so, creates (or mitigates) potential transmission channels for financial fragility. During the 2008 financial crisis, small, non-group insurers experienced particularly severe drawdowns in the value of their corporate bond portfolios (see Figure 1), illustrating how concentrated exposure to the financial sector can amplify losses in a systemic event. Although the 2017 reform came after this episode, the results suggest that giving small insurers access to low-cost, diversified alternatives may reduce their exposure to similar shocks going forward.

Finally, the paper opens up several avenues for future research. First, this paper focuses on the post-crisis period from 2011 to 2019. Examining the same mechanisms during episodes of financial stress would yield valuable insights for policymakers concerned with financial stability. Second, as more small- and mid-sized insurers adopt bond ETFs, the ownership structure of corporate debt will undergo a structural shift. Understanding how this shift affects market functioning and risk remains an important question for future research.

References

Acharya, V. V., Hasan, I., and Saunders, A. (2006). Should Banks Be Diversified? Evidence from Individual Bank Loan Portfolios. *The Journal of Business*, 79(3):1355–1412.

Allen, F. and Gale, D. (1997). Financial Markets, Intermediaries, and Intertemporal Smoothing. *Journal of Political Economy*, 105(3):523–546.

Bao, J., Pan, J., and Wang, J. (2011). The Illiquidity of Corporate Bonds. *The Journal of Finance*, 66(3):911–946.

Becker, B. and Ivashina, V. (2015). Reaching for Yield in the Bond Market. *The Journal of Finance*, 70(5):1863–1902.

Becker, B., Opp, M., and Saidi, F. (2022). Regulatory Forbearance in the U.S. Insurance Industry: The Effects of Removing Capital Requirements for an Asset Class. *The Review of Financial Studies*, 35(12):5438–5482.

Berlin, M. and Mester, L. J. (1999). Deposits and Relationship Lending. *The Review of Financial Studies*, 12(3):579–607.

Berndt, A., Duffie, D., and Zhu, Y. (2025). The Decline of Too Big to Fail. *American Economic Review*, 115(3):945–974.

Bhardwaj, A., Ge, S., and Mukherjee, S. (2025). Does Loan Securitization Expose Borrowers to Non-Bank Investor Shocks? – Evidence from Insurers. *Working Paper*.

Bini, P. (2024). Common Investment Advisors for Insurance Companies: Implications for Liquidity and Systemic Risk. *Working Paper*.

Bittner, C., Fecht, F., Pala, M., and Saidi, F. (2026). Strategic communication among banks. *Journal of Financial Economics*, 184:104338.

Bosshardt, J., Kakhbod, A., and Saidi, F. (2024). Banking on the Edge: Liquidity Constraints and Illiquid Asset Risk. *Working Paper*.

Boyd, J. H. and Prescott, E. C. (1986). Financial intermediary-coalitions. *Journal of Economic Theory*, 38(2):211–232.

Buffett, W. (2019). Chairman's Letter. Berkshire Hathaway Inc. 2018 Annual Report.

Calomiris, C. and Kahn, C. (1991). The Role of Demandable Debt in Structuring Optimal Banking Arrangements. *American Economic Review*, 81(3):497–513.

Chodorow-Reich, G. (2014). The Employment Effects of Credit Market Disruptions: Firm-level Evidence from the 2008–9 Financial Crisis. *The Quarterly Journal of Economics*, 129(1):1–59.

Chodorow-Reich, G., Ghent, A., and Haddad, V. (2021). Asset Insulators. *The Review of Financial Studies*, 34(3):1509–1539.

Coppola, A. (2025). In Safe Hands: The Financial and Real Impact of Investor Composition over the Credit Cycle. *The Review of Financial Studies*, 38(8):2275–2325.

Deng, S. E. and Elyasiani, E. (2008). Geographic Diversification, Bank Holding Company Value, and Risk. *Journal of Money, Credit and Banking*, 40(6):1217–1238.

Diamond, D. W. (1984). Financial Intermediation and Delegated Monitoring. *Review of Economic Studies*, 51(3):393–414.

Diamond, D. W. and Dybvig, P. H. (1983). Bank Runs, Deposit Insurance, and Liquidity. *Journal of Political Economy*, 91(3):401–419.

Diamond, D. W. and Rajan, R. G. (2001a). Banks and Liquidity. *American Economic Review*, 91(2):422–425.

Diamond, D. W. and Rajan, R. G. (2001b). Liquidity Risk, Liquidity Creation, and Financial Fragility: A Theory of Banking. *Journal of Political Economy*, 109(2):287–327.

Dick-Nielsen, J. (2009). Liquidity Biases in TRACE. *Journal of Fixed Income*, 19(2):43–55.

Dick-Nielsen, J. (2014). How to Clean Enhanced TRACE Data. *Working Paper*.

Dick-Nielsen, J., Feldhütter, P., and Lando, D. (2012). Corporate bond liquidity before and after the onset of the subprime crisis. *Journal of Financial Economics*, 103(3):471–492.

Dick-Nielsen, J., Feldhütter, P., and Lando, D. (2025). The Financial Premium. *The Journal of Finance*, forthcoming.

Doerr, S. and Schaz, P. (2021). Geographic diversification and bank lending during crises. *Journal of Financial Economics*, 140(3):768–788.

Earley, M., Oliver, L., and Stack, D. (2017). Clarifying the bond ETF discussion for insurance investing. Technical report, Deutsche Asset Management.

Edwards, A. K., Harris, L. E., and Piwowar, M. S. (2007). Corporate Bond Market Transaction Costs and Transparency. *The Journal of Finance*, 62(3):1421–1451.

Ellul, A., Jotikasthira, C., Kartasheva, A., Lundblad, C. T., and Wagner, W. (2022). Insurers as Asset Managers and Systemic Risk. *The Review of Financial Studies*, 35(12):5483–5534.

Ellul, A., Jotikasthira, C., and Lundblad, C. T. (2011). Regulatory pressure and fire sales in the corporate bond market. *Journal of Financial Economics*, 101(3):596–620.

Ellul, A., Jotikasthira, C., Lundblad, C. T., and Wang, Y. (2015). Is Historical Cost Accounting a Panacea? Market Stress, Incentive Distortions, and Gains Trading. *The Journal of Finance*, 70(6):2489–2538.

Fache Rousová, L. and Giuzio, M. (2019). Insurers' Investment Strategies: Pro- or Countercyclical? *Working Paper*.

Fama, E. F. and French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33:3–56.

Fang, C. (2025). Monetary Policy Amplification through Bond Fund Flows. *Working Paper*.

Flannery, M. J. (1994). Debt Maturity and the Deadweight Cost of Leverage: Optimally Financing Banking Firms. *American Economic Review*, 84(1):320–331.

Foley-Fisher, N., Heinrich, N., and Verani, S. (2023). Are US Life Insurers the New Shadow Banks? *Working Paper*.

Fringuellotti, F. and Santos, J. A. (2026). Insurance Companies and the Growth of Corporate Loans' Securitization. *Federal Reserve Bank of New York Staff Reports*, 975.

Ge, S. and Weisbach, M. S. (2021). The role of financial conditions in portfolio choices: The case of insurers. *Journal of Financial Economics*, 142(2):803–830.

Gelman, M., Goldstein, I., and MacKinlay, A. (2023). Bank Diversification and Lending Resiliency. *Working Paper*.

Girardi, G., Hanley, K. W., Nikolova, S., Pelizzon, L., and Sherman, M. G. (2021). Portfolio similarity and asset liquidation in the insurance industry. *Journal of Financial Economics*, 142(1):69–96.

Goetz, M. R., Laeven, L., and Levine, R. (2013). Identifying the Valuation Effects and Agency Costs of Corporate Diversification: Evidence from the Geographic Diversification of U.S. Banks. *The Review of Financial Studies*, 26(7):1787–1823.

Goetz, M. R., Laeven, L., and Levine, R. (2016). Does the geographic expansion of banks reduce risk? *Journal of Financial Economics*, 120(2):346–362.

Gorton, G. and Pennacchi, G. (1990). Financial Intermediaries and Liquidity Creation. *The Journal of Finance*, 45(1):49.

Greenwood, J. and Jovanovic, B. (1990). Financial Development, Growth, and the Distribution of Income. *Journal of Political Economy*, 98(5, Part 1):1076–1107.

Han, Y., Hu, T., and Lesmond, D. A. (2015). Liquidity Biases and the Pricing of Cross-Sectional Idiosyncratic Volatility around the World. *Journal of Financial and Quantitative Analysis*, 50(6):1269–1292.

Han, Y. and Lesmond, D. (2011). Liquidity Biases and the Pricing of Cross-sectional Idiosyncratic Volatility. *The Review of Financial Studies*, 24(5):1590–1629.

Harris, L. (2015). Transaction Costs, Trade Throughs, and Riskless Principal Trading in Corporate Bond Markets. *Working Paper*.

Hendershott, T., Li, D., Livdan, D., and Schürhoff, N. (2020). Relationship Trading in Over-the-Counter Markets. *The Journal of Finance*, 75(2):683–734.

Holmström, B. and Tirole, J. (1997). Financial Intermediation, Loanable Funds, and the Real Sector. *The Quarterly Journal of Economics*, 112(3):663–691.

Holmström, B. and Tirole, J. (1998). Private and Public Supply of Liquidity. *Journal of Political*

Economy, 106(1):1–40.

Ivashina, V. and Scharfstein, D. (2010). Loan Syndication and Credit Cycles. *American Economic Review*, 100(2):57–61.

Kashyap, A. K., Rajan, R., and Stein, J. C. (2002). Banks as Liquidity Providers: An Explanation for the Coexistence of Lending and Deposit-taking. *The Journal of Finance*, 57(1):33–73.

Kirti, D. and Sarin, N. (2023). What Private Equity Does Differently: Evidence from Life Insurance. *The Review of Financial Studies*, 37(1):201–230.

Knox, B. and Sørensen, J. A. (2026). Insurers' Investments and Insurance Prices. *Management Science*, forthcoming.

Koijen, R. S. and Yogo, M. (2023). Understanding the Ownership Structure of Corporate Bonds. *American Economic Review: Insights*, 5(1):73–91.

Kraham, J. L. and Pierce, S. L. (2023). Regulatory Considerations for Investments by Insurance Holding Company System Members. *FORC Journal*, 34(2).

Kubitza, C. (2026). Investor-Driven Corporate Finance: Evidence from Insurance Markets. *The Review of Financial Studies*, forthcoming.

Kubitza, C., Grochola, N., and Gründl, H. (2025). Life insurance convexity. *Journal of Banking and Finance*, 178:107502.

Levine, R. (2005). Chapter 12 Finance and Growth: Theory and Evidence. In **Aghion, P. and Durlauf, S. N.**, editors, *Handbook of Economic Growth*, pages 865–934. North-Holland.

Levine, R., Lin, C., and Xie, W. (2021). Geographic Diversification and Banks' Funding Costs. *Management Science*, 67(5):2657–2678.

Liu, Y., Rossi, S., and Yun, H. (2025). Insurance Companies and the Propagation of Liquidity Shocks to the Real Economy. *Working Paper*.

Manconi, A., Massa, M., and Zhang, L. (2016). Bondholder Concentration and Credit Risk: Evidence from a Natural Experiment. *Review of Finance*, 20(1):127–159.

Massa, M. and Zhang, L. (2021). The Spillover Effects of Hurricane Katrina on Corporate Bonds and the Choice Between Bank and Bond Financing. *Journal of Financial and Quantitative Analysis*, 56(3):885–913.

Masters, B. (2023). Billions pouring into bond ETFs are bright spot for BlackRock. *Financial Times*. Available at: `https://www.ft.com/content/231524e2-fe76-412c-ac84-dbfc365879af`; accessed on 2026/07/13.

Meisenzahl, R., Overpeck, J., and Polacek, A. (2025). Life Insurers' Private Credit Investments and Annuity Market Share Capture. *Working Paper*.

National Association of Insurance Commissioners (2013). 2013 Proceedings of the National Association of Insurance Commissioners. *Spring Volume II*.

National Association of Insurance Commissioners (2015). 2015 Proceedings of the National Association of Insurance Commissioners. *Fall Volume II*.

National Association of Insurance Commissioners (2017a). 2017 Proceedings of the National Association of Insurance Commissioners. *Spring Volume II*.

National Association of Insurance Commissioners (2017b). Purposes and Procedures Manual of the NAIC Investment Analysis Office.

National Association of Insurance Commissioners (2017c). Statutory Issue Paper No. 156 – Bonds.

National Association of Insurance Commissioners (2018). Purposes and Procedures Manual of the NAIC Investment Analysis Office.

National Association of Insurance Commissioners (2019). ETF Bond List.

Neuhann, D. and Saidi, F. (2018). Do universal banks finance riskier but more productive firms? *Journal of Financial Economics*, 128(1):66–85.

O' Hara, M., Wang, Y., and (Alex) Zhou, X. (2018). The execution quality of corporate bonds. *Journal of Financial Economics*, 130(2):308–326.

Ozdagli, A. K. and Wang, Z. K. (2020). Interest Rates and Insurance Company Investment Behavior. *Working Paper*.

Pintér, G., Wang, C., and Zou, J. (2024). Size Discount and Size Penalty: Trading Costs in Bond Markets. *The Review of Financial Studies*, 37(7):2156–2190.

Reichenbacher, M. and Schuster, P. (2022). Size-adapted bond liquidity measures and their asset pricing implications. *Journal of Financial Economics*, 146(2):425–443.

Schultz, P. (2001). Corporate Bond Trading Costs: A Peek Behind the Curtain. *The Journal of Finance*, 56(2):677–698.

Schwert, M. (2018). Bank Capital and Lending Relationships. *The Journal of Finance*, 73(2):787–830.

Sen, I. (2023). Regulatory Limits to Risk Management. *The Review of Financial Studies*, 36(6):2175–2223.

Sen, I., Sharma, V., and Viceira, L. M. (2026). Valuation as Regulatory Capital. *Working Paper*.

State Street Global Advisors (2021). Systematic Value Calculation For Fixed Income ETFs: The Step-by-Step Calculation and Hypothetical Example. *Insights Fixed Income*, Q2.

Svensson, L. E. (1994). Estimating and Interpreting Forward Interest Rates: Sweden 1992–1994. *Working Paper*.

Tam, A. J., Curtiss, M. K., and Smith, B. M. (2023). Iowa Adpots New Life Insurance Investment Law. *Willkie Farr & Gallagher LLP Client Alert*.

Ueda, K. and Weder di Mauro, B. (2013). Quantifying structural subsidy values for systemically important financial institutions. *Journal of Banking and Finance*, 37(10):3830–3842.

Warburton, A. J., Anginer, D., and Acharya, V. V. (2022). The End of Market Discipline? Investor Expectations of Implicit State Guarantees. *Working Paper*.

Welch, I. and Goyal, A. (2008). A Comprehensive Look at The Empirical Performance of Equity Premium Prediction. *The Review of Financial Studies*, 21(4):1455–1508.

Figures

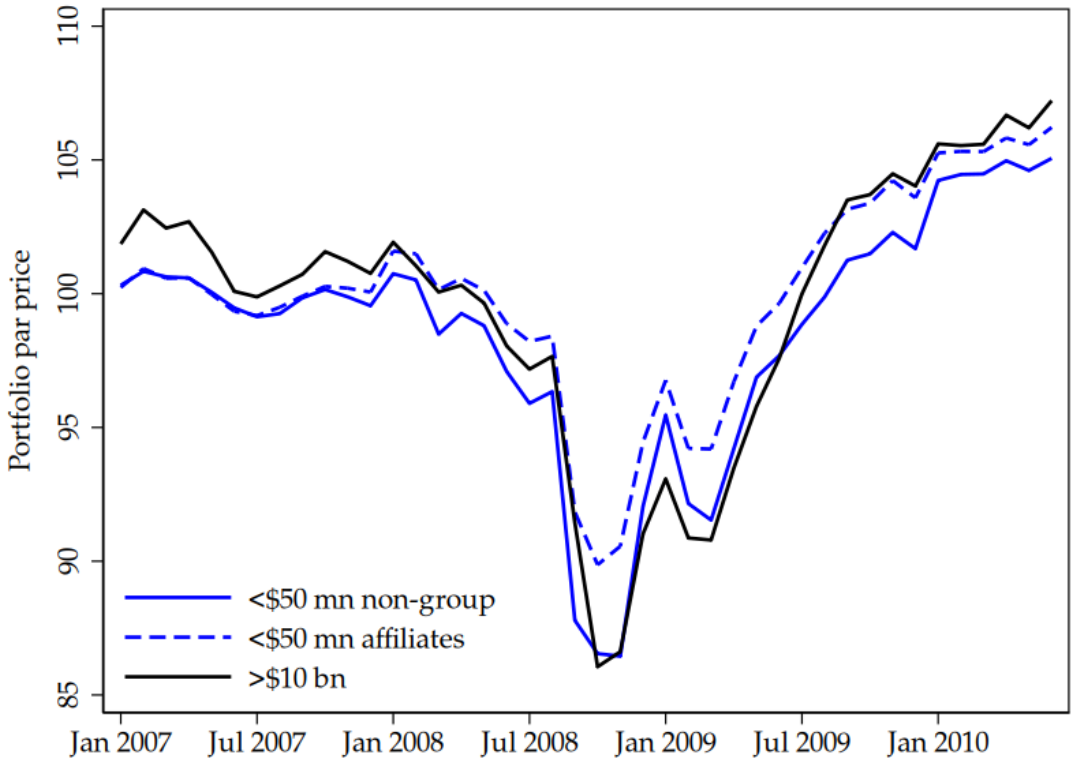


Figure 1
Insurers' Portfolio Drawdown During the Global Financial Crisis

This figure shows the average portfolio par price for small non-group insurers (blue solid line), small group affiliates (blue dashed line), and large insurers (black solid line) between January 2007 and June 2010. The portfolio par price is calculated as the weighted average of the end-of-month par prices in insurers' corporate bond portfolios. The weights are the par value of the bond holdings reported at the end of the preceding year. Small insurers are insurers with total assets below $50 million; large insurers are insurers with total assets above $10 billion. Group affiliates are insurers that are part of an insurance group with at least two insurers or more. Sources: NAIC Schedule D Part 1, TRACE, and Mergent FISD.

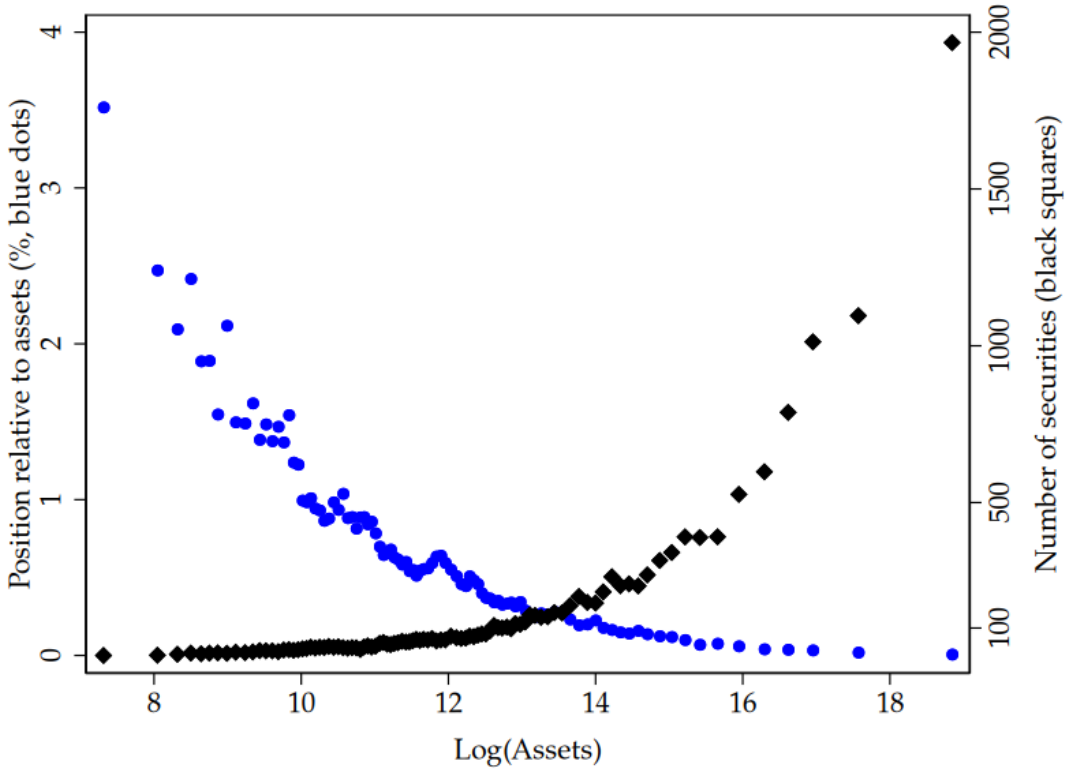


Figure 2
Portfolio Breadth and Position Exposure across Insurer Size

This figure shows binned scatter plots for (a) the average number of securities in insurers' portfolios (black squares) and (b) the average position's size relative to total assets (blue dots) across insurer size.

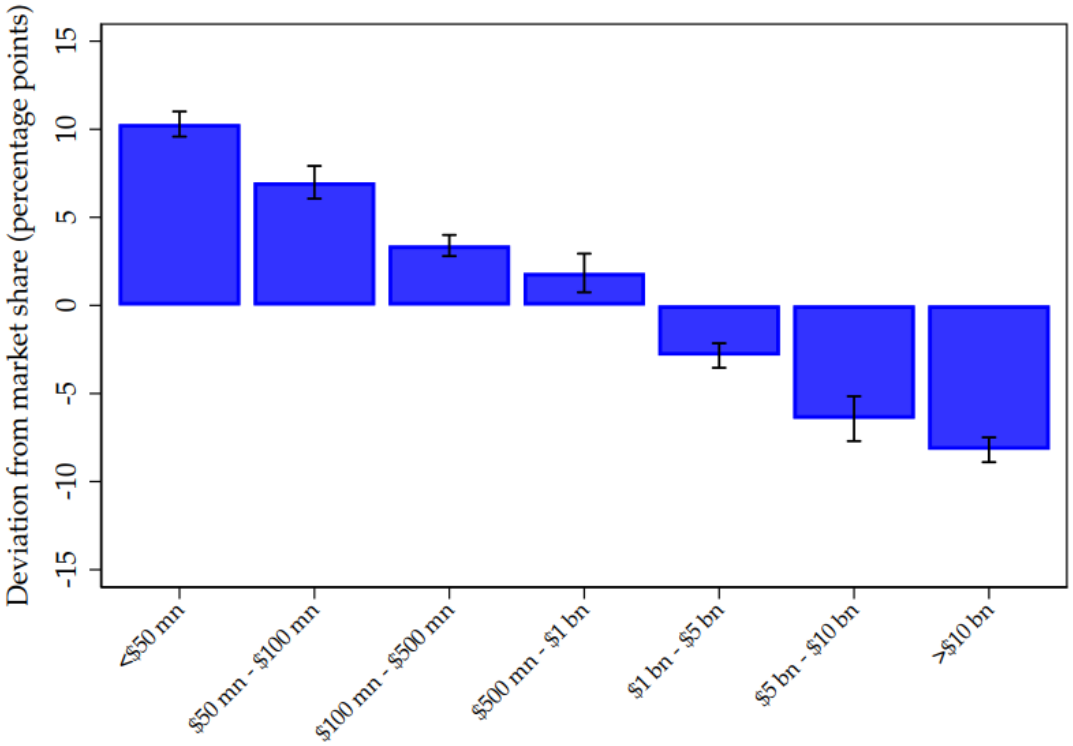


Figure 3
Financial Bond Investments by Insurer Size

This figure shows the average difference between the share of financial bonds in insurers' corporate bond portfolios and the corresponding share of financial bonds in the market portfolio across insurer size. Within each size bucket, the average difference is weighted by insurers' total assets. The black caps indicate the 95% confidence intervals. The average market share of financial bonds between 2011 and 2019 was around 30%.

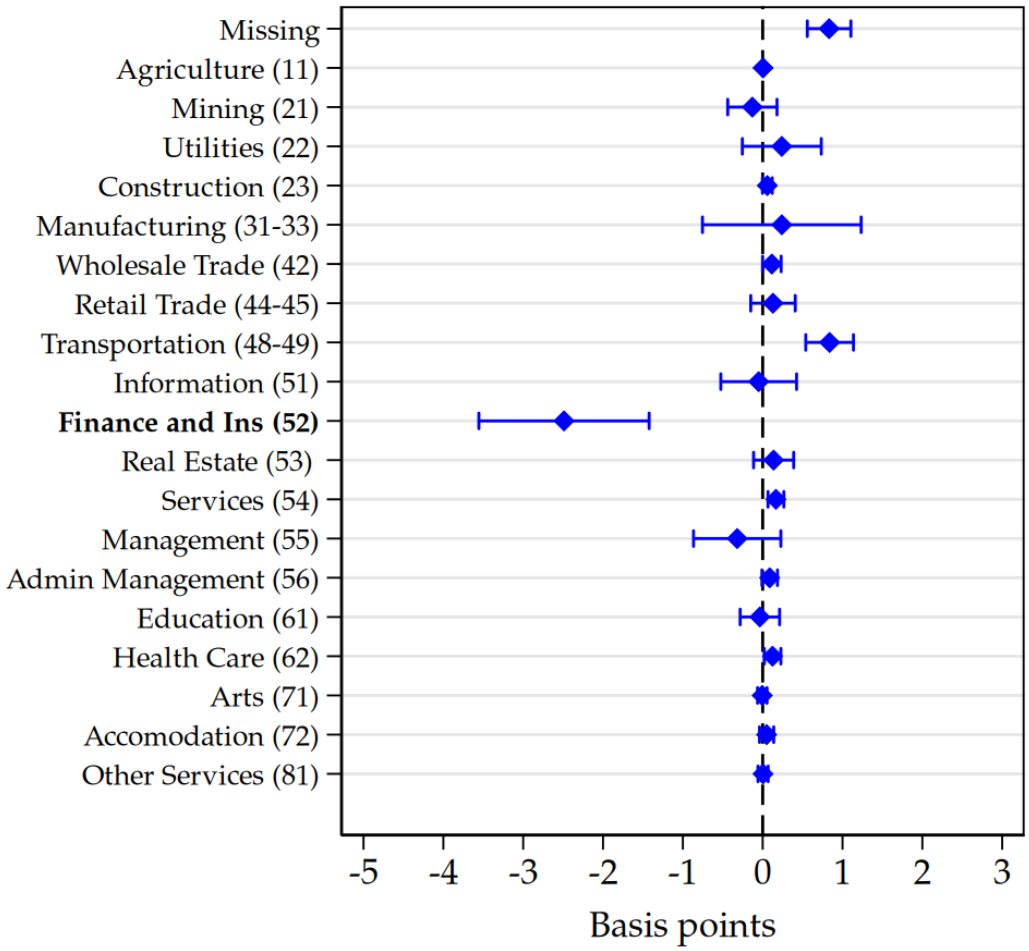
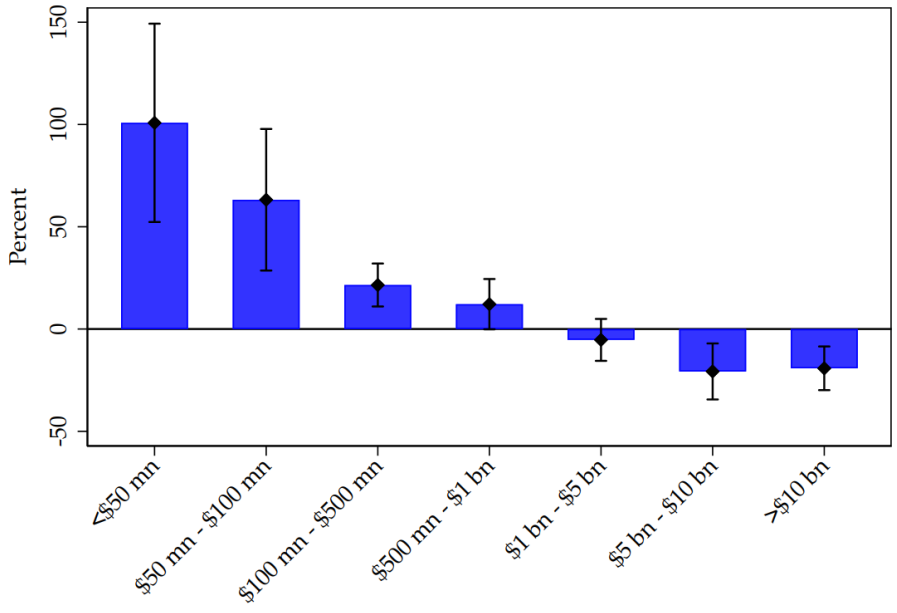
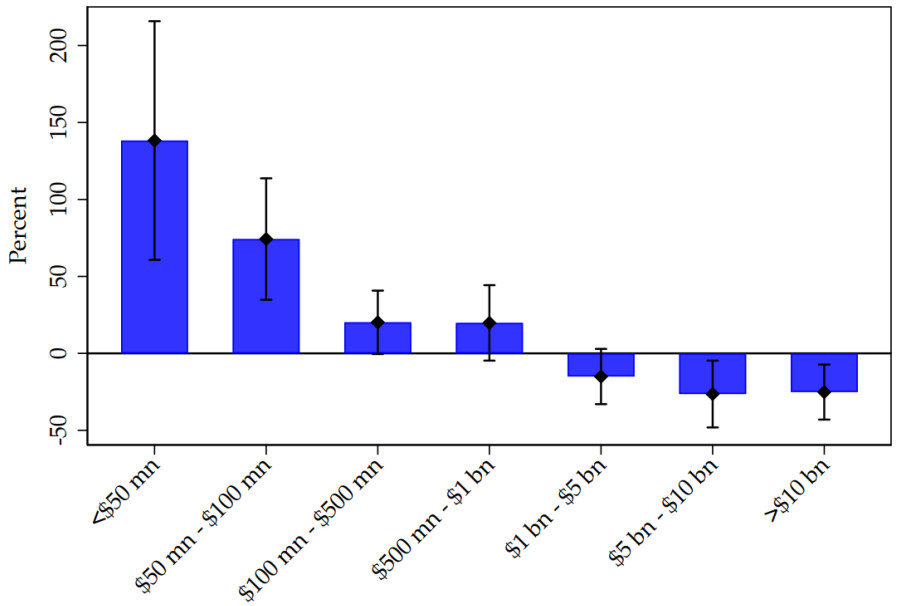


Figure 4
Insurer Size as Determinant of Portfolio Allocation across Industries

This figure displays estimated coefficients β_s for the interaction of the industry dummies and size in Equation (1). The dependent variable is the portfolio share, in par values, of an industry in an insurer's corporate bond portfolio. The regression includes controls for insurers' leverage, return on equity, RBC ratio, and the Herfindahl-Hirschman index across sector-level bond holdings; moreover, I include insurer-industry and year fixed effects. The caps indicate the 95% confidence intervals. Standard errors are clustered at the insurer level.



(a) All Bonds



(b) A-rated Bonds

Figure 5
Preference for Financial Bonds by Insurer Size

This figure shows the estimates for the β coefficient in Equation (2) by insurer size. For each size bucket, the coefficients are scaled by the mean of the dependent variable, i.e., the share of the bond issue acquired by insurers of a certain size. The regression includes controls for bonds' yield spread, log maturity, and indicator variables for credit enhancement and callability; moreover, I include SIFI-year and maturity-rating-year fixed effects. The caps indicate the 95% confidence intervals. Standard errors are clustered at the parent level.

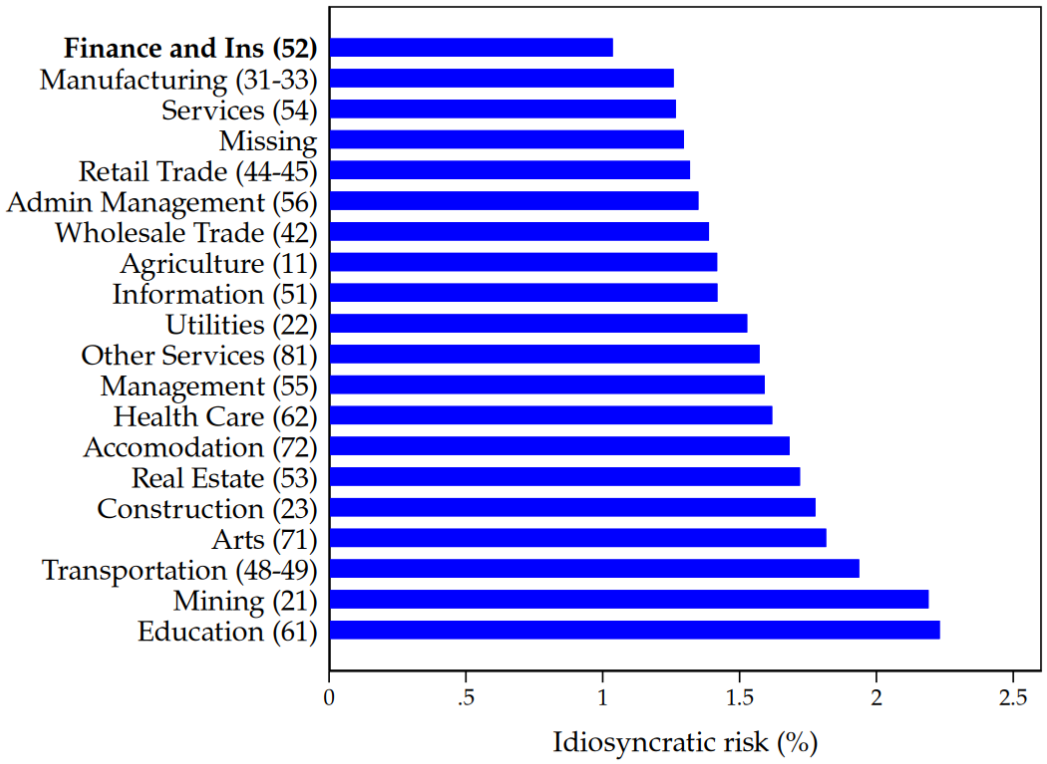


Figure 6
Corporate Bond Idiosyncratic Volatility by Industry Sector

This figure shows the weighted median idiosyncratic volatility of bond issues by industry sector. The idiosyncratic volatility is calculated as the standard deviation of the residuals of a three-factor model containing market risk, default risk, and term risk. For a detailed description of the construction, see Appendix A.1. The weights are the par value of the bond issues.

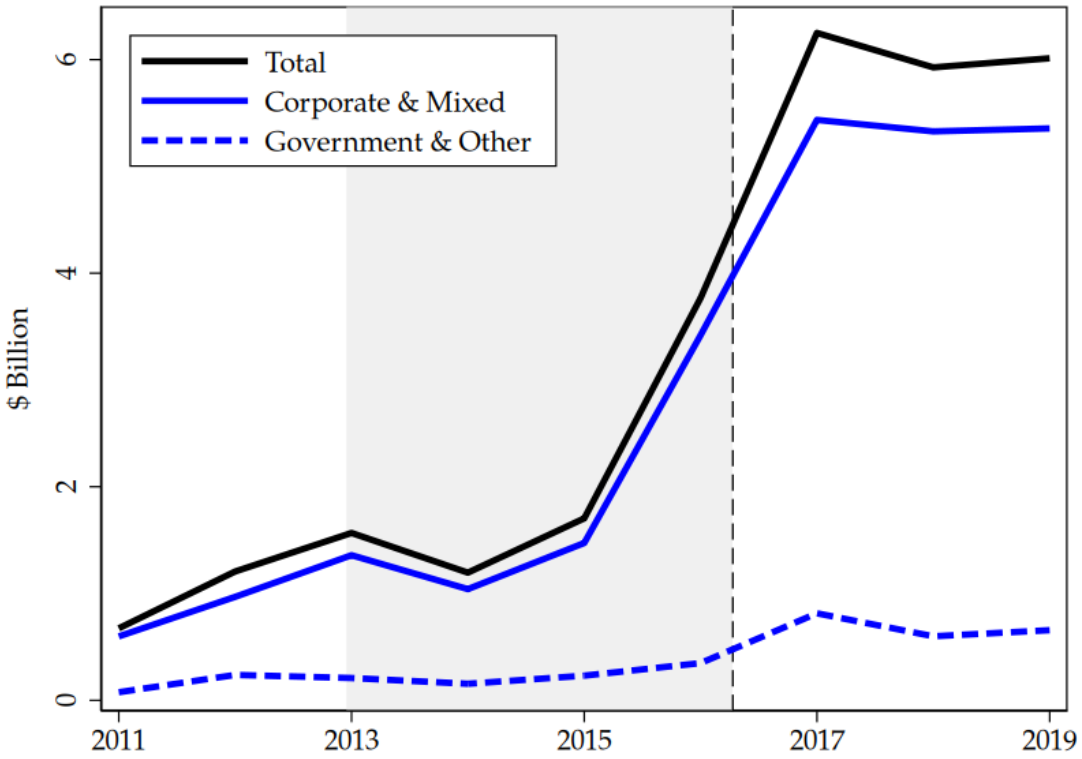


Figure 7
Insurers' Aggregate Investments in Bond ETFs

This figure shows insurers' investments in bond ETFs between 2011 and 2019 for all bond ETFs (black graph) and split by the ETF's investment universe (blue graphs). Insurers' ETF investments are identified using the NAIC's 2017–2019 lists of bond ETFs eligible for bond-like treatment. I classify bond ETFs into the four categories "Corporate", "Mixed", "Government", and "Other", based on publicly available information on the ETFs' investment universe from the web. Appendix Table A.2 contains a detailed overview of all bond ETFs and their classification. Insurers' investments are measured at historical cost reported in NAIC Schedule D, i.e., the acquisition price. The shaded area indicates the period between the NAIC's first public exposure of the bond ETF reform for comment (December 15, 2013) and its implementation (April 8, 2017).

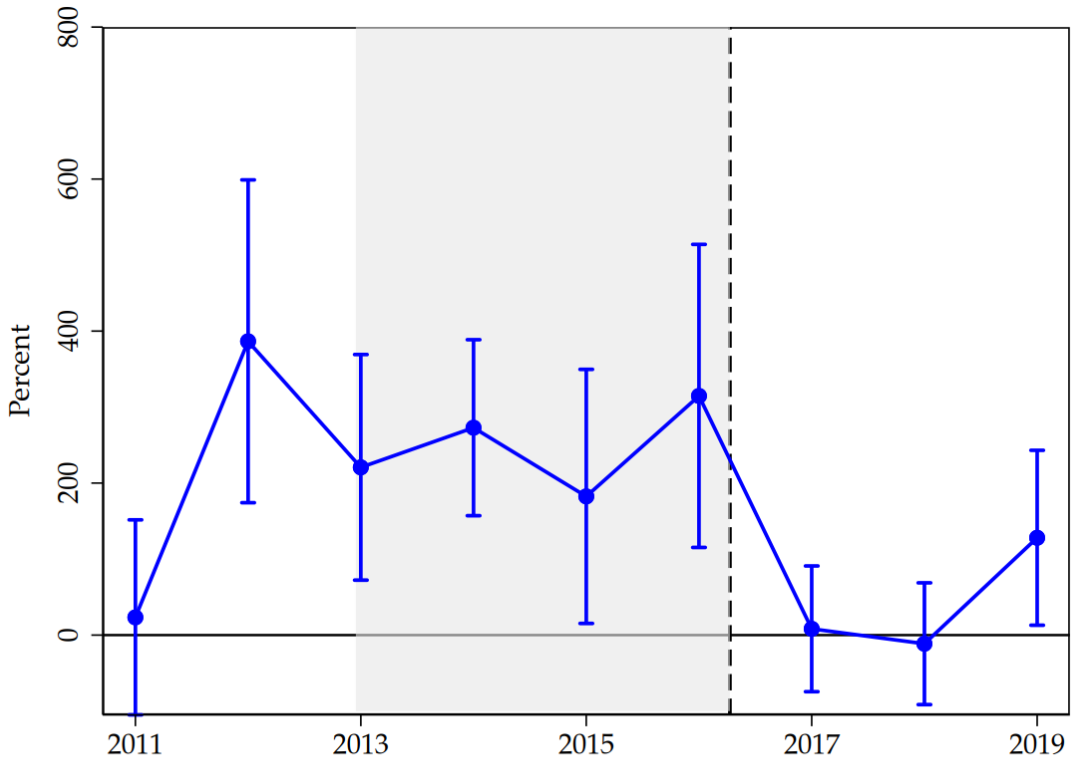


Figure 8
Insurers' Preference for Financial Bonds over Time

This figure shows estimates for a specification based on Equation (4) including year dummy interactions for insurers with total assets lower than $50 million. The coefficients are scaled by the mean of the dependent variable, i.e., the *Issue share* acquired by small insurers. The regression includes controls for bond's yield spread, log maturity, and indicator variables for credit enhancement and callability; moreover, I include SIFI-year and maturity-rating-year fixed effects. The caps indicate the 95% confidence intervals. Standard errors are clustered at the parent level. The shaded area indicates the period between the NAIC's first public exposure of the bond ETF reform for comment (December 15, 2013) and its implementation (April 8, 2017).

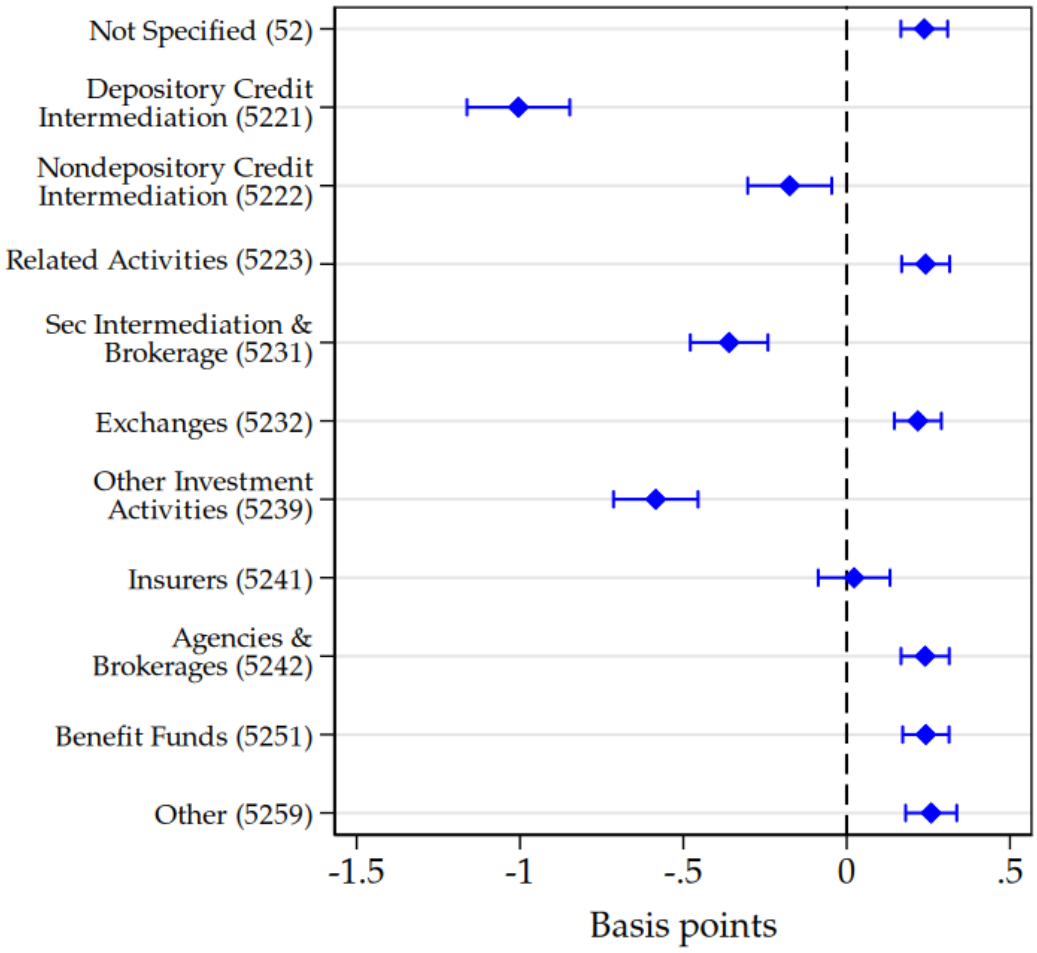


Figure 9
Insurer Size as Determinant of Investment Allocation within the Financial Sector

This figure displays estimated coefficients β_s for the interaction of subindustry dummies and size, i.e., a variant of Equation (1) with the 4-digit NAICS subindustries of the financial sector. The dependent variable is the portfolio share, in par values, of an industry in an insurer's corporate bond portfolio. The regression includes controls for insurers' leverage, return on equity, RBC ratio, and the Herfindahl-Hirschman index across sector-level bond holdings; moreover, I include insurer and industry-year fixed effects. The caps indicate the 95% confidence intervals. Standard errors are clustered at the insurer level.

Tables

Table 1
Summary Statistics

Panel 1: Insurers' portfolios and balance sheets

	N	Mean	SD	1st	25th	Median	75th	99th
Portfolio share (%)								
All sectors	470,060	5.00	12.00	0.00	0.00	0.00	3.72	56.62
Finance and Insurance (NAICS 52)	23,503	35.19	21.41	0.00	21.13	32.92	45.12	100.00
Sector rating (1=AAA, 23=NR)	221,040	10.26	4.76	3.00	7.25	8.98	11.69	23.00
Sector maturity (years)	221,040	7.22	6.13	0.44	3.79	5.71	8.37	27.66
Assets ($ bn)	23,503	2.25	8.87	0.00	0.03	0.12	0.55	71.59
RBC ratio	22,801	35.44	71.01	1.47	6.11	9.80	19.20	382.88

Panel 2: Bond issues and idiosyncratic risk

	N	Mean	SD	1st	25th	Median	75th	99th
Issue size ($ bn)	9,566	0.67	0.61	0.00	0.33	0.50	0.85	3.00
Maturity (years)	9,566	8.00	3.95	2.02	5.02	8.03	10.02	29.92
1(Financial)	9,566	0.29	0.45	0	0	0	1	1
1(SIFI)	9,566	0.19	0.39	0	0	0	0	1
Issue share of insurers (%)								
with *Assets* <$50 mn	9,566	0.10	0.41	0.00	0.00	0.00	0.06	3.26
with *Assets* $50 - $100 mn	9,566	0.10	0.35	0.00	0.00	0.00	0.08	3.03
with *Assets* $100 - $500 mn	9,566	0.68	1.16	0.00	0.01	0.23	0.89	7.86
with *Assets* $500 mn - $1 bn	9,566	0.47	0.89	0.00	0.00	0.14	0.59	6.67
with *Assets* $1 bn - $5 bn	9,566	2.26	2.95	0.00	0.21	1.12	3.28	16.28
with *Assets* $5 bn - $10 bn	9,566	1.04	1.56	0.00	0.00	0.41	1.37	8.15
with *Assets* >$10 bn	9,566	16.49	18.20	0.00	2.35	10.26	24.71	80.70
Idiosyncratic risk based on								
3-factor model (pp)	5,943	1.67	1.93	0.14	0.88	1.39	1.85	8.64
4-factor model (pp)	5,943	1.53	1.84	0.13	0.85	1.29	1.66	8.22

This table shows the summary statistics for the main variables of (1) the insurer-sector-year panel and (2) the bond issues data set.
Panel 1: Insurers' portfolios and balance sheets. *Portfolio share* is the share, in par values, of an insurer's corporate bond portfolio invested into bonds from a specific two-digit NAICS industry sector at year-end. *Sector rating* (1=AAA, 23=NR) is the average credit rating of the bonds held by an insurer within a given industry sector. *Sector maturity* is the average maturity of the bonds held by an insurer within a given industry sector. *Assets* refers to an insurer's total assets. *RBC ratio* is an insurer's risk-based capital ratio.
Panel 2: Bond issues and idiosyncratic risk. *Issue size* is the offering amount of the bond issue. *Maturity* is the bond's number of years from the issue date to the maturity date. **1**(*Financial*) is an indicator variable that takes the value one if the bond issuer belongs to the financial industry (two-digit NAICS: 52 "Finance and Insurance"). **1**(*SIFI*) is an indicator variable that takes the value one if the bond issuer (or its parent company) has ever been classified as a systemically important financial institution (SIFI). *Issue share* is the share of the bond issue acquired by insurers with total assets in one of the seven different size categories. *Idiosyncratic risk* is the variance of estimated residuals from factor models.

Table 2
Insurers' Preference for Financial Bonds

	Dependent variable: *Issue share*$_b$					
Insurers with:	*Assets* $\leq$ \$50 mn			*Assets* $\in$ (\$50 mn, \$100 mn]		
Bonds in sample:	All		A-rated	All		A-rated
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbf{1}(\text{Financial})_b$	0.106***	0.110***	0.157***	0.065***	0.066***	0.080***
	[4.08]	[4.15]	[3.67]	[3.58]	[3.54]	[3.65]
$\mathbf{1}(\text{Financial})_b \times \text{Log(Maturity)}_b$		0.040***	0.066***		0.006	0.022
		[3.00]	[3.86]		[0.49]	[1.29]
Bond controls	Yes	Yes	Yes	Yes	Yes	Yes
SIFI-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Maturity-Rating-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean *Issue share*$_b$		0.10			0.10	
No. of obs.	9,566	9,566	2,344	9,566	9,566	2,344
R^2	0.188	0.190	0.219	0.128	0.128	0.125
Adj. R^2	0.129	0.130	0.161	0.064	0.064	0.060

This table reports estimates for specifications based on Equation (2). In columns (1) to (3) [(4) to (6)], the dependent variable, *Issue share*$_b$, is the share of bond issue b acquired by insurers with total assets below \$50 million [between \$50 million and \$100 million]. $\mathbf{1}(\textit{Financial})_b$ is an indicator variable that takes the value one if the bond is a financial bond, that is, the issuer belongs to the financial industry (two-digit NAICS: 52 "Finance and Insurance"). *Log(Maturity)*$_b$ is the natural logarithm of the bond's maturity in years. Bond control variables include yield spread, log maturity, and indicator variables for credit enhancement and callability. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the parent level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table 3
Idiosyncratic Risk of Financial Bonds Versus Non-Financial Bonds

	Dependent variable: $\sigma(\hat{\varepsilon})_b$			
Sample:	All		A-rated	
	(1)	(2)	(3)	(4)
$\mathbf{1}(\text{Financial})_b$	-0.129***	-0.136***	-0.068**	-0.078**
	[-3.06]	[-3.11]	[-2.28]	[-2.44]
$\mathbf{1}(\text{Financial})_b \times \text{Log(Maturity)}_b$		-0.060**		-0.088***
		[-2.11]		[-2.88]
Bond controls	Yes	Yes	Yes	Yes
Maturity-Rating-Year FE	Yes	Yes	Yes	Yes
SIFI-Year FE	Yes	Yes	Yes	Yes
No. of obs.	5,672	5,672	2,069	2,069
R^2	0.519	0.519	0.656	0.659
Adj. R^2	0.473	0.473	0.627	0.630

This table reports estimates for specifications based on Equation (3). The dependent variable $\sigma(\hat{\varepsilon})_b$ is the variance of residuals estimated from a factor model incorporating market, default, and term risk factors. $\mathbf{1}(\textit{Financial})_b$ is an indicator variable that takes the value one if the bond is a financial bond, that is, the issuer belongs to the financial industry (two-digit NAICS: 52 "Finance and Insurance"). $\textit{Log(Maturity)}_b$ is the natural logarithm of the bond's maturity in years. Bond control variables include log issue size, yield spread, log maturity, bid-ask spread, and indicator variables for credit enhancement and callability. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the parent level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table 4
The 2017 Bond ETF Reform and Insurers' Preference for Financial Bonds

Insurers with total assets:	Dependent variable: *Issue share*$_b$			
	<$50 mn		$50 mn - $100 mn	$100 mn - $500 mn
	(1)	(2)	(3)	(4)
$\mathbf{1}(\text{Financial})_b$	0.132***	0.138***	0.053***	0.133*
	[3.80]	[3.88]	[3.09]	[1.80]
$\mathbf{1}(\text{Financial})_b \times \text{Log(Maturity)}_b$		0.075***	0.014	0.115**
		[4.47]	[1.15]	[2.54]
$\mathbf{1}(\text{Post})_t \times \mathbf{1}(\text{Financial})_b$	-0.058**	-0.070**	-0.010	0.012
	[-2.46]	[-2.43]	[-0.40]	[0.09]
$\mathbf{1}(\text{Post})_t \times \mathbf{1}(\text{Financial})_b \times \text{Log(Maturity)}_b$		-0.086***	-0.018	0.011
		[-3.49]	[-0.78]	[0.12]
Other interaction terms		Yes	Yes	Yes
Bond controls	Yes	Yes	Yes	Yes
SIFI-Year FE	Yes	Yes	Yes	Yes
Maturity-Rating-Year FE	Yes	Yes	Yes	Yes
No. of obs.	2,344	2,344	2,344	2,344
R^2	0.187	0.193	0.124	0.159
Adj. R^2	0.127	0.132	0.058	0.095

This table reports estimates for specifications based on Equation (4). In columns (1) and (2), the dependent variable, *Issue share*$_b$, is the share of bond issue b acquired by insurers with total assets below $50 million. In column (3), the dependent variable is the corresponding share for insurers with total assets between $50 million and $100 million. In column (4), the dependent variable is the corresponding share for insurers with total assets between $100 million and $500 million. $\mathbf{1}(\textit{Financial})_b$ is an indicator variable that takes the value one if the bond is a financial bond, that is, the issuer belongs to the financial industry (two-digit NAICS: 52 "Finance and Insurance"). $\mathbf{1}(\textit{Post})_t$ is an indicator variable that takes the value one if the bond has been issued after the 2017 bond ETF reform, that is, in 2017 or later. *Log(Maturity)*$_b$ is the natural logarithm of the bond's maturity in years. Bond control variables include yield spread, log maturity, and indicator variables for credit enhancement and callability. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the parent level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table 5
Bond ETF Investments across Insurer Size after the 2017 Bond ETF Reform

	Dependent variable: $\frac{\textit{Bond ETFs}_{i,t}}{\textit{Balance sheet item}_{i,t}}$					
Sample:	Adopting states			Non-adopting states		
Balance sheet item$_{i,t}$:	Invested assets		Total bonds	Invested assets		Total bonds
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Assets)$_{i,t}$	-0.047***	-0.064***	-0.116***	-0.020*	-0.025	-0.045
	[-2.71]	[-3.51]	[-3.12]	[-1.76]	[-1.40]	[-1.28]
Controls		Yes	Yes		Yes	Yes
Domicile-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	6,446	6,446	6,447	932	932	932
R^2	0.031	0.032	0.040	0.068	0.077	0.071
Within R^2	0.003	0.004	0.005	0.004	0.013	0.015

This table reports estimates for specifications based on Equation (5). The dependent variable, $\frac{\textit{Bond ETFs}_{i,t}}{\textit{Balance sheet item}_{i,t}}$, is the share, in book values, of insurer i's total invested assets, columns (1), (2), (4), and (5), or fixed income investments, columns (3) and (6), allocated to bond ETFs focusing on corporate securities or the broader market in year t. Columns (1) to (3) show the results for insurers located in states that adopted the 2017 bond ETF reform, while columns (4) to (6) show the results for insurers located in states that did not adopt the reform, i.e., New York, Iowa, and Virginia. *Log(Assets)*$_{i,t}$ is the natural logarithm of insurer i's total assets in year t. Control variables include insurers' leverage, return on equity, and RBC ratio. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the insurer level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table 6
Insurance Group Affiliation and Financial Bond Investments

	Dep. variable: *Financial bond share*$_{i,t}$			
	(1)	(2)	(3)	(4)
Log(Assets)$_{i,t}$	-2.665***	-4.137***	-4.214***	-4.310***
	[-4.14]	[-4.97]	[-5.02]	[-5.15]
$\mathbf{1}$(Affiliate)$_{i,t}$		-23.253***	-23.897***	-19.929**
		[-3.05]	[-3.10]	[-2.57]
$\mathbf{1}$(Affiliate)$_{i,t}$ × Log(Assets)$_{i,t}$		1.853***	1.871***	1.986***
		[3.04]	[3.03]	[3.08]
$\mathbf{1}$(Post)$_t$ × Log(Assets)$_{i,t}$			0.753**	0.726**
			[2.33]	[2.23]
$\mathbf{1}$(Post)$_t$ × $\mathbf{1}$(Affiliate)$_{i,t}$			8.651**	8.292*
			[2.02]	[1.91]
$\mathbf{1}$(Post)$_t$ × $\mathbf{1}$(Affiliate)$_{i,t}$ × Log(Assets)$_{i,t}$			-0.640*	-0.614*
			[-1.83]	[-1.74]
Controls	Yes	Yes	Yes	Yes
$\mathbf{1}$(*Affiliate*) × Controls				Yes
Insurer FE	Yes	Yes	Yes	Yes
Domicile-Year FE	Yes	Yes	Yes	Yes
No. of obs.	22,594	22,594	22,594	22,594
R^2	0.726	0.726	0.727	0.727
Adj. R^2	0.677	0.678	0.678	0.678

This table reports estimated coefficients for specifications based on Equation (6). The dependent variable, *Financial bond share*$_{i,t}$, is the share, in par values, of insurer i's corporate bond portfolio invested in financial bonds in year t. *Log(Assets)*$_{i,t}$ is the natural logarithm of insurer i's total assets in year t. $\mathbf{1}$(*Post*)$_t$ is an indicator variable that takes the value one after the 2017 bond ETF reform, i.e., for the year 2017 and afterward. $\mathbf{1}$(*Affiliate*)$_{i,t}$ is an indicator variable that takes the value one if insurer i is an affiliate of an insurance group in year t. Control variables include insurers' leverage, return on equity, RBC ratio, and corporate bond log portfolio maturity and portfolio rating. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the insurer level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table 7
M&As and Financial Bond Investments

	Dep. variable: *Financial bond share*$_{i,t}$		
Sample:	All	All	Matched
	(1)	(2)	(3)
$\mathbf{1}(\text{Post-merger})_{i,t}$	-15.522***	-28.470***	-30.554***
	[-3.39]	[-3.01]	[-3.37]
$\mathbf{1}(\text{Post-merger})_{i,t} \times \mathbf{1}(\text{Pre-merger affiliate})_i$		17.312	20.935**
		[1.60]	[2.01]
$\text{Log(Assets)}_{i,t}$	-2.603***	-2.964***	-2.317*
	[-3.79]	[-3.88]	[-1.92]
$\mathbf{1}(\text{Pre-merger affiliate})_i \times \text{Log(Assets)}_{i,t}$		1.733	1.639
		[1.30]	[0.99]
$\mathbf{1}(\text{Post-merger})_{i,t} \times \text{Log(Assets)}_{i,t}$	1.145***	2.249***	2.403***
	[3.27]	[2.92]	[3.25]
$\mathbf{1}(\text{Post-merger})_{i,t} \times \mathbf{1}(\text{Pre-merger affiliate})_i \times \text{Log(Assets)}_{i,t}$		-1.475*	-1.716**
		[-1.71]	[-2.06]
Controls	Yes	Yes	Yes
Insurer FE	Yes	Yes	Yes
Domicile-Year FE	Yes	Yes	Yes
No. of obs.	21,974	21,968	7,169
R^2	0.731	0.731	0.704
Adj. R^2	0.683	0.683	0.636

This table reports estimates for specifications based on Equation (6). The dependent variable, *Financial bond share*$_{i,t}$, is the share, in par values, of insurer i's corporate bond portfolio invested in financial bonds in year t. *Log(Assets)*$_{i,t}$ is the natural logarithm of insurer i's total assets in year t. $\mathbf{1}(\textit{Post-merger})_{i,t}$ is an indicator variable that takes the value one if the merger involving insurer i has already taken place in year t. $\mathbf{1}(\textit{Pre-merger affiliate})_i$ is an indicator variable that takes the value one if insurer i is an affiliate of an insurance group prior to the merger. Control variables include insurers' leverage, return on equity, RBC ratio, and corporate bond log portfolio maturity and portfolio rating. Column (3) uses a matched sample constructed via propensity score matching based on the pre-merger characteristics of insurers, including log assets, leverage, return on equity, RBC ratio, and corporate bond log portfolio maturity and portfolio rating, requiring exact matches within the same year and the same domicile state. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the insurer level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table 8
Composition of Financial Bond Portfolios across Insurer Size

	Dependent variable: *Diversified share*$_{i,t}$		
Sample:	All	Non-group insurers	Group affiliates
	(1)	(2)	(3)
Log(Assets)$_{i,t}$	-1.522**	-2.894**	-1.318*
	[-2.38]	[-2.07]	[-1.69]
Controls	Yes	Yes	Yes
Insurer FE	Yes	Yes	Yes
Domicile-Year FE	Yes	Yes	Yes
No. of obs.	19,315	5,019	14,155
R squared	0.592	0.637	0.601
Adj. R squared	0.513	0.520	0.516

This table reports estimates for specifications based on Equation (7). The dependent variable, *Diversified share*$_{i,t}$, is the share, in par values, of insurer i's financial bond portfolio in year t allocated to bonds of diversified financial intermediaries, where a financial intermediary is classified as diversified if it is an active lender in the syndicated loan market, following Schwert (2018). *Log(Assets)*$_{i,t}$ is the natural logarithm of insurer i's total assets in year t. $\mathbf{1}(\textit{Post})_t$ is an indicator variable that takes the value one after the 2017 bond ETF reform, i.e., for the year 2017 and afterward. Control variables include insurers' leverage, return on equity, RBC ratio, corporate bond log portfolio maturity and portfolio rating, and the log sector maturity and sector rating of financial bond investments. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the insurer level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Internet Appendix for
Do Investors Value Intermediaries' Diversification? Evidence from Insurers' Corporate Bond Portfolios

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A Data Construction

Table A.1
Variable Definitions and Data Sources

Variable	Definition (Unit)
	Insurer-Level Variables
Assets	Total assets. *Source: NAIC Regulatory Filings.*
Invested assets	Total invested assets. *Source: NAIC Regulatory Filings.*
Diversified share	Share of the financial bond portfolio, in par values, invested in bonds of diversified financial intermediaries, where a financial intermediary is classified as diversified if it is an active lender in the syndicated loan market, following Schwert (2018). *Source: NAIC Regulatory Filings, Mergent FISD and Fang (2025)'s Bond-Compustat linking table.*
Financial bond share	Share of the corporate bond portfolio, in par values, invested in financial bonds.
Portfolio share	Share of the corporate bond portfolio, in par values, invested in bonds from a specific two-digit NAICS sector. *Source: NAIC Regulatory Filings and Mergent FISD.*
Portfolio HHI	Herfindahl-Hirschman index across sector-level bond holdings. *Source: NAIC Regulatory Filings and Mergent FISD.*
Portfolio yield	Average yield reported by an insurer on its corporate bond investments. *Source: NAIC Regulatory Filings.*
Portfolio maturity	Average remaining time to maturity (in years) of the corporate bond portfolio. *Source: NAIC Regulatory Filings and Mergent FISD.*
Portfolio rating	Average S&P credit rating (1=AAA, 23=NR) of the corporate bond portfolio. *Source: NAIC Regulatory Filings and Mergent FISD.*
Sector maturity	Average remaining time to maturity (in years) of bond holdings within a specific two-digit NAICS sector. *Source: NAIC Regulatory Filings and Mergent FISD.*
Sector rating	Average S&P credit rating (1=AAA, 23=NR) of bond holdings within a specific two-digit NAICS sector. *Source: NAIC Regulatory Filings and Mergent FISD.*
Average position size	Average par value of corporate bond holdings. *Source: NAIC Regulatory Filings.*
Relative position size	Average par value of corporate bond holdings relative to total assets. *Source: NAIC Regulatory Filings.*
RBC ratio	The risk-based capital ratio. *Source: NAIC Regulatory Filings.*
ROE	Annual return on equity. *Source: NAIC Regulatory Filings.*
Leverage	Ratio of assets to liabilities. *Source: NAIC Regulatory Filings.*

Table A.1 continued.

Variable	Definition (Unit)
1(Affiliate)	Indicator variable that takes the value one if the insurer is part of an insurance group in a given year. *Source: NAIC Regulatory Filings.*
1(Post-merger)	Indicator variable that takes the value one after a merger involving the insurer. *Source: NAIC Regulatory Filings.*
1(Pre-merger affiliate)	Indicator variable that takes the value one if the insurer is an affiliate of an insurance group prior to the merger. *Source: NAIC Regulatory Filings.*
	Bond-Level Variables
Issue share	Share of a bond issue acquired by insurers of a certain size. *Source: NAIC Regulatory Filings and Mergent FISD.*
Issue size	Bond issuance amount. *Source: Mergent FISD.*
Maturity	Time to maturity in years. *Source: Mergent FISD.*
Rating	S&P credit rating (1=AAA, 23=NR). Depending on the specification, the rating is (1) the rating at issuance, or (2) the highest rating attained. *Source: Mergent FISD.*
Yield spread	Difference between offering yield and a maturity-matched Treasury yield calculated using the Svensson (1994) yield curve parameters. *Source: Mergent FISD and Federal Reserve.*
Bid-ask spread	Difference between bid and ask prices. Depending on the specification, the bid-ask spread is measured (1) in the month of issuance or (2) as the median over the bond's lifetime. *Source: TRACE.*
$\sigma(\hat{\varepsilon})$	Standard deviation of residuals from a factor model regression of bond returns. *Source: Own calculations.*
1(Enhancement)	Indicator variable that takes the value one if the bond issue has a credit enhancement option. *Source: Mergent FISD.*
1(Callable)	Indicator variable that takes the value one if the bond issue has a call option. *Source: Mergent FISD.*
	Issuer-Level Variables
1(Financial)	Indicator variable that takes the value one if the bond issuer belongs to the financial industry (NAICS code: 52 "Finance and Insurance"). *Source: Mergent FISD.*
Company leverage	Ratio of total liabilities to total assets. *Source: Compustat.*
EBIT margin	Ratio of EBIT to total gross profit. *Source: Compustat.*
Cash balance	Cash holdings divided by total assets. *Source: Compustat.*
1(SIFI)	Indicator variable that takes the value one if the bond issuer has ever been classified as a systemically important financial institution (SIFI) by the Financial Stability Board. *Source: Financial Stability Board.*

Table A.1 continued.

Variable	Definition (Unit)
	Other Variables
$\mathbf{1}(\text{Industry})$	Indicator variable that takes the value one if the bond issuer is from a specific two-digit industry. There are 19 two-digit NAICS industry sectors and one category for bonds without NAICS code. *Source: Mergent FISD.*
$\mathbf{1}(\text{Post})$	An indicator variable that takes the value one after the bond ETF reform in 2017.

A.1 Calculating the Idiosyncratic Risk of Bonds

I define the idiosyncratic risk of a corporate bond as the standard deviation of the error terms estimated from factor pricing models using bonds' excess returns. More specifically, I regress for each bond its monthly excess returns over its lifespan up until one year before its maturity on a set of risk factors:

$$R_{b,t} - R_{f,t} = \alpha + \mathbf{\Gamma}\, \boldsymbol{F}_t + \varepsilon_{b,t}. \tag{A1}$$

$R_{b,t}$ is the monthly return of bond b from month $t-1$ to t. $R_{f,t}$ is the risk-free rate of return at time t proxied by the one-month Treasury bill rate. $\boldsymbol{F}_t$ is a vector of risk factors. To ensure a reliable estimation of idiosyncratic risk, I require at least 12 months of return data for a bond.

To construct bond returns $R_{b,t}$, I first retrieve end-of-month bond prices from TRACE Enhanced applying the standard cleaning procedure of Dick-Nielsen (2009) and Dick-Nielsen (2014) to filter out erroneous, cancelled, interdealer trades, and others. The end-of-month price of a bond is the price on the last trade of this bond in a month. Adding issue-level information on coupon payments, interest frequency, issue and maturity dates from Mergent FISD, I then calculate monthly bond returns as:

$$R_{b,t} = \frac{(P_{b,t} + AI_{b,t}) + C_{b,t} - (P_{b,t} + AI_{b,t-1})}{(P_{b,t-1} + AI_{b,t-1})}. \tag{A2}$$

$P_{b,t}$ is the price of bond b at the end of month t; $AI_{b,t}$ is the accrued interest of bond b in month t; $C_{b,t}$ is the coupon payment on bond b in month t.

I estimate idiosyncratic risk using two sets of risk factors. My main measure uses three factors: the market risk factor from Ken French's website; the default spread, measured

as the spread between BAA- and AAA-rated monthly corporate bond yields[1]; and the term spread, measured as the monthly return on the Ibbotson U.S. long-term government bond index minus the one-month Treasury bill rate. For robustness checks, I add a fourth factor – the liquidity risk factor developed by Dick-Nielsen et al. (2012) – to this baseline specification.[2] Having obtained estimates for $\mathbf{\Gamma}$ and α, I calculate idiosyncratic risk as the standard deviation of the predicted error terms $\hat{\varepsilon} = R_{b,t} - \hat{\alpha} - \hat{\mathbf{\Gamma}}\boldsymbol{F}_t$.

A.2 Classifying Bond ETFs

This section provides a comprehensive overview of the classification of bond ETFs that I use in analyzing the impact of the 2017 bond ETF reform. Based on the NAIC's 2017–2019 lists of bond ETFs eligible for bond-like treatment (National Association of Insurance Commissioners, 2017, 2018, 2019), I classify bond ETFs into four categories: (1) corporate bond ETFs, consisting of bond securities issued by corporations; (2) mixed bond ETFs, consisting of bond securities issued by both governments and corporations; (3) government bond ETFs, consisting of bond securities issued by the U.S. government, government agencies, or foreign sovereigns, and (4) other ETFs, typically for mortgage-backed securities (MBS). For most ETFs, the classification is based on the name of the ETF, e.g., "iShares JP Morgan EM Corporate Bond ETF" or "SPDR FTSE International Government Inflation-Protected Bond ETF;" otherwise I classify the ETF based on publicly available information on the ETF provider's website, e.g., the iShares website for iShares ETFs, or online ETF databases such as "etfdb.com."

The lists also include seven ETFs investing not in bond securities but either perpetual preferred stocks or corporate loans, both of which are treated analogously to corporate bonds under NAIC accounting rules under certain conditions. The results on the post-reform relationship between size and ETF investments are robust to excluding these seven ETFs from the definition of insurers' total bond ETF investments (see Appendix Table C.10). More specifically, the seven ETFs are the following:

1 The data on BAA- and AAA-rate monthly corporate bond yields, and the data on the Ibbotson U.S. long-term government bond index is taken from Welch and Goyal (2008) which is made available by Amit Goyal on his webpage (see sites.google.com).

2 Peter Feldhütter makes the liquidity risk factor available on his webpage (see feldhutter.com).

- **First Trust Senior Loan ETF (33738D309):** First Trust's webpage states that "the fund will invest in at least 80% of its net assets in senior loans that are made predominantly to businesses operating in North America and may also invest up to 20% of its net assets in non-senior loan debt securities, warrants, equity securities and securities of other investment companies" (ftportfolios.com). Therefore, I classify this ETF as a corporate ETF.

- **Highland/iBoxx Senior Loan ETF (430101774):** This ETF tracks the Markit iBoxx USD Liquid Leveraged Loan Index (ihsmarkit.com). Therefore, I classify this ETF as a corporate ETF.

- **Invesco / PowerShares Senior Loan ETF (46138G508 / 73936Q769):** This ETF was renamed from 2017 to 2018 and received a new CUSIP. It tracks "the market-weighted performance of the largest institutional leveraged loans" (invesco.com). Therefore, I classify this ETF as a corporate ETF.

- **SPDR Blackstone / GSO Senior Loan ETF (78467V608):** This ETF tracks the Morningstar LSTA U.S. Leveraged Loan Index (ssga.com). Therefore, I classify this ETF as a corporate ETF.

- **Invesco Preferred ETF (46138E511):** This ETF invests in U.S. and non-U.S. preferred stocks (invesco.com). Under NAIC accounting rules, most preferred stock is treated similarly to a bond with amortized cost accounting. Therefore, I classify this ETF as a corporate ETF.

- **iShares S&P U.S. Preferred Stock Index Fund (464288687):** This ETF invests in sufficiently large preferred stocks (sec.gov). Therefore, I classify this ETF as a corporate ETF.

- **SPDR Wells Fargo Preferred Stock ETF (78464A292):** This ETF invests in preferred stocks (ssga.com). Therefore, I classify this ETF as a corporate ETF.

Table A.2 gives a complete overview of the classification of all bond ETFs appearing at least once in the NAIC's 2017–2019 lists of bond ETFs eligible for bond-like treatment.

Table A.2
Bond ETF classification

CUSIP	In list since	Investment universe	Source
233051259	2018	Corporate securities	etfdb.com
233051267	2018	Corporate securities	etfdb.com
233051283	2018	Corporate securities	etfdb.com
233051432	2017	Corporate securities	ETF name
233051705	2017	Government securities	ETF name
33738D309	2017	Corporate securities (senior loans)	See above
33739Q408	2017	Mixed	etfdb.com
33939L506	2017	Government securities (TIPS)	ETF name
33939L605	2017	Government securities (TIPS)	ETF name
33939L662	2019	Corporate securities	etfdb.com
33939L886	2017	Mixed	investing.com
353506108	2017	Government securities	ETF name
381430362	2019	Government securities (TIPS)	ETF name
381430453	2017	Corporate securities	ETF name
381430479	2017	Corporate securities	ETF name
381430529	2017	Government securities	ETF name
430101774	2017	Corporate securities (senior loans)	See above
45409F827	2018	Government securities	ETF name
45409F843	2018	Government securities	ETF name
46138E511	2018	Corporate securities (preferred stocks)	See above
46138E636	2018	Corporate securities	ETF name
46138E719	2018	Corporate securities	ETF name
46138E784	2018	Government securities	ETF name
46138G508	2018	Corporate securities (senior loans)	See above
46138G805	2018	Government securities	ETF name
46138G888	2018	Government securities	ETF name
464286178	2017	Corporate securities	ETF name
464286210	2017	Corporate securities	pininvest.com
464286251	2017	Corporate securities	ETF name
464286285	2017	Mixed	ishares.com
464286517	2017	Government securities	ishares.com
464287176	2017	Government securities (TIPS)	ETF name
464287226	2017	Mixed	ishares.com
464287242	2017	Corporate securities	ETF name
464287432	2017	Government securities	ETF name
464287440	2017	Government securities	ETF name
464287457	2017	Government securities	ETF name
464288117	2017	Government securities	ETF name
464288125	2017	Government securities	ETF name
464288158	2017	Government securities	ETF name
464288166	2017	Government securities (agency bonds)	ETF name
464288281	2017	Government securities	ishares.com
464288323	2017	Government securities	ETF name
464288356	2017	Government securities	ETF name
464288414	2017	Government securities	ETF name
464288513	2017	Corporate securities	ETF name

Table A.2 continued.

CUSIP	In list since	Investment universe	Source
464288588	2017	Other (MBS)	ETF name
464288596	2017	Mixed	ishares.com
464288612	2017	Mixed	ishares.com
464288620	2017	Corporate securities	ETF name
464288638	2017	Corporate securities	ETF name
464288646	2017	Corporate securities	ETF name
464288653	2017	Government securities	ETF name
464288661	2017	Government securities	ETF name
464288679	2017	Government securities	ETF name
464288687	2018	Corporate securities (preferred stocks)	See above
464289479	2017	Mixed	ishares.com
464289511	2017	Corporate securities	ETF name
46429B267	2017	Government securities	ETF name
46429B291	2017	Corporate securities	ETF name
46429B333	2017	Government (agency MBS)	ETF name
46429B366	2017	Other (CMBS)	ETF name
46429B564	2017	Government securities	ETF name
46429B580	2017	Government securities	ETF name
46429B655	2017	Mixed	ishares.com
46429B747	2017	Government securities (TIPS)	ETF name
46431W507	2017	Mixed	ishares.com
46432F859	2017	Mixed	ishares.com
46432FAG2	2017	Corporate securities	ETF name
46432FAK3	2017	Corporate securities	ETF name
46432FAN7	2017	Corporate securities	ETF name
46432FAW7	2017	Corporate securities	ETF name
46432FAZ0	2017	Corporate securities	ETF name
46432FBC0	2017	Corporate securities	ETF name
46434V100	2017	Corporate securities	ETF name
46434V407	2017	Corporate securities	ETF name
46434V571	2017	Government securities	ETF name
46434V613	2017	Mixed	ishares.com
46434V787	2017	Mixed	ishares.com
46434V860	2017	Government securities	ETF name
46434V878	2017	Mixed	ishares.com
46434VAA8	2017	Corporate securities	ETF name
46434VAQ3	2017	Corporate securities	ETF name
46434VAU4	2017	Corporate securities	ETF name
46434VAX8	2017	Corporate securities	ETF name
46434VBA7	2017	Corporate securities	ETF name
46434VBD1	2017	Corporate securities	ETF name
46434VBG4	2017	Corporate securities	ETF name
46434VBK5	2017	Corporate securities	ETF name
46435G144	2018	Corporate securities	ETF name
46435G151	2018	Corporate securities	ETF name
46435G193	2018	Corporate securities	ETF name
46435G219	2018	Corporate securities	ishares.com
46435G243	2018	Corporate securities	ETF name

Table A.2 continued.

CUSIP	In list since	Investment universe	Source
46435G250	2018	Corporate securities	ishares.com
46435G441	2017	Corporate securities	ETF name
46435G474	2017	Corporate securities	ishares.com
46435G755	2017	Government securities	ETF name
46435G789	2017	Government securities	ETF name
46435GAA0	2017	Corporate securities	ETF name
46435U432	2019	Government securities	ETF name
46435U515	2019	Corporate securities	ETF name
46435U549	2019	Mixed	ishares.com
46435U697	2018	Government securities	ETF name
46435U853	2018	Corporate securities	ETF name
46641Q449	2019	Corporate securities	ETF name
46641Q613	2019	Mixed	etfdb.com
46641Q837	2017	Mixed	etfdb.com
46641Q878	2017	Corporate securities	etfdb.com
47103U886	2019	Mixed	etfdb.com
66538H583	2018	Corporate securities	etfdb.com
67092P102	2017	Mixed	etfdb.com
67092P110	2017	Mixed	etfdb.com
69344A107	2019	Mixed	aaii.com
72201R783	2017	Corporate securities	ETF name
72201R817	2019	Corporate securities	ETF name
72201R833	2017	Mixed	etfdb.com
73936Q769	2017	Corporate securities (senior loans)	See above
73936Q835	2017	Corporate securities	ETF name
73936T557	2017	Corporate securities	ETF name
73936T573	2017	Government securities	ETF name
73937B407	2017	Government securities	ETF name
78464A144	2017	Corporate securities	ETF name
78464A151	2017	Corporate securities	ETF name
78464A284	2017	Government securities	ETF name
78464A292	2018	Corporate securities (preferred stocks)	See above
78464A334	2017	Government securities	ETF name
78464A367	2017	Corporate securities	ETF name
78464A375	2017	Corporate securities	ETF name
78464A383	2017	Other (MBS)	ETF name
78464A391	2017	Government securities	etfdb.com
78464A417	2017	Corporate securities	etfdb.com
78464A474	2017	Corporate securities	ETF name
78464A490	2017	Government securities	ETF name
78464A516	2017	Government securities	ETF name
78464A649	2017	Mixed	etfdb.com
78464A656	2017	Government securities (TIPS)	ETF name
78464A664	2017	Government securities	ETF name
78464A672	2017	Government securities	ETF name
78464A680	2017	Government securities	ETF name
78467V608	2017	Corporate securities (senior loans)	See above
78467V707	2017	Mixed	etfdb.com

Table A.2 continued.

CUSIP	In list since	Investment universe	Source
78468R101	2017	Government securities	ETF name
78468R200	2017	Corporate securities	etfdb.com
78468R408	2017	Corporate securities	etfdb.com
78468R606	2017	Corporate securities	etfdb.com
78468R622	2019	Corporate securities	etfdb.com
78468R663	2018	Government securities	ETF name
78468R721	2017	Government securities	ETF name
78468R739	2017	Government securities	ETF name
886364108	2019	Mixed	investing.com
92189F346	2017	Government securities	ETF name
92189F353	2017	Corporate securities	etfdb.com
92189F361	2017	Government securities	ETF name
92189F437	2019	Corporate securities	etfdb.com
92189F445	2017	Corporate securities	etfdb.com
92189F486	2017	Corporate securities	etfdb.com
92189F494	2017	Government securities	etfdb.com
92189F544	2017	Government securities	ETF name
92189H201	2019	Government securities	ETF name
92189H300	2019	Government securities	etfdb.com
92189H409	2019	Government securities	ETF name
921910709	2017	Government securities	ETF name
921937793	2017	Mixed	etfdb.com
921937819	2017	Mixed	etfdb.com
921937827	2017	Mixed	etfdb.com
921937835	2017	Mixed	etfdb.com
921946885	2017	Government securities	ETF name
922020805	2017	Government securities (TIPS)	ETF name
92203J407	2017	Mixed	etfdb.com
92206C102	2017	Government securities	ETF name
92206C409	2017	Corporate securities	ETF name
92206C573	2018	Corporate securities	ETF name
92206C706	2017	Government securities	ETF name
92206C771	2017	Other (MBS)	ETF name
92206C813	2017	Corporate securities	ETF name
92206C847	2017	Government securities	ETF name
92206C870	2017	Corporate securities	ETF name
922907746	2017	Government securities	ETF name
97717X511	2017	Mixed	etfdb.com
97717X628	2019	Government securities	ETF name
97717X693	2017	Corporate securities	ETF name
97717X784	2017	Corporate securities	ETF name
97717X842	2017	Government securities	etfdb.com
97717X867	2017	Government securities	etfdb.com

A.3 Matching Bonds and Dealers

To see whether the dealer issued the bond traded, I use two data sources: acquisition and disposal data from NAIC Schedule D Part 3 and 4 and issue-level information from Mergent FISD. The NAIC transactions data contains all types of acquisitions and disposals of insurance companies, i.e., the data also contains bond maturities, bond calls, tax-free exchanges of bonds between insurers, and others. I can differentiate market transactions from other changes in the corporate bond portfolio with the help of the counterparty reported by the insurance company. For acquisitions, insurers have to report a vendor, while they have to report a purchaser for disposals. These data fields are reported as strings and contain entries like "MATURED", "CALLED AT 100", and "TAX-FREE EXCHANGE" for non-market transactions. For market transactions, the insurer reports the name of the counterparty like "DEUTSCHE BANK", "JP MORGAN", or "GOLDMAN SACHS." In a first step, I identify all market transactions. For this, I build a dictionary with keywords that fit market transactions, e.g., the names of large banks and financial counterparties. Then, I match this data with issue-level information from Mergent FISD. To identify a bond-dealer match, I exploit three different sources of information. Each time, I use a fuzzy string matching method to find similarities between the vendor and purchaser information given in the NAIC data and one of the following sources: (1) the transacted security's description reported by the insurer in the NAIC data, (2) the transacted security's issuer name reported by the insurer in the NAIC data, and (3) the bond issuer's prospectus name in Mergent FISD. I set the matching ratio of the fuzzy string matching to 0.75, that is, the similarity between the vendor (purchaser) string and the matching string has to be at least 75 percent to be identified as a match.

B Additional Figures

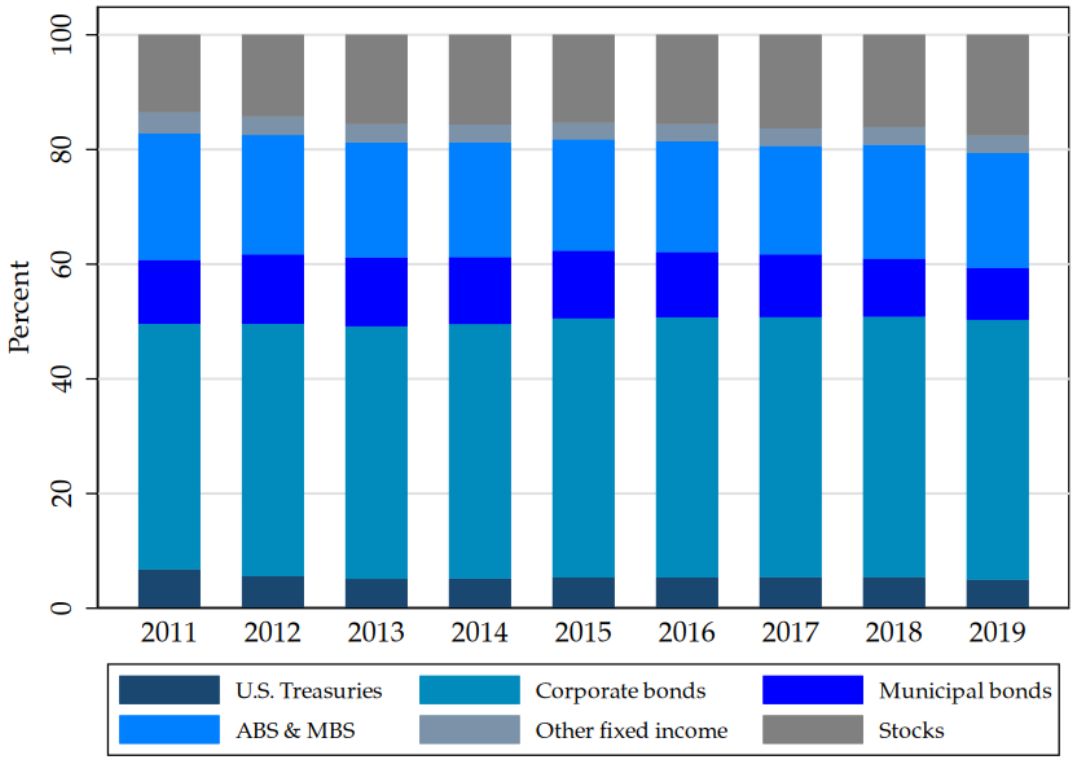


Figure B.1
Composition of Insurers' Total Invested Assets

This figure shows the composition of insurers' total invested assets over time. "Other fixed income" refers to other fixed income asset holdings reported in Schedule D Part 1 but not listed as a separate class in this graph, e.g., sovereign bonds other than U.S. Treasuries, bank loans, and other.

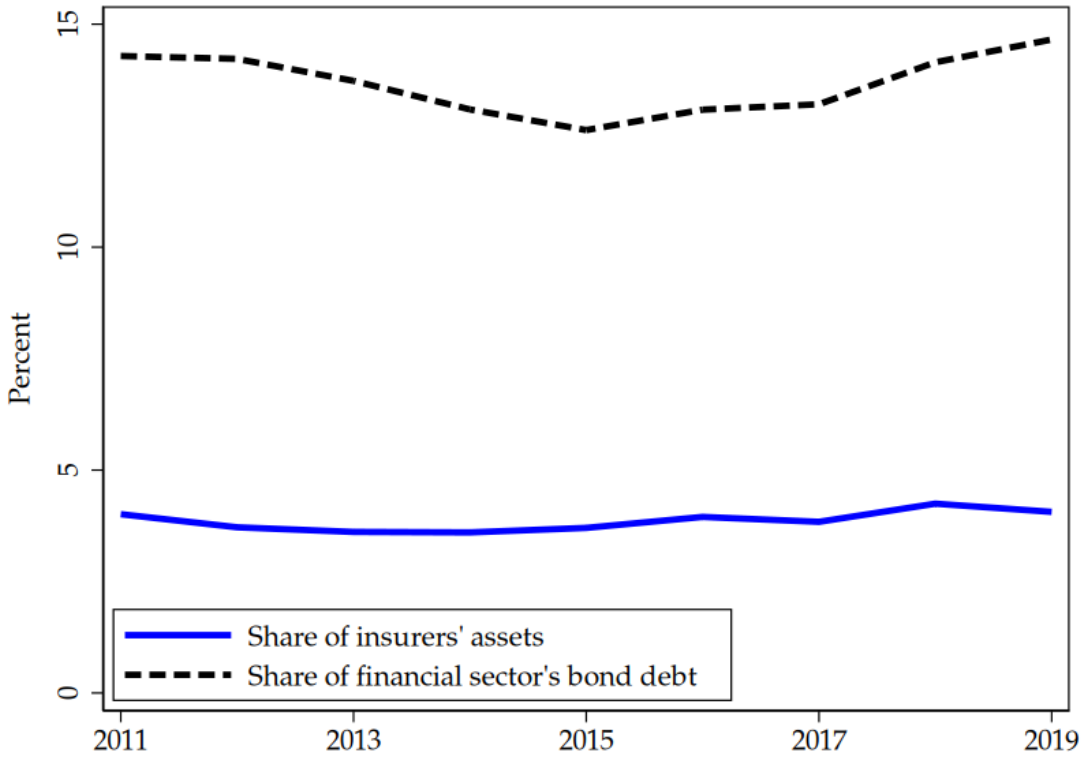


Figure B.2
Insurers' Aggregate Investments in the Financial Sector

This figure shows the share of the financial sector's corporate bond debt held by U.S. insurance companies (blue) and the share of insurers' total assets invested in bonds of the financial sector (black) between 2011 and 2019. To proxy for the outstanding amount of bond issues, I consider the total issuance amount of bonds from their issuance to maturity date.

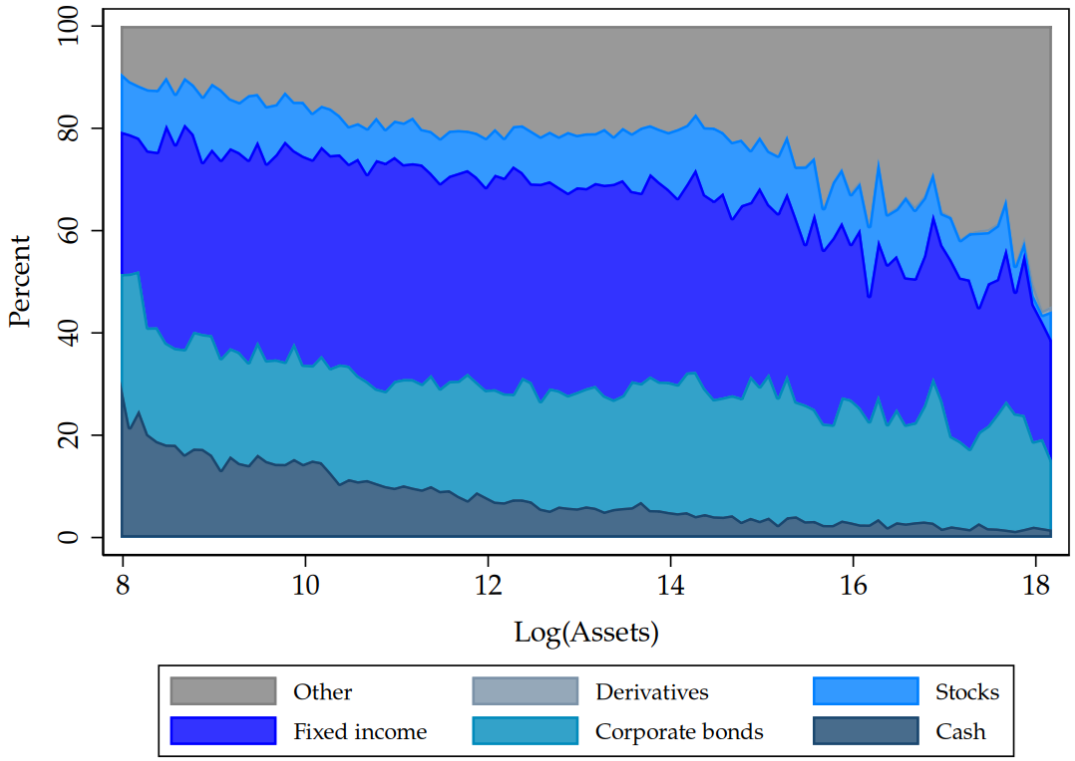


Figure B.3
Composition of Insurers' Assets across Size

This figure shows the composition of insurers' total assets across size. Asset shares are measured as book values divided by total assets. "Fixed income" refers to all fixed income asset holdings other than corporate bonds reported in Schedule D Part 1. "Stocks" refers to all asset holdings reported in Schedule D Part 2 Section 1 and Section 2.

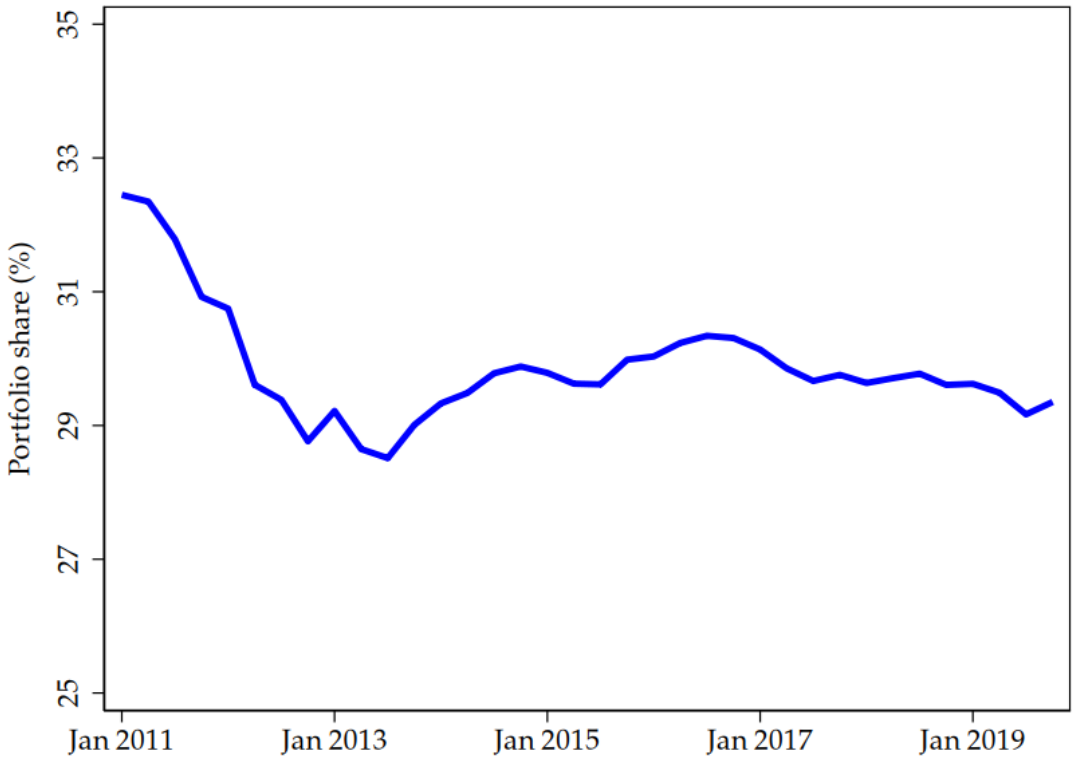


Figure B.4
Portfolio Share of Financial Bonds in the Corporate Bond Market Portfolio

This figure shows the share of financial bonds in the corporate bond market portfolio between 2011 and 2019. The market portfolio includes all active bonds from Mergent FISD that appear in at least one trade in TRACE. Outstanding amounts are proxied by issuance amounts reported in Mergent FISD.

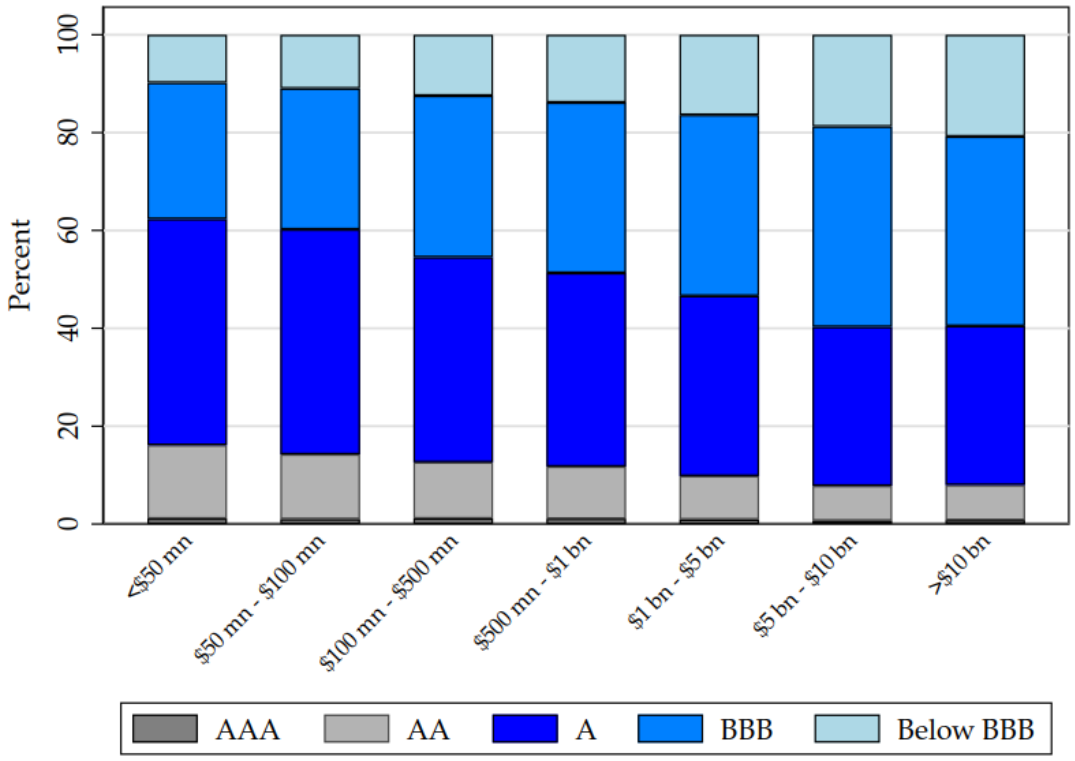
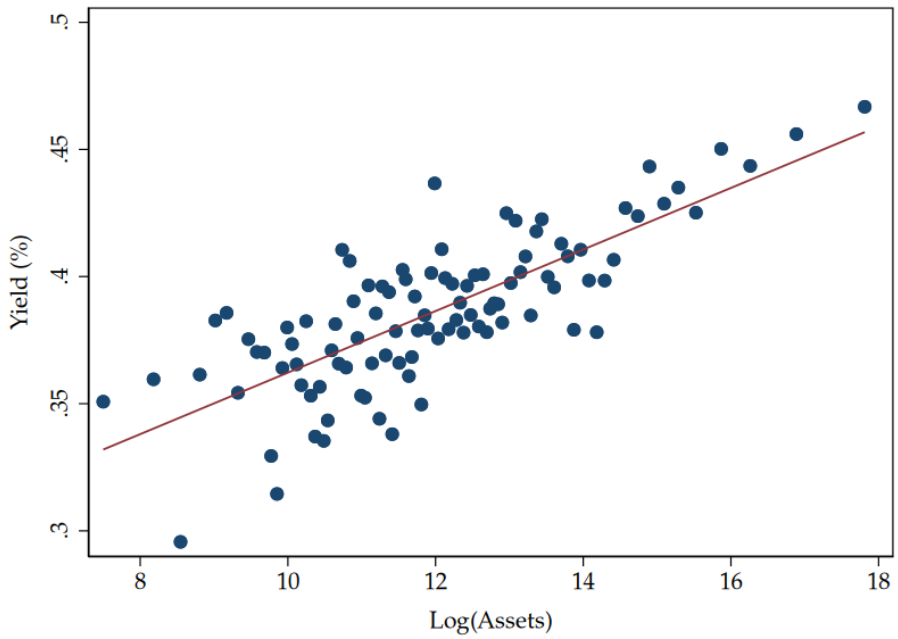
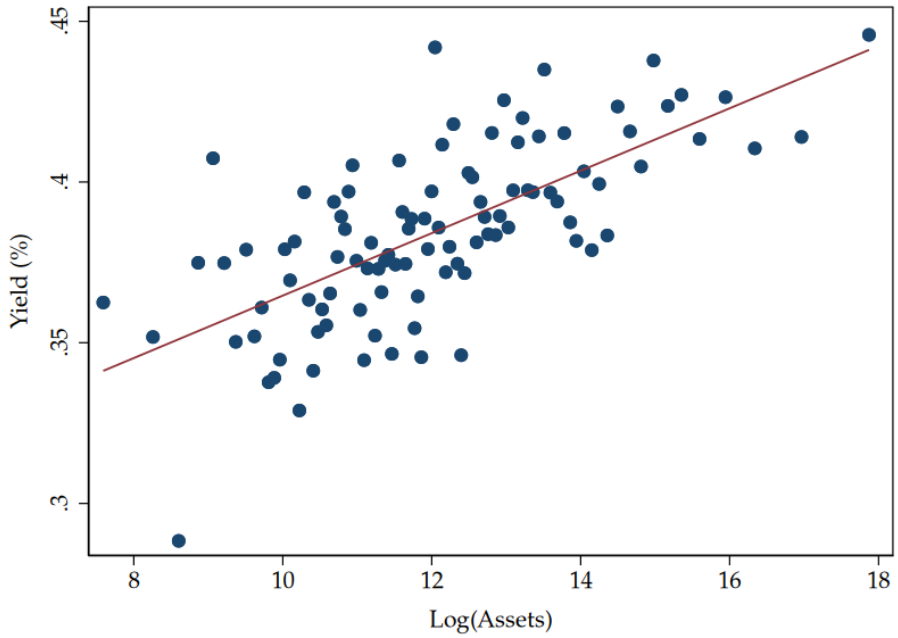


Figure B.5
Credit Rating of Insurers' Corporate Bond Portfolios by Insurer Size

This figure shows the credit rating composition of insurers' corporate bond portfolios by insurer size. I conservatively assign bonds for which no rating was available to the lowest category. Portfolio shares are computed using par values.



(a) All bonds



(b) Financial bonds

Figure B.6
Portfolio Yield across Insurer Size

This figure shows the weighted average yield on insurers' corporate bond portfolios across insurer size: (a) for all corporate bonds, and (b) for financial bonds only. Portfolio yields are computed using the par value of individual bond positions as weights. Yields correspond to the yield to maturity at acquisition as reported by insurers in Schedule D Part 1.

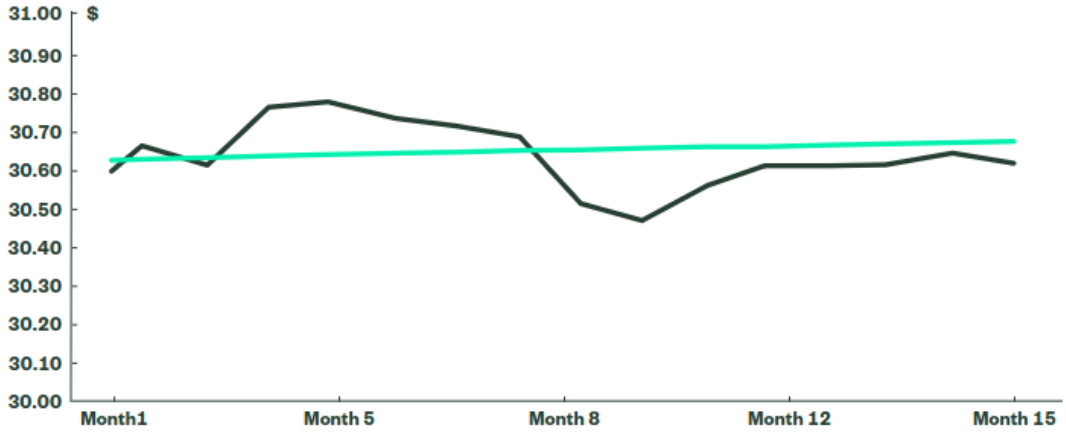


Figure B.7
Systematic Value Versus Fair Value
This figure shows the book value of an ETF share using the systematic value approach proposed by BlackRock (green) and the fair value approach (black). Source: State Street Global Advisors (2021).

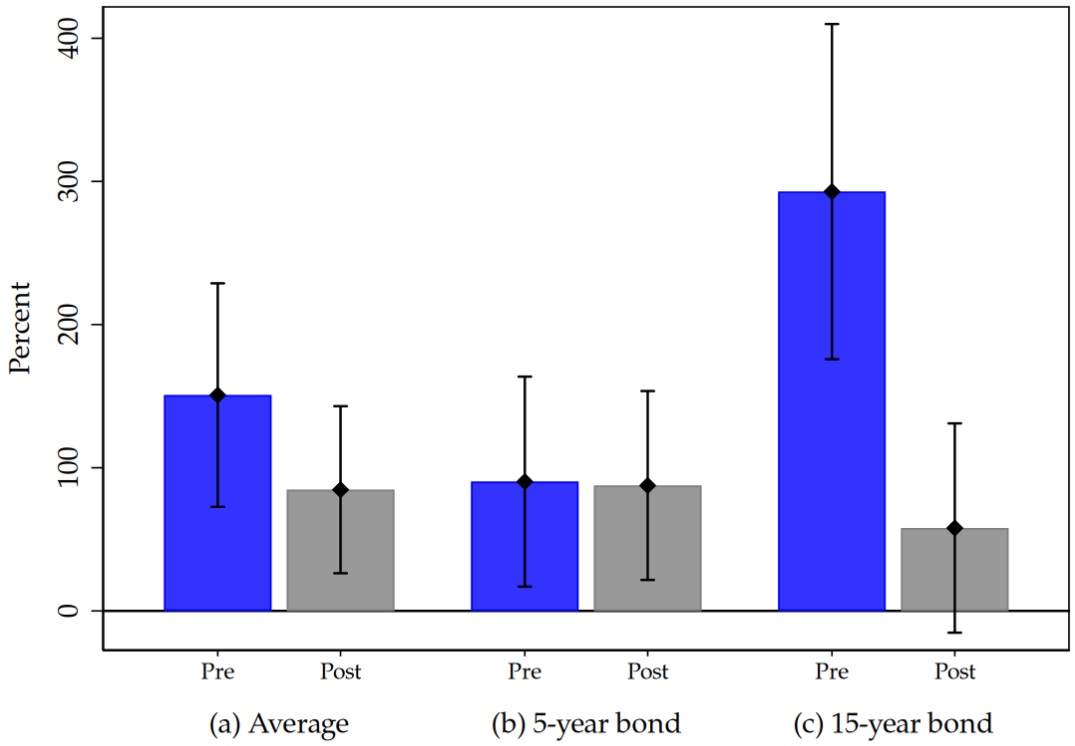


Figure B.8
The 2017 Bond ETF Reform and Small Insurers' Preference for Financial Bonds

This figure shows the estimates for the difference-in-differences approach in Equation (4) for insurers with assets lower than $50 million. Panel (a) shows small insurers' preference for financial bonds relative to non-financial bonds in the pre-reform period (blue) and the post-reform period (gray) for the average bond issue. Panel (b) shows the estimates for a bond with a maturity of five years at issuance; panel (c) shows the estimates for a bond with a maturity of 15 years at issuance. For each panel, the coefficients are scaled by the mean of the dependent variable, i.e., the issue share acquired by small insurers. The regression includes controls for bonds' yield spread, log maturity, and indicator variables for credit enhancement and callability; moreover, I include SIFI-year and maturity-rating-year fixed effects. The caps indicate the 95% confidence intervals. Standard errors are clustered at the parent level.

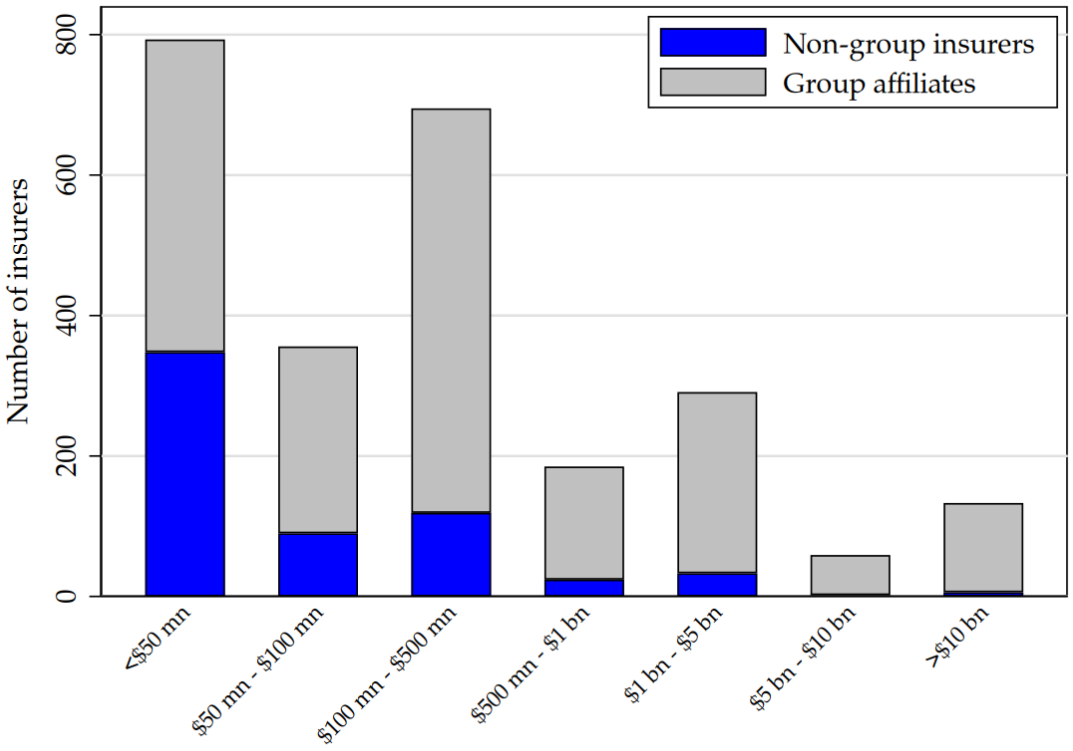


Figure B.9
Insurance Group Affiliation by Insurer Size

This figure shows the number of insurance group affiliates and non-group insurers by size at the end of 2016. Insurance group affiliates are insurers that operate as part of an insurance group comprising two or more individual insurers.

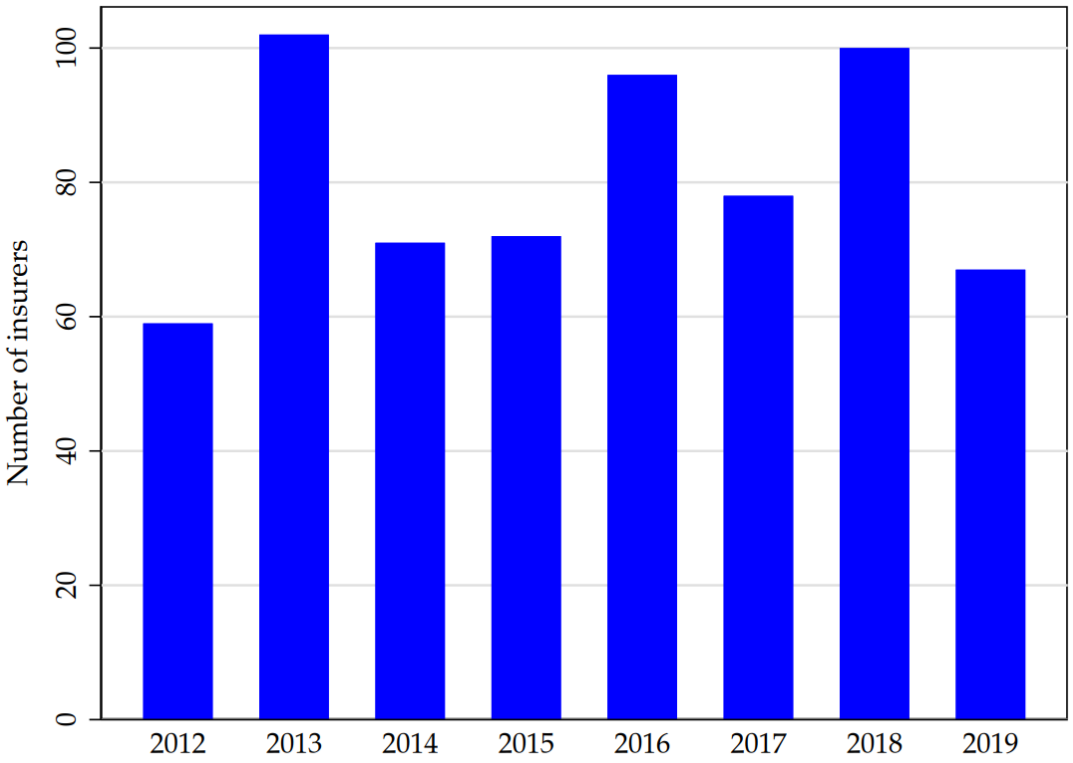
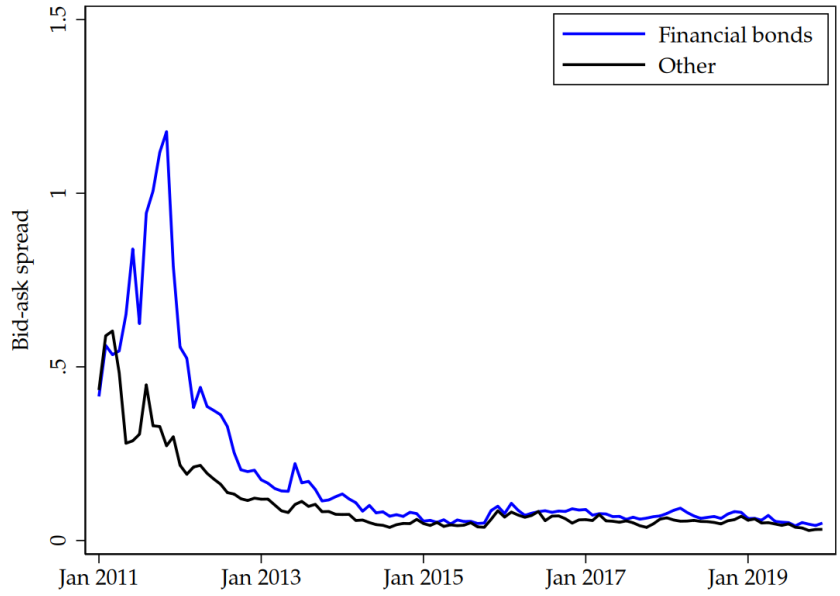
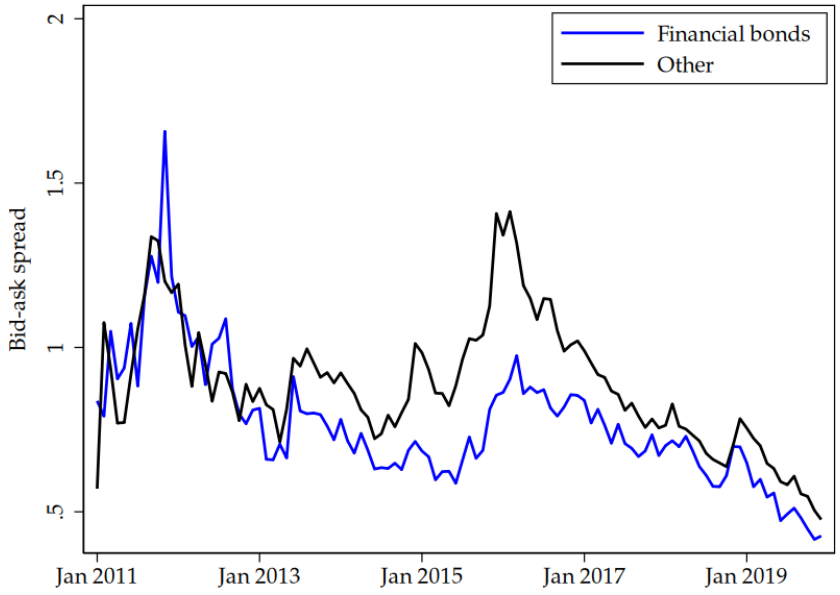


Figure B.10
Number of Insurers Involved in Mergers over Time

This figure shows the number of insurers involved in mergers by year. An insurer is involved in a merger if its group identifier assigned by the NAIC changes from one year to the next.



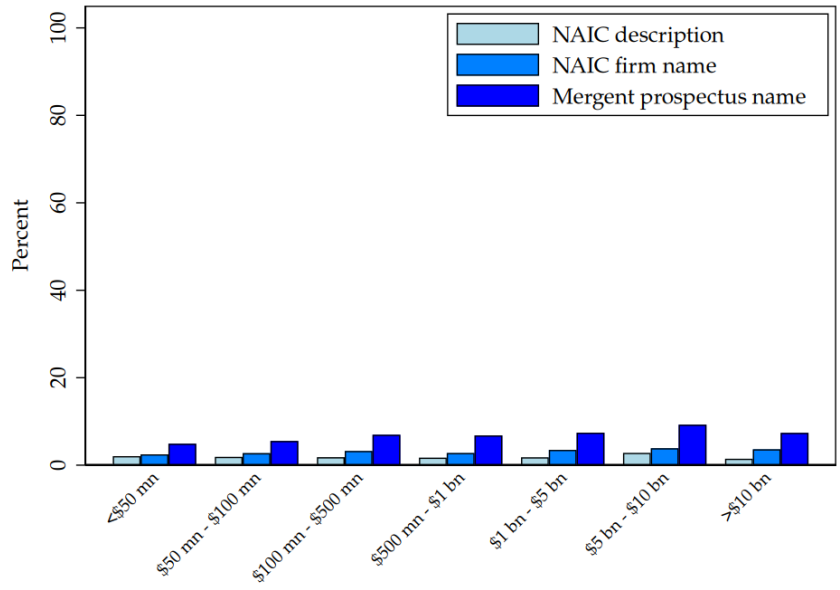
(a) Most liquid bonds



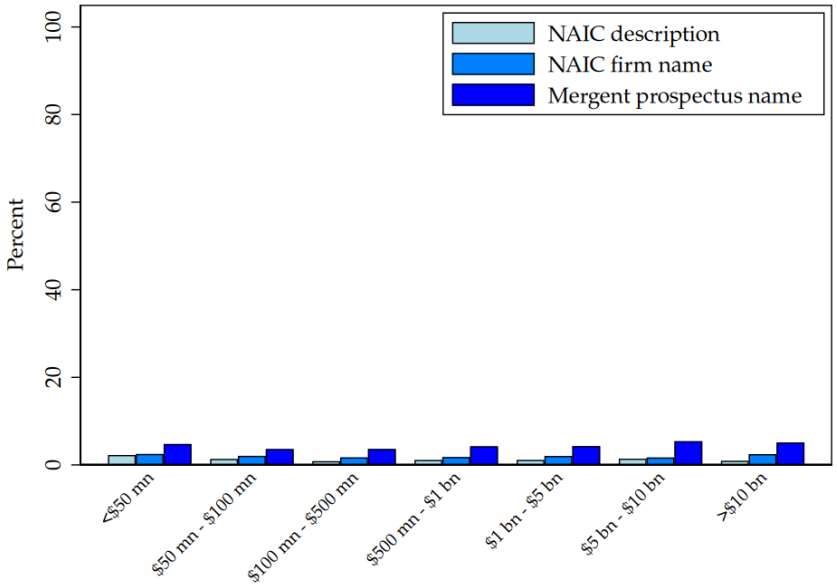
(b) Small trades

Figure B.11
Transaction Costs of Financial Bonds Versus Non-Financial Bonds

This figure shows the average bid-ask spread (a) of the most liquid financial bonds versus the most liquid bonds from any other industry and (2) for trade sizes less than $100,000. In panel (a), the blue line represents the average bid-ask spread of the 100 financial bonds with the lowest spread in a given month. The black line shows the same measure for the 100 most liquid bonds from all other industries. In panel (b), the blue line represents the average bid-ask spread of financial bonds in small trades. The black line shows the same measure for the average of all other industries.



(a) Acquisitions



(b) Disposals

Figure B.12
Occurrences of Dealer-Issuer Matches in Insurers' Bond Trades by Insurer Size

This figure shows the share of (a) acquisitions and (b) disposals of financial bonds for which the vendor (purchaser) was also the issuer of the traded bond by insurer size. Shares are weighted by the par value traded. I identify vendor-issuer (purchaser-issuer) links through string matching between the insurer-reported vendor (purchaser) in NAIC Schedule D Part 3 (Part 4) and the issuer name in the prospectus given in Mergent FISD, the firm name given in Schedule D, or the bond description in Schedule D. For more details on the matching process, see Appendix A.3.

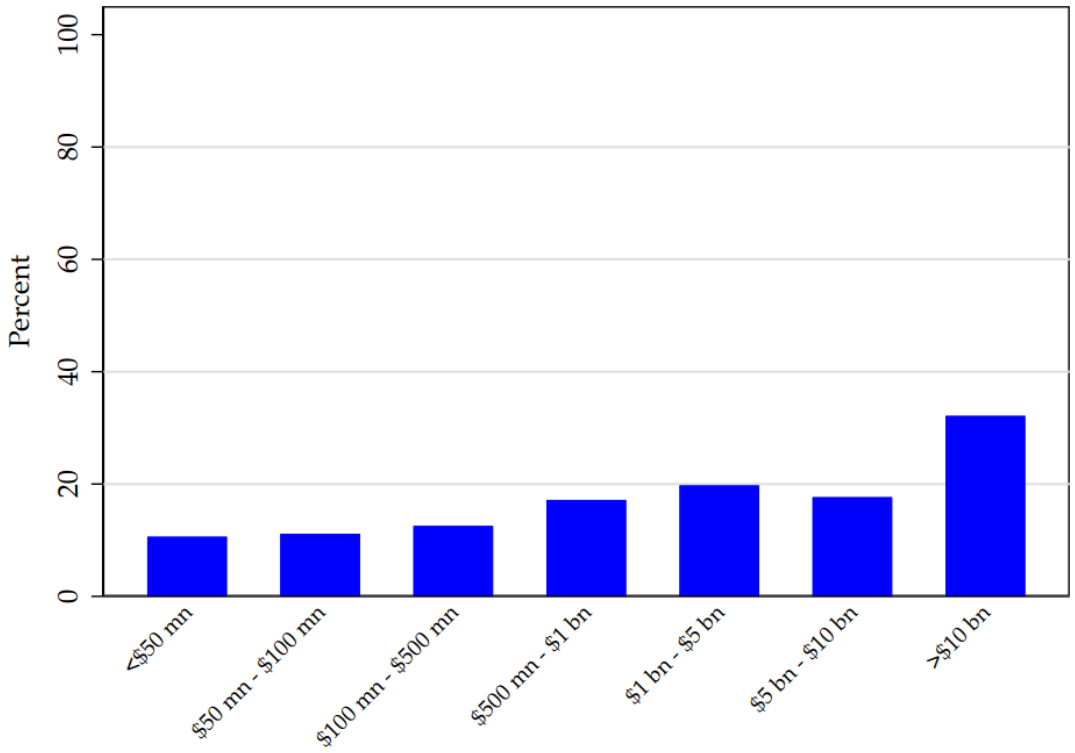


Figure B.13
Insurers' Potential Links to Investment Banking Services by Insurer Size

This figure shows the share of insurers that potentially need investment banking services by insurer size. An insurer is considered to potentially require investment banking services if its liabilities feature capital notes, or surplus notes, or the insurer reports to have borrowed money in any other form.

C Additional Tables

Table C.1
Additional Summary Statistics

Panel 1: Insurers' portfolios and balance sheets

	N	Mean	SD	1st	25th	Median	75th	99th
Leverage	23,501	54.49	25.73	0.12	39.06	58.22	72.81	96.40
ROE (%)	23,401	4.72	30.97	-160.14	-0.21	5.39	15.00	97.85
Securities (#)	23,503	144.95	323.06	1	16	49	127	1,602
Portfolio HHI	23,503	33.79	20.74	14.12	21.01	26.90	37.05	100.00
Average position size ($ mn)	23,498	1.40	3.16	0.02	0.20	0.52	1.37	12.35
Relative position size (%)	23,498	0.72	1.16	0.01	0.16	0.37	0.81	5.68
Portfolio rating (1=AAA, 23=NR)	23,503	9.16	2.73	4.00	7.45	8.77	10.23	21.38
Portfolio maturity (years)	23,503	6.42	4.53	0.79	3.80	5.24	7.52	22.50

Panel 2: Bond issues

	N	Mean	SD	1st	25th	Median	75th	99th
Yield spread (bps)	9,566	225.64	188.58	28.45	91.52	153.81	306.17	894.70
Rating (1=AAA, 23=NR)								
At issuance	9,566	11.08	5.79	2	7	9	14	23
Highest	9,566	10.72	5.82	2	7	9	13	23
Bid-ask spread (%)								
At issuance	5,957	0.29	0.47	-0.70	0.00	0.15	0.47	2.01
Over lifetime	5,767	0.47	0.49	-0.01	0.16	0.29	0.55	2.56
$\mathbf{1}$(Enhancement)	9,566	0.20	0.40	0	0	0	0	1
$\mathbf{1}$(Callable)	9,566	0.83	0.37	0	1	1	1	1

This table shows summary statistics for additional controls and other variables of (1) the insurer-sector-year panel and (2) the bond issues data set.
Panel 1: Insurers' portfolios and balance sheets. *Leverage* is an insurer's financial leverage at year-end. *ROE* is an insurer's annual return on equity. *Securities* is the number of corporate bond securities held by the insurer. *Portfolio HHI* is the Herfindahl-Hirschman index across an insurer's sector-level bond holdings. *Average position size* is the average par value of an insurer's corporate bond holdings. *Relative position size* is the average par value of an insurer's corporate bond holdings relative to total assets. *Portfolio rating* is the average S&P credit rating (1=AAA, 23=NR) of an insurer's corporate bond portfolio. *Portfolio maturity* is the average remaining time to maturity (in years) of an insurer's corporate bond portfolio.
Panel 2: Bond issues. *Yield spread* is the difference between a bond's offering yield and the yield of a maturity-matched Treasury bond derived from (Svensson, 1994)'s formula for zero-coupon spot rates. *Rating* is a bond's S&P credit rating (1=AAA, 23=NR) (1) at issuance, or (2) the higest credit rating the bond attained. *Bid-ask spread* is the bid-ask spread (1) in the month of issuance or (2) the median over the bond issue's lifetime. $\mathbf{1}(\textit{Enhancement})$ is an indicator variable that takes the value one if the bond issue has a credit enhancement option. $\mathbf{1}(\textit{Callable})$ is an indicator variable that takes the value one if the bond issue has a call option.

Table C.2
Robustness: Insurer Size as Determinant of Portfolio Allocation across Industries

	Dependent variable: *Portfolio share*$_{i,s,t}$				
	(1)	(2)	(3)	(4)	(5)
$\mathbf{1}(\text{Financial})_s \times \text{Log(Assets)}_{i,t}$	-2.763***	-2.766***	-3.321***	-2.915***	-2.693***
	[-20.23]	[-20.09]	[-5.88]	[-4.84]	[-19.80]
$\text{Log(Assets)}_{i,t}$	0.085***	0.075***	0.832***	0.177	
	[4.28]	[3.64]	[5.98]	[1.28]	
Other industries	Yes	Yes	Yes	Yes	Yes
Controls		Yes	Yes	Yes	Yes
Insurer FE	Yes	Yes			
Year FE			Yes		
Insurer-Industry FE			Yes	Yes	
Insurer-Year FE					Yes
Industry-Year FE	Yes	Yes		Yes	Yes
Domicile-Year FE					Yes
No. of obs.	470,060	454,680	452,120	452,120	469,980
R^2	0.623	0.623	0.862	0.864	0.623
Adj. R^2	0.620	0.621	0.842	0.844	0.602

This table reports estimates for specifications based on Equation (1). The dependent variable, *Portfolio share*$_{i,s,t}$, is the share, in par values, of insurer i's corporate bond portfolio allocated to industry s in year t. *Log(Assets)*$_{i,t}$ is the natural logarithm of insurer i's total assets in year t. $\mathbf{1}(\textit{Financial})_s$ is an indicator variable that takes the value one if the portfolio share pertains to bonds issued by firms in the financial industry (two-digit NAICS sector: 52 "Finance and Insurance"). Control variables are insurers' leverage, return on equity, and RBC ratio, and the Herfindahl-Hirschman index across sector-level bond holdings. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the insurer level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table C.3
Financial Bond Holdings on Insurers' Balance Sheets across Size

	Dependent variable: $\frac{Par\ value_{i,s,t}}{Balance\ sheet\ item_{i,t}}$					
Balance sheet item$_{i,t}$:	Total bonds		Invested assets		Assets	
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbf{1}(\text{Financial})_s \times \text{Log(Assets)}_{i,t}$	-0.956***	-0.872***	-0.470***	-0.473***	-0.525***	-0.525***
	[-11.86]	[-11.32]	[-8.80]	[-8.66]	[-10.71]	[-10.51]
$\text{Log(Assets)}_{i,t}$	0.094***	-0.025	0.064***	-0.042*	0.027	-0.023
	[3.45]	[-0.82]	[2.69]	[-1.72]	[1.35]	[-1.11]
Controls		Yes		Yes		Yes
Other industries	Yes	Yes	Yes	Yes	Yes	Yes
Insurer FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Domicile-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	469,981	454,601	469,981	454,601	469,981	454,601
R^2	0.548	0.557	0.552	0.554	0.534	0.537
Adj. R^2	0.545	0.553	0.548	0.551	0.530	0.533

This table reports estimates for specifications based on Equation (1). In columns (1) and (2), the dependent variable is the share of insurer i's fixed income assets allocated to corporate bonds from industry s in year t. Columns (3) and (4) use the share of invested assets as dependent variable; columns (5) and (6) use the share of total assets. *Log(Assets)*$_{i,t}$ is the natural logarithm of insurer i's total assets in year t. $\mathbf{1}(\textit{Financial})_s$ is an indicator variable that takes the value one if the portfolio share pertains to bonds issued by firms in the financial industry (two-digit NAICS sector: 52 "Finance and Insurance"). Control variables include insurers' leverage, return on equity, RBC ratio, and the Herfindahl-Hirschman index across sector-level bond holdings. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the insurer level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table C.4
Mapping of S&P Credit Ratings to NAIC Designations

NAIC Designation	S&P Credit Ratings
1	AAA, AA+, AA, AA-, A+, A, A-
2	BBB+, BBB, BBB-
3	BB+, BB, BB-
4	B+, B, B-
5	CCC+, CCC, CCC-
6	CC, C, D

This table lists the NAIC designations and their corresponding S&P credit ratings in effect through the end of 2020.

Table C.5
Robustness: Bond Maturity and Small Insurers' Preference for Financial Bonds

	Dependent variable: *Issue share*$_b$									
Specification:	Additional controls				Matched sample		Matched sample + additional controls			
Sample:	All		A-rated		All				A-rated	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\mathbf{1}(\text{Financial})_b$	0.071***	0.074***	0.068*	0.078*	0.086***	0.093***	0.065**	0.071**	0.077*	0.086*
	[3.00]	[3.02]	[1.74]	[1.85]	[2.99]	[3.17]	[2.34]	[2.48]	[1.70]	[1.85]
$\mathbf{1}(\text{Financial})_b \times \text{Log(Maturity)}_b$		0.048***		0.071***		0.038***		0.036***		0.044**
		[4.19]		[5.13]		[3.21]		[3.07]		[2.46]
Bond controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SIFI-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity-Rating-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes
Mean *Issue share*$_b$	0.10									
No. of obs.	5,458	5,458	1,846	1,846	3,371	3,371	3,103	3,103	1,479	1,479
R^2	0.209	0.211	0.240	0.245	0.204	0.205	0.223	0.224	0.258	0.260
Adj. R^2	0.126	0.128	0.169	0.174	0.100	0.101	0.117	0.118	0.181	0.182

This table reports estimates for specifications based on Equation (2). The dependent variable, *Issue share*$_b$, is the share of bond issue b acquired by insurers with total assets below $50 million. $\mathbf{1}(\textit{Financial})_b$ is an indicator variable that takes the value one if the bond is a financial bond, that is, the issuer belongs to the financial industry (two-digit NAICS: 52 "Finance and Insurance"). *Log(Maturity)*$_b$ is the natural logarithm of the bond's maturity in years. Bond control variables include yield spread, log maturity, and indicator variables for credit enhancement and callability. Columns (1) to (4) and (7) to (10) further include bonds' bid-ask spread at issuance and issuer-level controls consisting of company leverage, EBIT margin, and cash balance. Columns (5) to (10) use a matched sample constructed via propensity score matching based on the bond control variables requiring exact matches within rating-maturity clusters. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the parent level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table C.6
Robustness: Idiosyncratic Risk of Financial Bonds Versus Non-Financial Bonds

Specification:	Dependent variable: $\sigma(\hat{\varepsilon})_b$									
	Rating at issuance		Issuer controls		Matched sample		Matched sample + issuer controls		Residuals from 4-factor model	
Sample:	All	A-rated	All	A-rated	All	A-rated	All	A-rated	All	A-rated
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\mathbf{1}(\text{Financial})_b$	-0.130***	-0.079**	-0.104**	-0.051*	-0.113***	-0.107***	-0.116***	-0.085**	-0.136***	-0.078**
	[-2.97]	[-2.19]	[-2.28]	[-1.71]	[-3.07]	[-3.07]	[-2.99]	[-2.43]	[-3.11]	[-2.44]
$\mathbf{1}(\text{Financial})_b \times \text{Log(Maturity)}_b$	-0.070**	-0.096***	-0.060**	-0.089***	-0.039	-0.107***	-0.034	-0.111***	-0.060**	-0.088***
	[-2.57]	[-2.93]	[-1.97]	[-2.76]	[-1.29]	[-3.06]	[-1.04]	[-2.94]	[-2.11]	[-2.88]
Bond controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity-Rating-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SIFI-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Issuer controls			Yes	Yes			Yes	Yes		
No. of obs.	5,633	1,901	5,285	1,964	3,285	1,606	3,043	1,523	5,672	2,069
R^2	0.511	0.663	0.530	0.661	0.591	0.653	0.611	0.653	0.519	0.659
Adj. R^2	0.462	0.632	0.483	0.631	0.540	0.620	0.560	0.618	0.473	0.630

This table reports estimates for specifications based on Equation (3). In columns (1)–(8), the dependent variable $\sigma(\hat{\varepsilon})_b$ is the standard deviation of residuals estimated from a factor model incorporating market, default, and term risk factors; columns (9) and (10) add the liquidity factor developed by Dick-Nielsen et al. (2012). $\mathbf{1}(\textit{Financial})_b$ is an indicator variable that takes the value one if the bond is a financial bond, that is, the issuer belongs to the financial industry (two-digit NAICS: 52 "Finance and Insurance"). $\textit{Log(Maturity)}_b$ is the natural logarithm of the bond's maturity in years. Bond control variables include log issue size, yield spread, log maturity, bid-ask spread, and indicator variables for credit enhancement and callability. Columns (3)–(4) and (7)–(8) further include issuer-level controls consisting of company leverage, EBIT margin, and cash balance. Columns (5)–(8) use a matched sample constructed via propensity score matching based on the bond control variables requiring exact matches within rating-maturity clusters. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the parent level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table C.7
Robustness: The 2017 Bond ETF Reform and Insurers' Preference for Financial Bonds

	Dependent variable: *Issue share*$_b$							
Bonds:	A-rated						NAIC 1	NAIC 2-6
Specification:	Non-adopters		Exclude 2014-2016	Additional controls	Matched sample	Matched sample + additional controls	Baseline	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\mathbf{1}(\text{Financial})_b$	0.001	0.001	0.137***	0.088**	0.138***	0.102**	0.144***	0.048
	[0.84]	[0.74]	[3.25]	[2.18]	[4.29]	[2.54]	[4.18]	[1.36]
$\mathbf{1}(\text{Financial})_b \times \text{Log(Maturity)}_b$	0.002**	0.002	0.066***	0.079***	0.072***	0.077***	0.066***	-0.007
	[2.18]	[1.42]	[2.71]	[5.52]	[3.77]	[4.41]	[3.99]	[-0.66]
$\mathbf{1}(\text{Post})_t \times \mathbf{1}(\text{Financial})_b$		-0.000	-0.074**	-0.085**	-0.066**	-0.110**	-0.087***	0.051
		[-0.10]	[-2.01]	[-2.14]	[-2.53]	[-2.55]	[-2.95]	[1.58]
$\mathbf{1}(\text{Post})_t \times \mathbf{1}(\text{Financial})_b \times \text{Log(Maturity)}_b$		0.001	-0.077**	-0.080***	-0.102***	-0.084***	-0.073***	0.019
		[0.44]	[-2.51]	[-4.38]	[-3.09]	[-4.32]	[-3.07]	[0.78]
Other interaction terms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bond controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SIFI-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity-Rating-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls				Yes		Yes		
Mean *Issue share*$_b$	0.004				0.088			
No. of obs.	2,344	2,344	1,540	1,846	1,837	1,444	2,915	6,651
R^2	0.107	0.107	0.204	0.214	0.189	0.224	0.194	0.147
Adj. R^2	0.040	0.039	0.141	0.139	0.120	0.139	0.113	0.091

This table reports estimated coefficients for specifications based on Equation (4). The dependent variable, *Issue share*$_b$, is the share of bond issue b acquired by insurers with total assets below $50 million. $\mathbf{1}(\textit{Financial})_b$ is an indicator variable that takes the value one if the bond is a financial bond, that is, the issuer belongs to the financial industry (two-digit NAICS: 52 "Finance and Insurance"). $\mathbf{1}(\textit{Post})_t$ is an indicator variable that takes the value one if the bond has been issued after the 2017 bond ETF reform, that is, in 2017 or later. *Log(Maturity)*$_b$ is the natural logarithm of the bond's maturity in years. Bond control variables include yield spread, log(maturity), and indicator variables for credit enhancement and callability. Columns (2) and (4) further include bonds' bid-ask spread at issuance and issuer-level controls consisting of company leverage, EBIT margin, and cash balance. Columns (5) and (6) use a matched sample constructed via propensity score matching based on the bond control variables requiring exact matches within rating-maturity clusters. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the parent level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table C.8
Issuer Diversification and Idiosyncratic Risk of Financial Bonds

	Dependent variable: $\sigma(\hat{\varepsilon})_b$			
	(1)	(2)	(3)	(4)
$\mathbf{1}(\text{Diversified})_b$	-0.050	-0.079*	-0.086*	-0.118**
	[-1.33]	[-1.84]	[-1.87]	[-2.26]
$\mathbf{1}(\text{Diversified})_b \times \text{Log(Maturity)}_b$			-0.069**	-0.077**
			[-2.58]	[-2.57]
Bond controls	Yes	Yes	Yes	Yes
Maturity-Rating-Year FE	Yes	Yes	Yes	Yes
SIFI-Year FE	Yes	Yes	Yes	Yes
Issuer controls		Yes		Yes
No. of obs.	1,787	1,636	1,787	1,636
R^2	0.741	0.758	0.742	0.759
Adj. R^2	0.690	0.707	0.690	0.708

This table reports estimates for specifications based on Equation (3). The dependent variable $\sigma(\hat{\varepsilon})_b$ is the standard deviation of residuals estimated from a factor model incorporating market, default, and term risk factors. $\mathbf{1}(\textit{Diversified})_b$ is an indicator variable that takes the value one if bond b's issuer is classified as a diversified financial intermediary, defined as an active lender in the syndicated loan market following Schwert (2018). $\textit{Log(Maturity)}_b$ is the natural logarithm of the bond's maturity in years. Bond control variables include log issue size, yield spread, log maturity, bid-ask spread, and indicator variables for credit enhancement and callability. Columns (2) and (4) further include issuer-level controls consisting of company leverage, EBIT margin, and cash balance. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the parent level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table C.9
Determinants of Dealer-Issuer Matches in Insurers' Bond Trades

	Dependent variable: $\mathbf{1}(\textit{Dealer} = \textit{Bond issuer})_a$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log(Assets)$_{i,t(a)-1}$	-0.001						0.001
	[-0.45]						[0.26]
$\mathbf{1}$(Affiliate)$_{i,t(a)-1}$		0.007					0.006
		[1.35]					[1.14]
Leverage$_{i,t(a)-1}$			-0.000*				-0.000
			[-1.66]				[-0.91]
ROE$_{i,t(a)-1}$				-0.000			-0.000
				[-0.57]			[-1.02]
RBC ratio$_{i,t(a)-1}$					0.000***		0.000**
					[3.12]		[2.55]
Portfolio HHI$_{i,t(a)-1}$						-0.000	-0.000
						[-0.85]	[-1.27]
Insurer FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Domicile-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	255,186	255,186	255,186	252,373	249,048	255,186	246,464
R^2	0.045	0.046	0.046	0.046	0.046	0.045	0.046
Adj. R^2	0.034	0.034	0.034	0.034	0.034	0.034	0.035

This table reports estimates for specifications based on:

$$\mathbf{1}(\textit{Dealer} = \textit{Bond issuer})_a = \boldsymbol{\gamma}\, \boldsymbol{X}_{i,t(a)-1} + u_i + v_{g,t} + \varepsilon_{i,a}.$$

The dependent variable, $\mathbf{1}(\textit{Dealer} = \textit{Bond issuer})_a$, is an indicator variable that takes the value one if the name of the dealer reported by the insurer for acquisition a matches any prospectus issuer name from Mergent FISD of the bond traded in acquisition a, or any other bonds that were issued by entities that belong to the same company as the bond traded. For more details on the matching procedure, see Appendix A.3. $\boldsymbol{X}_{i,t(a)-1}$ is a vector of insurer i's characteristics at the end of the previous year $t(a)-1$ including log assets, an indicator for whether the insurer is an insurance group affiliate, leverage, return on equity, RBC ratio, and the Herfindahl-Hirschman index across sector-level bond holdings. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the insurer level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table C.10
Robustness: Bond ETF Investments across Insurer Size

	Dependent variable: $\frac{\textit{Bond ETFs}_{i,t}}{\textit{Balance sheet item}_{i,t}}$					
Sample:	Adopting states			Non-adopting states		
Balance sheet item$_{i,t}$:	Invested assets		Total bonds	Invested assets		Total bonds
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Assets)$_{i,t}$	-0.042**	-0.054***	-0.095***	-0.016	-0.014	-0.028
	[-2.51]	[-3.32]	[-3.10]	[-1.49]	[-0.92]	[-0.88]
Controls		Yes	Yes		Yes	Yes
Domicile-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	6,446	6,446	6,447	932	932	932
R^2	0.030	0.030	0.039	0.075	0.083	0.073
Within R^2	0.002	0.003	0.004	0.003	0.012	0.014

This table reports estimates for specifications based on Equation (5) excluding the seven ETFs mentioned in Appendix A.2 from insurers' bond ETF investments. The dependent variable, $\frac{\textit{Bond ETFs}_{i,t}}{\textit{Balance sheet item}_{i,t}}$, is the share, in book values, of insurer i's total invested assets, columns (1), (2), (4), and (5), or fixed income investments, columns (3) and (6), allocated to bond ETFs focusing on corporate securities or the broader market in year t. Columns (1) to (3) show the results for insurers located in states that adopted the 2017 bond ETF reform, while columns (4) to (6) show the results for insurers located in states that did not adopt the reform, i.e., New York, Iowa, and Virginia. *Log(Assets)*$_{i,t}$ is the natural logarithm of insurer i's total assets in year t. Control variables include insurers' leverage, return on equity, and RBC ratio. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the insurer level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

D The Financial Industry Definition of the NAICS

This section gives more context on the definition of financial bonds and the composition of the financial industry as defined by the North American Industry Classification System (NAICS).

The paper's argument relies on the fact that financial bonds are debt instruments issued by financial intermediaries that, unlike non-financial firms, hold a diversified portfolio of assets – making these bonds a suitable means of diversification for investors. In the main analysis, I define financial bonds based on the two-digit NAICS code provided in Mergent, with the code 52 indicating the industry sector "Finance and Insurance." Generally, the NAICS industry 52 covers a wide range of entities that provide financial services, including banks, non-bank financial intermediaries, insurance companies, as well as other financial services providers such as exchanges or brokerages (see Appendix Table D.1).

Appendix Figure D.1 shows that the largest part of the financial industry's bonds issued during the sample period is from traditional credit intermediaries, such as banks and credit unions (NAICS 5221) and non-bank credit intermediaries (NAICS 5222). In addition, the subsectors labeling entities in securities intermediation (NAICS 5231), other investment activities (5239), and insurance companies (NAICS 5241) had sizable bond issuances. Zooming into subsectors 5231 and 5239, the largest issuers are predominantly well-known financial intermediaries, such as Morgan Stanley and Goldman Sachs (5231), or Citigroup and JPMorgan Chase (5239) (see Appendix Table D.2). These issuers are heavily involved in a broad range of financial intermediation activities and consequently hold a diversified asset portfolio. Overall, the four subsectors (5221, 5222, 5231, and 5239) account for more than 82% of the total amount issued by the financial industry during the sample period.

The preceding evidence shows that the financial bond universe is dominated by diversified intermediaries. Appendix Figure D.2 confirms that insurers' corporate bond portfolios mirror this composition. Insurers' bond holdings within the financial industry are mostly from the four subsectors with the largest overall bond issuance. The top-10 issuers in insurers' portfolios (see Appendix Table D.3) are predominantly large issuers that are involved in a broad range of intermediation activities. Overall, this evidence suggests that the definition of financial bonds based on NAICS code 52 captures the type of issuers that are typically considered as financial intermediaries in the theoretical literature, for which diversification is a core part of their intermediation activity.

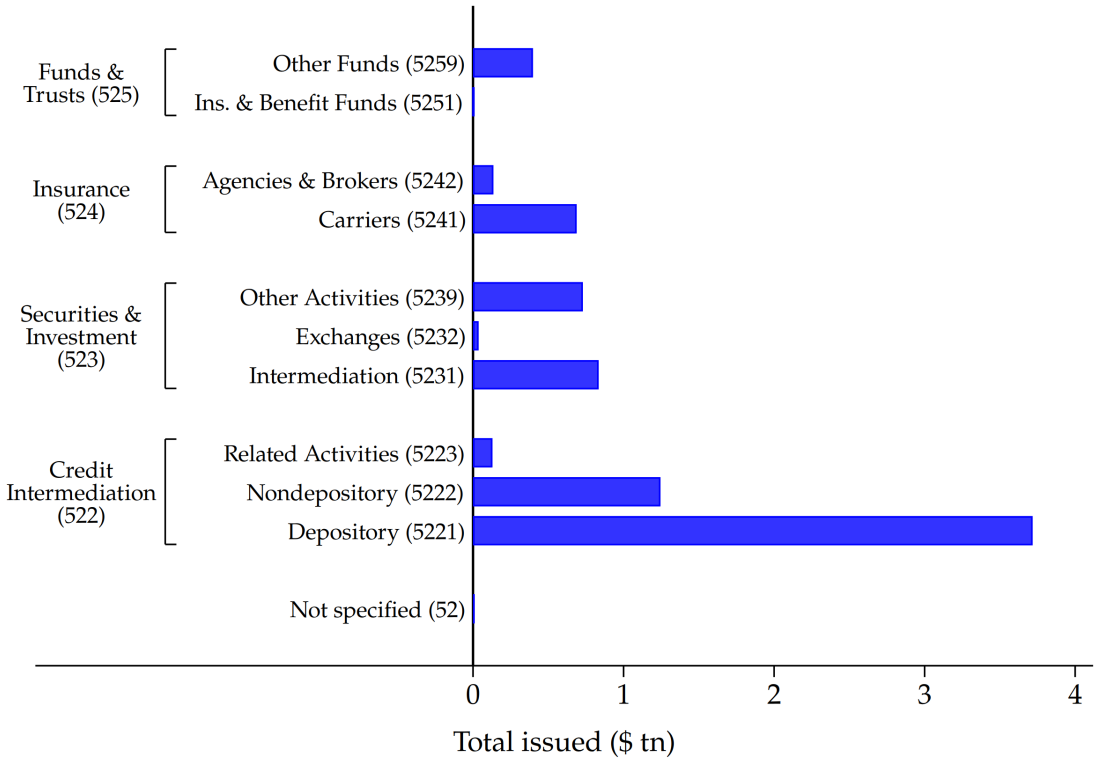
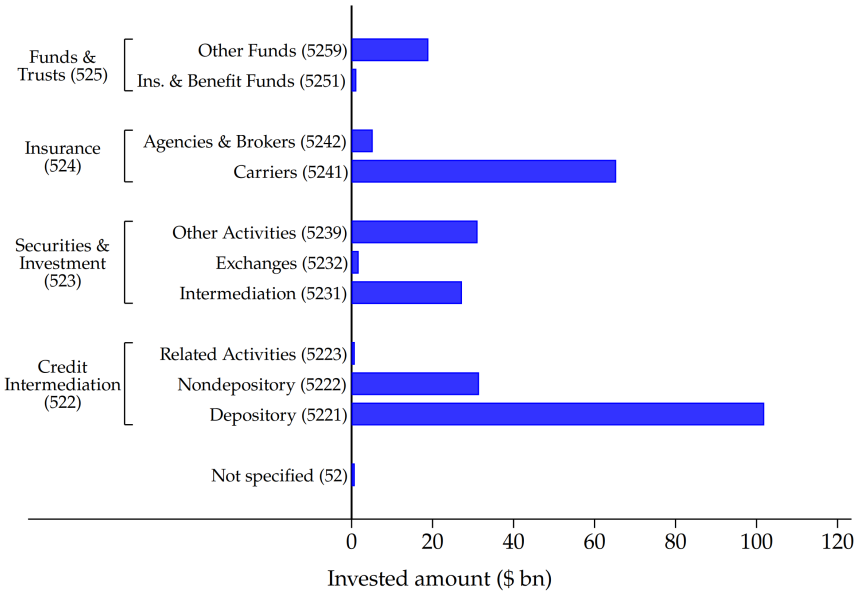
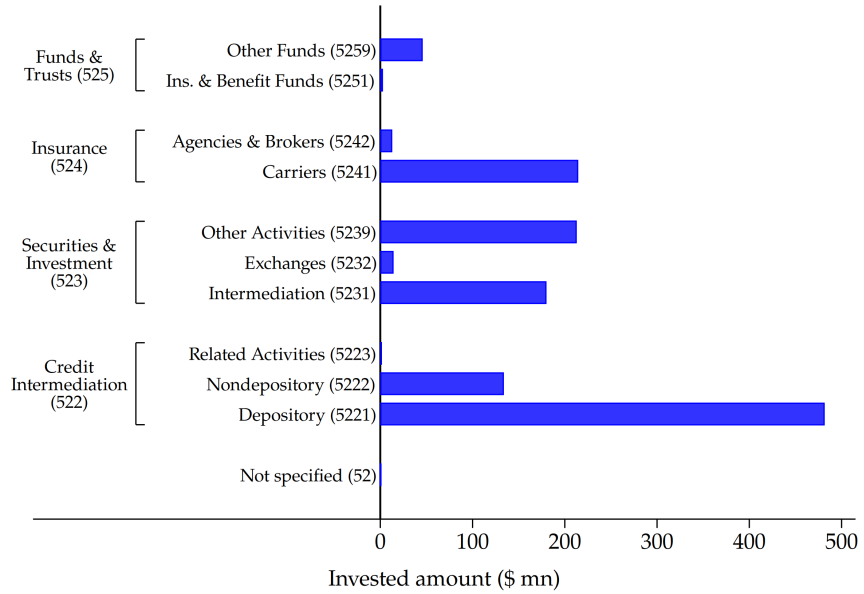


Figure D.1
Bond Issuance by 4-digit Subsector in NAICS Industry 52

This figure shows the total amount issued between 2011 and 2019 by 4-digit NAICS subsector within the NAICS industry 52 ("Finance and Insurance"). The figure is based on all dollar-denominated corporate bonds issued between 2011 and 2019 reported in the Mergent FISD database. For more details on the NAICS industry classification, see Appendix Table D.1.



(a) All Insurers



(b) Insurers With Assets <$ 50 mn

Figure D.2
Insurer Bond Holdings by 4-digit Subsector in NAICS Industry 52

This figure shows the total investments in bonds by 4-digit NAICS subsector within the NAICS industry 52 ("Finance and Insurance") in the bond portfolios of all insurers (left panel) and in the bond portfolios of insurers with assets below $50 million (right panel). This figure considers all dollar-denominated corporate bonds held by insurers in 2013. For more details on the 4-digit NAICS sectors, see Appendix Table D.1. Source: NAIC Schedule D Part 1 and Mergent FISD.

Table D.1
Subsectors of NAICS Industry 52 ("Finance and Insurance")

4-digit NAICS	Title	Description
5221	Depository Credit Intermediation	This industry group comprises establishments primarily engaged in accepting deposits (or share deposits) and in lending funds from these deposits.
5222	Nondepository Credit Intermediation	This industry group comprises establishments, both public (government-sponsored enterprises) and private, primarily engaged in extending credit or lending funds raised by credit market borrowing, such as issuing commercial paper or other debt instruments or by borrowing from other financial intermediaries.
5223	Activities Related to Credit Intermediation	This industry group comprises establishments primarily engaged in facilitating credit intermediation by performing activities, such as arranging loans by bringing borrowers and lenders together and clearing checks and credit card transactions.
5231	Securities and Commodity Contracts Intermediation and Brokerage	This industry group comprises establishments primarily engaged in putting capital at risk in the process of underwriting securities issues or in making markets for securities and commodities; and those acting as agents and/or brokers between buyers and sellers of securities and commodities, usually charging a commission.
5232	Securities and Commodity Exchanges	This industry comprises establishments primarily engaged in furnishing physical or electronic marketplaces for the purpose of facilitating the buying and selling of stocks, stock options, bonds, or commodity contracts.
5239	Other Financial Investment Activities	This industry group comprises establishments primarily engaged in one of the following: (1) acting as principals in buying or selling financial contracts (except investment bankers, securities dealers, and commodity contracts dealers); (2) acting as agents (i.e., brokers) (except securities brokerages and commodity contracts brokerages) in buying or selling financial contracts; or (3) providing other investment services (except securities and commodity exchanges), such as portfolio management; investment advice; and trust, fiduciary, and custody services.
5241	Insurance Carriers	This industry group comprises establishments primarily engaged in underwriting (assuming the risk, assigning premiums, and so forth) annuities and insurance policies and investing premiums to build up a portfolio of financial assets to be used against future claims. Direct insurance carriers are establishments that are primarily engaged in initially underwriting and assuming the risk of annuities and insurance policies. Reinsurance carriers are establishments that are primarily engaged in assuming all or part of the risk associated with an existing insurance policy (or set of policies) originally underwritten by another insurance carrier.
5242	Agencies, Brokerages, and Other Insurance Related Activities	This industry group comprises establishments primarily engaged in (1) acting as agents (i.e., brokers) in selling annuities and insurance policies or (2) providing other employee benefits and insurance related services, such as claims adjustment and third party administration.
5251	Insurance and Employee Benefit Funds	This industry group comprises legal entities (i.e., funds, plans, and/or programs) organized to provide insurance and employee benefits exclusively for the sponsor, firm, or its employees or members.
5259	Other Investment Pools and Funds	This industry group comprises legal entities (i.e., investment pools and/or funds) organized to pool securities or other assets (except insurance and employee benefit funds) on behalf of shareholders, unitholders, or beneficiaries.

This table provides the official definitions for the 4-digit sub-sectors of the NAICS industry 52 ("Finance and Insurance"). The table omits the sub-sector 5211 ("Monetary Authorities-Central Bank"), which is filtered out in the main analysis as it contains bonds issued by government-owned financial institutions and central banks. Note that the official NAICS definition of subsector 5222 ("Nondepository Credit Intermediation") includes government-sponsored enterprises (GSEs) but these are excluded from the analysis (see Section 2.2). Source: 2022 NAICS Manual (census.gov).

Table D.2
Largest Issuers in NAICS 52 Subsectors from 2011 to 2019

Issuer name (from Mergent)	Issued ($ bn)	% subsector total	Avg $\sigma(\hat{\varepsilon})$
NAICS 52: Not Specified			
MIZUHO CORPORATE BK LTD	5.50	47.21	
BANCO SANTANDER MEXICO SA	4.05	34.76	
CAISSE CENTRALE DESJARDINS	1.50	12.88	
CORONADO FIN PTY LTD	0.35	3.00	
GEORGIA BK JT STK CO	0.25	2.15	
NAICS 5221: Depository Credit Intermediation			
BOFA FIN LLC	366.67	10.36	0.14
HSBC USA INC	217.43	6.15	0.15
WELLS FARGO & CO NEW	216.65	6.12	0.13
BARCLAYS BK PLC	169.62	4.79	0.03
ROYAL BK CDA	146.65	4.15	0.09
NAICS 5222: Nondepository Credit Intermediation			
TOYOTA MTR CR CORP	133.41	10.84	0.03
FORD MTR CR CO LLC	100.77	8.19	0.16
AMERICAN EXPRESS CO	87.47	7.11	0.11
GENERAL MTRS FINL CO INC	80.18	6.51	0.18
AMERICAN HONDA FIN CORP	74.24	6.03	0.08
NAICS 5223: Activities Related to Credit Intermediation			
AERCAP IRELAND CAP	34.10	27.21	0.01
VISA INC	25.75	20.54	
NATIONWIDE BLDG SOC	13.65	10.89	
PAYPAL HLDGS INC	12.00	9.57	
OWL ROCK CAP CORP	3.78	3.01	
NAICS 5231: Securities and Commodity Contracts Intermediation and Brokerage			
MORGAN STANLEY FIN LLC	305.28	34.53	0.17
GS FIN CORP	302.32	34.19	0.07
CREDIT SUISSE NASSAU BRH	96.10	10.87	0.00
CREDIT SUISSE LONDON BRH	64.52	7.30	0.15
CREDIT AGRICOLE CORP & INVT BK	26.70	3.02	0.00

Table D.2 continued.

NAICS 5232: Securities and Commodity Exchanges			
INTERCONTINENTAL EXCHANGE INC	25.00	67.11	0.17
NASDAQ INC	8.05	21.61	0.16
CME GROUP INC	4.20	11.28	0.33
NAICS 5239: Other Financial Investment Activities			
CITIGROUP GLOBAL MKTS HLDGS INC	288.26	32.70	0.08
JPMORGAN CHASE FINL CO LLC	230.88	26.19	0.20
GENERAL ELEC CAP CORP	61.70	7.00	0.27
STATE STR CORP	27.26	3.09	0.26
REYNOLDS GROUP ISSUER INC	23.28	2.64	0.05
NAICS 5241: Insurance Carriers			
CIGNA CORP	77.84	11.41	0.04
UNITEDHEALTH GROUP INC	76.94	11.28	0.22
PRUDENTIAL FINL INC	62.99	9.23	0.03
BERKSHIRE HATHAWAY FIN CORP	62.05	9.10	0.17
METROPOLITAN LIFE GLOBAL FDG I	57.10	8.37	0.11
NAICS 5242: Agencies, Brokerages, and Other Insurance Related Activities			
ELEVANCE HEALTH INC	34.70	27.78	0.18
MARSH & MCLENNAN COS INC	13.80	11.05	0.26
AIA GROUP LTD	8.65	6.92	
AXA EQUITABLE HLDGS INC	8.00	6.40	0.06
WILLIS NORTH AMER INC	6.48	5.18	0.43
NAICS 5251: Insurance and Employee Benefit Funds			
UNUMPROVIDENT CORP	3.18	67.34	0.52
SWISS RE TREAS US CORP	0.75	15.91	
AES EL SALVADOR TR II	0.31	6.57	
IFM US COLONIAL PIPELINE 2 LLC	0.25	5.30	
HERITAGE INS HLDGS INC	0.23	4.88	
NAICS 5259: Other Investment Pools and Funds			
SHELL INTL FIN B V	52.25	12.85	0.17
ENEL FIN INTL N V	22.75	5.59	
DEXIA CR LOC NY BRH	19.21	4.72	0.04
REALTY INCOME CORP	18.58	4.57	0.25
INTELSAT JACKSON HLDGS S A	18.41	4.53	0.08

Table D.3
Top-10 Issuers of NAICS Industry 52 in Insurers' Portfolios

All Insurers			Insurers with Assets <$ 50 mn		
Issuer (as in Mergent)	**4-digit NAICS**	**USD bn**	**Issuer (as in Mergent)**	**4-digit NAICS**	**USD bn**
GENERAL ELEC CAP CORP	5239	10.36	GENERAL ELEC CAP CORP	5239	0.11
J P MORGAN CHASE & CO	5221	10.16	J P MORGAN CHASE & CO	5221	0.09
BANK AMER CORP	5221	9.43	GOLDMAN SACHS GROUP INC	5239	0.08
WELLS FARGO & CO	5221	8.65	BANK AMER CORP	5221	0.07
CITIGROUP INC	5231	8.03	WELLS FARGO & CO	5221	0.07
MORGAN STANLEY	5231	7.77	MORGAN STANLEY	5231	0.06
GOLDMAN SACHS GROUP INC	5239	7.34	CITIGROUP INC	5231	0.05
PNC FDG CORP	5221	5.4	METLIFE INC	5241	0.04
SHELL INTL FIN B V	5259	4.97	BERKSHIRE HATHAWAY FIN CORP	5241	0.03
METLIFE INC	5241	4.95	AMERICAN EXPRESS CR CORP	5222	0.03

This table shows the top-10 issuers of the NAICS industry 52 ("Finance and Insurance") in the bond portfolios of all insurers (left three columns) and in the bond portfolios of insurers with assets below $50 million (right three columns). The table considers all dollar-denominated corporate bonds held by U.S. insurers in 2013 and aggregates bond issuances to the parent company level. Source: NAIC Schedule D Part 1 and Mergent FISD.

E Robustness: Alternative Definitions of Financial Bonds

A potential concern is that the baseline definition of financial bonds, i.e., all bonds with a NAICS code 52, includes entities that are not necessarily intermediaries providing diversification through their business activity. This appendix shows that the paper's main results are robust to narrower definitions of financial bonds motivated by the discussion in Apppendix D.

E.1 Differences in Idiosyncratic Risk

As the four subsectors 5221, 5222, 5231, and 5239 comprise the main entities providing diversification through their financial intermediation, I first compare the idiosyncratic risk of these subsectors' bonds separately with all non-financial bonds (2-digit NAICS code $\neq$ 52). The idiosyncratic risk of bonds of these four subsectors is significantly lower than that of non-financial bonds. Additionally, I consider financial bonds defined as all bonds of these four subsectors and benchmark their idiosyncratic risk to two comparison groups: (i) all non-financial bonds, and (ii) all bonds not included in the definition of financial bonds, i.e., also other subsectors of the financial industry (NAICS 52). Lastly, I compare the idiosyncratic risk of financial bonds excluding insurers (four-digit NAICS 5241) to that of all remaining bonds, which now includes insurers. Again, the idiosyncratic risk of financial bonds is significantly lower than that of the comparison groups, with the coefficients being in the same order of magnitude as in the main analysis (see Table E.1 and Table E.2). Overall, these results reinforce the robustness of the study's main findings.

E.2 Insurers' Preference for Financial Bonds around the 2017 Bond ETF Reform

To ensure that my results are not driven by the specific definition of financial bonds, I repeat the diff-in-diff analysis of Equation (4) for narrower definitions of financial bonds focusing on the four key subsectors 5221, 5222, 5231, and 5239, which comprise the most diversified financial intermediaries in the financial industry. The effect of the 2017 bond ETF reform on insurers' preference for financial bonds is similar under the alternative definitions of financial bonds as in the main analysis (see Table E.3). The results are the strongest in the sample of A-rated bonds, are slightly weaker in the sample of NAIC 1 bonds,

and do not show up for bonds in the NAIC 2-6 (below A) categories. Overall, these results suggest that the key findings are robust to alternative definitions of financial bonds.

Table E.1
Differences in Idiosyncratic Risk: Alternative Definitions of Financial Bonds in the Sample of NAIC 1 Bonds

	Dependent variable: $\sigma(\hat{\varepsilon})_b$						
$\mathbf{1}(Financial)_b$ if 4-digit NAICS is:	5221	5222	5231	5239	All from (1)–(4)		Excl insurers (5241)
Comparison group:	Non-financials (2-digit NAICS code $\neq$ 52)					All not in $\mathbf{1}$(Financial) definition	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\mathbf{1}$(Financial)$_b$	-0.067	-0.147**	0.135	0.038	-0.086**	-0.069**	-0.072**
	[-1.57]	[-2.18]	[1.36]	[0.32]	[-2.26]	[-2.01]	[-2.28]
$\mathbf{1}$(Financial)$_b$ $\times$ Log(Maturity)$_b$	-0.068*	-0.114**	-0.281***	-0.195*	-0.083**	-0.065**	-0.069**
	[-1.94]	[-2.40]	[-2.84]	[-1.89]	[-2.49]	[-2.21]	[-2.37]
Bond controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity-Rating-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SIFI-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1,816	1,669	1,445	1,530	2,328	2,548	2,548
R^2	0.656	0.659	0.643	0.664	0.694	0.698	0.698
Adj. R^2	0.607	0.607	0.581	0.605	0.659	0.665	0.665

This table reports estimates for specifications based on Equation (3) for the sample of bonds with a rating of A- or better. The dependent variable, $\sigma(\hat{\varepsilon})_b$, is the standard deviation of residuals estimated from a factor model incorporating market, default, and term risk factors. $\mathbf{1}(Financial)_b$ is an indicator variable that takes the value one if the bond is a financial bond. The definition of financial bonds varies over the columns. In column (1), financial bonds are bonds issued by entities with a four-digit NAICS code 5221. In column (2), financial bonds are bonds issued by entities with a four-digit NAICS code 5222. In column (3), financial bonds are bonds issued by entities with a four-digit NAICS code 5231. In column (4), financial bonds are bonds issued by entities with a four-digit NAICS code 5239. In columns (5) and (6), financial bonds are bonds issued by entities with a four-digit NAICS code of 5221, 5222, 5231, or 5239. In column (7), financial bonds are bonds issued by entities with a 2-digit NAICS code of 52 specifically excluding insurance companies (four-digit NAICS 5241). In columns (1) to (5), I compare the idiosyncratic risk of financial bonds to that of all non-financial bonds (2-digit NAICS code $\neq$ 52). In columns (6) and (7), I compare the idiosyncratic risk of financial bonds to that of all bonds not included in the definition of financial bonds, i.e., also other subsectors of the financial industry (NAICS 52) or excluding insurers (four-digit NAICS 5241). *Log(Maturity)*$_b$ is the natural logarithm of the bond's maturity in years. Bond control variables include log issue size, yield spread, log maturity, bid-ask spread, and indicator variables for credit enhancement and callability. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the parent level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table E.2
Differences in Idiosyncratic Risk: Alternative Definitions of Financial Bonds in the Sample of A-rated Bonds

	Dependent variable: $\sigma(\hat{\varepsilon})_b$						
$\mathbf{1}(\textit{Financial})_b$ if 4-digit NAICS is:	5221	5222	5231	5239	All from (1)–(4)		Excl insurers (5241)
Comparison group:	Non-financials (2-digit NAICS code $\neq$ 52)					All not in $\mathbf{1}$(Financial) definition	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\mathbf{1}(\text{Financial})_b$	-0.061	-0.179**	0.124	0.090	-0.093**	-0.087**	-0.090***
	[-1.35]	[-2.34]	[1.26]	[0.76]	[-2.35]	[-2.50]	[-2.71]
$\mathbf{1}(\text{Financial})_b \times \text{Log(Maturity)}_b$	-0.074*	-0.126**	-0.278***	-0.277***	-0.096***	-0.082***	-0.086***
	[-1.92]	[-2.44]	[-2.84]	[-2.66]	[-2.73]	[-2.69]	[-2.82]
Bond controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity-Rating-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SIFI-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1,471	1,401	1,200	1,225	1,896	2,069	2,069
R^2	0.626	0.633	0.610	0.606	0.652	0.658	0.658
Adj. R^2	0.583	0.588	0.555	0.552	0.621	0.629	0.630

This table reports estimates for specifications based on Equation (3) for the sample of bonds rated between A- and A+. The dependent variable, $\sigma(\hat{\varepsilon})_b$, is the standard deviation of residuals estimated from a factor model incorporating market, default, and term risk factors. $\mathbf{1}(\textit{Financial})_b$ is an indicator variable that takes the value one if the bond is a financial bond. The definition of financial bonds varies over the columns. In column (1), financial bonds are bonds issued by entities with a four-digit NAICS code 5221. In column (2), financial bonds are bonds issued by entities with a four-digit NAICS code 5222. In column (3), financial bonds are bonds issued by entities with a four-digit NAICS code 5231. In column (4), financial bonds are bonds issued by entities with a four-digit NAICS code 5239. In columns (5) and (6), financial bonds are bonds issued by entities with a four-digit NAICS code of 5221, 5222, 5231, or 5239. In column (7), financial bonds are bonds issued by entities with a 2-digit NAICS code of 52 specifically excluding insurance companies (four-digit NAICS 5241). In columns (1) to (5), I compare the idiosyncratic risk of financial bonds to that of all non-financial bonds (2-digit NAICS code $\neq$ 52). In columns (6) and (7), I compare the idiosyncratic risk of financial bonds to that of all bonds not included in the definition of financial bonds, i.e., also other subsectors of the financial industry (NAICS 52) or excluding insurers (four-digit NAICS 5241). $\textit{Log(Maturity)}_b$ is the natural logarithm of the bond's maturity in years. Bond control variables include log issue size, yield spread, log maturity, bid-ask spread, and indicator variables for credit enhancement and callability. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the parent level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

Table E.3
Insurers' Preference for Financial Bonds around the 2017 Bond ETF Reform: Alternative Definitions of Financial Bonds

	Dependent variable: Issue share$_b$								
$\mathbf{1}(\textit{Financial})_b$ if 4-digit NAICS is:	5221, 5222, 5231, or 5239						Excl insurers (5241)		
Comparison group:	Non-financials (2-digit NAICS code $\neq$ 52)			All not in $\mathbf{1}$(Financial) definition					
Bonds in sample:	A-rated	NAIC 1	NAIC 2-6	A-rated	NAIC 1	NAIC 2-6	A-rated	NAIC 1	NAIC 2-6
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\mathbf{1}(\text{Financial})_b$	0.203***	0.207***	0.032	0.197***	0.203***	0.030	0.182***	0.187***	0.055
	[4.73]	[4.99]	[1.29]	[4.98]	[5.41]	[1.21]	[4.67]	[5.15]	[1.43]
$\mathbf{1}(\text{Post})_t \times \mathbf{1}(\text{Financial})_b$	-0.113***	-0.126***	0.107***	-0.108***	-0.122***	0.103***	-0.106***	-0.116***	0.059
	[-2.92]	[-3.26]	[2.80]	[-2.89]	[-3.31]	[2.70]	[-2.98]	[-3.38]	[1.64]
$\mathbf{1}(\text{Financial})_b \times \text{Log}(\text{Maturity})_b$	0.109***	0.095***	-0.001	0.109***	0.096***	0.001	0.103***	0.089***	-0.005
	[6.31]	[5.35]	[-0.08]	[6.63]	[5.78]	[0.07]	[6.17]	[5.38]	[-0.40]
$\mathbf{1}(\text{Post})_t \times \mathbf{1}(\text{Financial})_b \times \text{Log}(\text{Maturity})_b$	-0.116***	-0.099***	0.051	-0.117***	-0.101***	0.058*	-0.114***	-0.096***	0.026
	[-4.14]	[-3.61]	[1.50]	[-4.29]	[-3.83]	[1.71]	[-4.24]	[-3.74]	[0.91]
Bond controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SIFI-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity-Rating-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	2,173	2,674	6,229	2,344	2,915	6,651	2,344	2,915	6,651
R^2	0.205	0.205	0.149	0.202	0.202	0.147	0.199	0.200	0.149
Adj. R^2	0.140	0.120	0.089	0.142	0.122	0.091	0.139	0.119	0.093

This table reports estimates for specifications based on Equation (4). The dependent variable, *Issue share*$_b$, is the share of bond issue b acquired by insurers with total assets below $50 million. $\mathbf{1}(\textit{Financial})_b$ is an indicator variable that takes the value one if the bond is a financial bond. The definition of financial bonds varies over the columns. In columns (1) to (3), financial bonds are bonds issued by entities with a four-digit NAICS code of 5221, 5222, 5231, or 5239 and the comparison group consists of all non-financial bonds (2-digit NAICS code $\neq$ 52). In columns (4) to (6), financial bonds are bonds issued by entities with a four-digit NAICS code of 5221, 5222, 5231, or 5239 and the comparison group consists of all bonds not included in this definition, i.e., also bonds of other subsectors of the financial industry (NAICS 52). In columns (7) to (9), financial bonds are bonds issued by entities with a 2-digit NAICS code of 52 specifically excluding insurance companies (four-digit NAICS 5241) and the comparison group consists of all bonds not included in this definition, i.e., also bonds of insurance companies. *Log(Maturity)*$_b$ is the natural logarithm of the bond's maturity in years. Bond control variables include yield spread, log maturity, and indicator variables for credit enhancement and callability. Variable definitions are in Appendix Table A.1. t-statistics are shown in parentheses and based on standard errors clustered at the parent level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.

References

Dick-Nielsen, J. (2009). Liquidity Biases in TRACE. *Journal of Fixed Income*, 19(2):43–55.

Dick-Nielsen, J. (2014). How to Clean Enhanced TRACE Data. *Working Paper*.

Dick-Nielsen, J., Feldhütter, P., and Lando, D. (2012). Corporate bond liquidity before and after the onset of the subprime crisis. *Journal of Financial Economics*, 103(3):471–492.

Fang, C. (2025). Monetary Policy Amplification through Bond Fund Flows. *Working Paper*.

National Association of Insurance Commissioners (2017). Purposes and Procedures Manual of the NAIC Investment Analysis Office.

National Association of Insurance Commissioners (2018). Purposes and Procedures Manual of the NAIC Investment Analysis Office.

National Association of Insurance Commissioners (2019). ETF Bond List.

Schwert, M. (2018). Bank Capital and Lending Relationships. *The Journal of Finance*, 73(2):787–830.

State Street Global Advisors (2021). Systematic Value Calculation For Fixed Income ETFs: The Step-by-Step Calculation and Hypothetical Example. *Insights Fixed Income*, Q2.

Svensson, L. E. (1994). Estimating and Interpreting Forward Interest Rates: Sweden 1992–1994. *Working Paper*.

Welch, I. and Goyal, A. (2008). A Comprehensive Look at The Empirical Performance of Equity Premium Prediction. *The Review of Financial Studies*, 21(4):1455–1508.