The Effect of Climate Regulatory Actions on Credit Allocation: Evidence from the Insurance Industry*

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Abstract

We study the effect of climate-change-related regulatory actions on credit allocation. We use the mandated Climate Risk Disclosure Survey from the National Association of Insurance Commissioners (NAIC) to analyze the effect of the mandatory disclosure on corporate bond holdings of the insurance industry. We find that insurers who are mandated to disclose their climate risk practices significantly tilt their holdings away from high-climate-risk corporate bonds. We find that our results are robust when analyzing life insurers and property & casualty insurers separately.

Keywords: Climate change; regulation; disclosure; credit allocation; insurance companies
JEL Codes: G11, G22, G23, G28, O54

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1 Introduction

A recent report from the Council of Economic Advisers (CEA) emphasizes that the risks of climate change can be divided into two categories, physical and transition risks: "The physical risks are risks resulting from climatic events, such as wildfires, storms, and floods, whereas transition risks result from policy action taken to transition the economy off of fossil fuels." The transition risk is particularly relevant for the investment portfolio of financial institutions, not the least due to regulatory pressures these institutions will face to invest in greener industries. Indeed, the report argues that "private market actors—including many financial institutions—do not internalize the negative externalities tied to the risks of climate change that are associated with their credit allocation decisions. These decisions include the over-provision of credit to certain activities that exacerbate climate change risks."[1] Therefore, policymakers and financial institutions, as well as other investors and borrowers, need to understand how regulatory pressure affects these institutions' credit portfolios.

Though we are still in early stages of climate-related regulations, there has been a growing motivation to increase the disclosure of firm-level data surrounding climate risk practices and management.[2] However, despite this progress, there is still a scarcity of information surrounding the climate risks and regulations of institutional investors, particularly in the insurance market. This is highlighted by the Federal Insurance Office (FIO) sending out a request for information (RFI) in 2021, asking for input on how to better assess and regulate

[1] See https://www.whitehouse.gov/cea/written-materials/2021/11/03/new-tools-needed-to-assess-climate-related-financial-risk-2/

[2] In 2012, the United Kingdom (U.K.) announced a new law that would require publicly listed firms to disclose their greenhouse gas (GHG) emissions. More recently, in the United States, the Securities and Exchange Commission (SEC) proposed a mandate that would require disclosures of climate-related risks and metrics, like a firm's greenhouse gas (GHG) emissions levels. See https://www.sec.gov/news/press-release/2022-46. More recently, Federal Reserve has joined the Network for Greening Financial Services, a consortium of central banks and other regulators working on climate scenarios, and announced its own climate scenario analysis.

climate risk in the insurance industry.[3]

We address this gap by studying the effect of regulatory climate-change-related disclosure on the corporate bond portfolio of insurance companies, using the mandated NAIC Climate Risk Disclosure Survey as a laboratory. We document the decrease in insurance companies' holdings of high-climate-risk bonds after becoming mandated to participate in the NAIC Climate Risk Disclosure Survey. We find that if an insurance company was mandated to file survey responses in the previous year, their holdings of high-climate-risk corporate bonds decrease by 0.87%. Moreover, if an insurance company was mandated to file survey responses two years ago, then their holdings of high-climate-risk corporate bonds decreased by another 1.10% in the second year. We also find that the effect reaches a 5% cumulative reduction in seven years following the date of first treatment. Our results remain robust when analyzing the life insurance and the property & casualty (P&C) insurance industries separately. While these numbers may appear small relative to the fraction of high-climate-risk bonds in the insurers' total corporate bond portfolio (21%), they are a large fraction of overall climate-related corporate bond investment activity of insurance companies. Indeed, insurance companies, on average, actually increased their high-climate-risk bond holdings by 0.2% per year during our sample period. Our results suggest that climate regulatory actions, even as simple as mandated disclosure, can impact credit allocation.

Our work contributes to the emerging literature on how investors incorporate climate-related information into their portfolio. More specifically, there have been multiple studies which investigate the portfolio management of institutional investors directly before and after a natural disaster strikes (Massa & Zhang 2021, Liu 2018, Huynh & Xia 2021). There have also been studies which examine how firms manage their portfolio following climate policy shocks (Ramelli et al., 2021), and self commitment to responsible investing (Gibson

[3]See https://www.federalregister.gov/documents/2021/08/31/2021-18713/federal-insurance-office-request-for-information-on-the-insurance-sector-and-climate-related.

et al. 2021).

Our work also expands upon the current literature that studies the impact of mandatory climate disclosure. Much of the current literature studies the effect of disclosures on publicly traded firms, while our study focuses on institutional investors. Krueger (2015) studies the effect of a U.K. law that mandates publicly traded firms to disclose their greenhouse gas (GHG) emissions, and finds that firms who are heavily affected by the new regulation experience significant positive valuation effects. Utilizing the same U.K. law, Jouvenot and Krueger (2019) find that firms reduce their GHG emissions by 16% following the new regulation that mandates carbon disclosure. Moreover, Méssonier and Nguyen (2020) examine a French law that requires institutional investors, but not banks, to report their climate related exposure and mitigation policy. They found evidence that investors who were subject to the mandate lowered their financing of fossil energy companies compared to other investors in the euro area. Ilhan et al. (2022) show that investors demand climate risk disclosures and influence their portfolio firms for improvements.

Finally, our study contributes to the ongoing conversation surrounding the progress of climate risk regulation in the insurance industry. In 2008, the NAIC wrote a report detailing how insurance companies could help mitigate and prevent losses from climate change, as well as how the government and the NAIC could aid in regulating insurers with respect to climate change (NAIC 2008). Since the NAIC report, multiple consulting firms and government agencies have also written reports detailing the progress of the insurance industry with regards to climate risk management. Messervy (2016) utilizes the NAIC Climate Risk Disclosure survey to evaluate the climate risk management practices of insurance companies, and found that only 16 percent of total insurers earned a "high quality" rating, while 64% earned a "low quality" or "minimal" rating. Similarly, a report by the New York Department of Financial Services (DFS) also utilized the NAIC Climate Risk Survey responses to create composite ratings of domestic New York insurance companies, and found that most insurance

companies were in the "making progress" category (New York DFS 2021b). Moreover, a report by the Geneva association in 2021 offers a "holistic decision-making framework for P&C and life re/insurers" (Golnaraghi 2021), and concludes that "the development of methodologies and tools that would produce meaningful and decision-useful information is a work in progress" (Golnaraghi 2021). Finally, the New York Department of Financial Services (DFS) released another report in 2021 that analyzed the transition risk exposure of insurers using data from NAIC Schedule D. They found evidence that New York domestic insurers were meaningfully exposed to transition risk, and that their portfolios were not aligned with the Paris Agreement (New York DFS 2021a).

Our paper continues with background information about the NAIC Climate Risk Disclosure Survey in the next section, followed by a discussion of our data and empirical strategy, and results.

2 Regulatory Background

The NAIC Climate Risk Disclosure Survey was first implemented by the California Department of Insurance (CDI) in 2010 to "provide regulators with a window into how insurers across all lines of insurance assess and manage risks related to climate change."[4] The survey is comprised of eight open-ended questions that cover a variety of topics regarding insurers' responses to climate change. Select examples of topics covered in the survey include climate risk management, mitigation of carbon emissions, and engagement with policyholders, with two questions specifically addressing the impact of climate change on the insurance company's investment portfolio and strategy (questions 5A and 5B). The full list of questions can be found in the appendix (See Table A1).

Moreover, insurance companies are mandated to file survey responses if they fulfill two requirements: They are licensed in a state that is participating in the survey, and they write

[4]Source: California Department of Insurance Website: http://www.insurance.ca.gov/0250-insurers/0300-insurers/0100-applications/ClimateSurvey/

more premiums nationally than the preset number the CDI employs. At its origination, the survey was only mandated for insurers who were licensed in California and wrote more than $500 million in premiums nationally. As the years have passed, the survey has expanded to multiple states, and the mandate requirement for national premiums has decreased. Table 1 shows the national premium and state mandate requirements for the NAIC Climate Risk Disclosure Survey throughout each reporting year.

[TABLE 1 HERE]

First, we clarify an important but ambiguous naming convention. A regulator, such as the CDI, administers the climate risk survey to insurers in a specific year based upon their financial numbers and licensing practices from the year prior. As a result, the CDI denotes the year of their surveys based upon the year of financial information they use, and not when the survey was administered. For example, while the first survey was administered in 2010, the CDI titles the first survey as being from "Reporting Year 2009" on their online database. In our study, we remain consistent with the naming convention that the CDI uses.[5]

As mentioned earlier, the survey started in reporting year 2009 and was only mandated for companies licensed in California who wrote more than $500 million in premiums nationally. In reporting year 2010, the mandate requirement for national premiums dropped to $300 million, with California still being the only state to mandate the survey. In reporting year 2011, the number of states participating in the survey expanded to include New York and Washington, with the premium requirement remaining $300 million. In reporting year 2012, the number of states participating expanded again to include Connecticut and Minnesota, while the premium requirement dropped from $300 million to $100 million. In reporting year 2013, Illinois, Maryland and New Mexico participated in the survey, while the premium requirement remained at $100 million. Illinois and Maryland only participated in

[5]For the rest of this paper, any mention of year when regarding the survey is referring to the reporting year, and not the year the survey was administered

the survey in reporting year 2013, and left immediately after. Finally, from reporting year 2014 to reporting year 2019, California, Connecticut, Minnesota, New Mexico, New York and Washington participated in the survey, with the premium requirement remaining $100 million throughout.

[FIGURE 1 HERE]

While only six states participated in the survey in reporting year 2019, the percentage of insurers required to file a survey represent a large portion of the insurance industry. Figure 1a, left panel, represents the percentage of total premiums written by mandated U.S. life insurers relative to that of the entire U.S. life insurance market; Figure 1b, left panel, does the same for the P&C insurance market. We see in both the life and P&C markets, mandated insurers represent over 80% of the premiums written in their respective markets following 2012. However, the actual filers (right panels) in 2009 and 2010 made up a very small percentage of the total written premiums in the insurance market. This is driven by the fact that not all mandated insurers actually responded to the survey.

[TABLE 2 HERE]

To illustrate this point more clearly, Table 2 presents the number of different types of filers throughout each reporting year. From the table, we see that from 2012 onward, more than 95% of insurers who were mandated to answer the survey did file responses to the survey.[6] In 2011, this number was around 80%, meaning that a large majority of mandated insurers did file. However, for 2009 and 2010, an incredibly small number of mandated insurers actually responded to the survey, with the rate being lower than 3% for both years. Due to lack of enforcement in 2009 and 2010, which lead to an exceptionally low response

[6]This percentage is equal to $Mandatory(Filed)/[Mandatory(Filed) + Mandatory(NotFiled)] * 100$ in Table 2.

rate in those years, we consider the survey voluntary for these years. This means that, for our purposes, the survey does not become mandatory until 2011.

3 Data and Sample

3.1 Data

To perform our analysis, we utilize institutional investor data and bond characteristic data to determine the percentage of high-climate risk bonds that an insurance company holds. First, we obtain end of year corporate bond holdings data, for life and P&C insurers, using NAIC Schedule D Part 1. We also use the demographic files from NAIC Schedule D to determine which state each insurer is domiciled in for each year. The state domiciled data will be used in future analysis as part of an interacted fixed-effects term.

Next, we obtain corporate bond-level characteristics data from the Mergent Fixed Income Securities Database (FISD). We specifically look at the NAICS code of each corporate bond to determine whether a bond is in a sector that experiences high climate risk. We define a sector to be high-risk based upon a report released in 2020 by the U.S. Commodity Futures Trading Commission (CFTC).[7] The specific NAICS codes that were matched with each high-risk sectors defined by the CFTC can be found in the appendix of the paper (See Table A2). After combining the Mergent FISD data with the NAIC Schedule D data using bond identifiers (CUSIP), we use equation (1) to determine the percentage of high climate risk corporate bonds each insurance company is holding at the end of every year.[8]

$$PercentageHighRisk_{i,t} = \left(\frac{\sum_{h=1}^{n} ParHighRiskBonds_{i,h,t}}{\sum_{j=1}^{n} ParAnyBond_{i,j,t}}\right) * 100 \tag{1}$$

$ParHighRiskBonds_{i,h,t}$ is the par value of a high-climate-risk bond h that insurer i holds

[7] Link to CFTC Report: https://www.cftc.gov/PressRoom/PressReleases/8234-20 (See Table 3.1)

[8] We have done the same calculation using Book Adjusted Carrying Value, and Fair Value of the bond instead of Par Value. The results were similar.

in year t. $ParAnyBond_{i,j,t}$ is the par value of any bond j that insurer i holds in reporting year t. In equation (1), we take the sum of the par value of all the high risk corporate bonds that insurer i holds in year t, and divide it by the sum of the par value of all corporate bonds that insurer i holds in year t. This term, multiplied by hundred, calculates the $PercetageHighRisk_{i,t}$ variable, which we use to represent the percentage of high-climate-risk corporate bonds that insurer i holds in year t relative to their entire corporate bond portfolio.

After calculating the percentage of high-risk bonds an insurer holds, we use the survey data hosted by CDI and the NAIC Schedule T data to determine whether an insurer was mandated to file a survey. The CDI database helps identify which insurers have filed responses to the survey, but does not specify whether they were mandated to do so. To make this distinction, we utilize NAIC Schedule T to find the annual amount of premiums written nationally for each insurer, as well as which states they are licensed in. Combining the CDI data with the NAIC Schedule T data allows us to determine which insurers were mandated to file survey responses, which insurers voluntarily filed responses, and whether an insurance company didn't file survey responses even though they were mandated to do so.

3.2 Sample

To create our regression sample, we apply some commonly used restrictions from previous literature. First, using data on net total assets and active status from the Assets Exhibit and Jurat Pages of the NAIC Insurance Regulatory Filing, we restrict our sample to mutual and stock insurance companies with positive net total assets and that are active during the reporting year.[9] We also use the data on insurers' net total assets to create a control variable, for our regressions, that serves as a proxy for firm size.

Next, we drop any insurance company who holds zero high-climate-risk bonds in 2004,

[9]We obtain the data for the Assets Exhibit and the Jurat Pages from the S&P Global's Insurance Statutory Financials Database.

the first year of our sample. This allows us to minimize the censoring bias caused by the fact that insurance companies that do not hold any high-climate-risk bonds cannot reduce their holdings of these bonds any further.

Finally, after applying these restrictions, we create our regression sample by balancing the data. This creates a balanced panel from 2004 to 2019, which we can then analyze using a fixed effects regression

4 Effect of Mandatory Disclosure: Empirical Results

We study the effect of mandatory climate disclosure on the high climate-risk bond holdings of life and P&C Insurance companies. We estimate the following three fixed-effects linear regression models:

$$\begin{aligned} PercentageHighRisk_{i,t} =& \beta_0 + \beta_1 Mandatory_{i,t} + \beta_2 Mandatory_{i,t-1} + \beta_3 Mandatory_{i,t-2} \\ &+ FixedEffects + e_{i,t} \end{aligned} \tag{2}$$

$$\begin{aligned} PercentageHighRisk_{i,t} =& \beta_0 + \beta_1 Mandatory_{i,t} + \beta_2 Mandatory_{i,t-1} + \beta_3 Mandatory_{i,t-2} \\ &+ \beta_4 Voluntary_{i,t} + \beta_5 Voluntary_{i,t-1} + \beta_6 Voluntary_{i,t-2} \\ &+ FixedEffects + e_{i,t} \end{aligned} \tag{3}$$

$$
\begin{aligned}
PercentageHighRisk_{i,t} = &\beta_0 + \beta_1 Mandatory_{i,t} + \beta_2 Mandatory_{i,t-1} + \beta_3 Mandatory_{i,t-2} \\
&+ \beta_4 Voluntary_{i,t} + \beta_5 Voluntary_{i,t-1} + \beta_6 Voluntary_{i,t-2} \\
&+ \beta_7 FirmSize_{i,t} + FixedEffects + e_{i,t}
\end{aligned} \tag{4}
$$

where $PercetageHighRisk_{i,t}$ is the percentage of high-climate-risk corporate bonds that insurer i holds in year t, relative to their entire corporate bond portfolio. $Mandatory_{i,t}$ is an indicator variable which equals one if insurer i was mandated to take the survey in reporting year t, and zero otherwise. To round out our first model (equation 2), we also include the first and second lags of the $Mandatory_{i,t}$ variable, as well as insurance company and year fixed effects.

Our second regression model builds upon equation (2) by adding a $Voluntary_{i,t}$ indicator variable that equals one if insurer i voluntarily filed survey responses in reporting year t, and zero otherwise. We also include the first and second lags of our $Voluntary_{i,t}$ variable in our second model.

Our final regression model is identical to equation (3), but with the addition of a $FirmSize_{i,t}$ control variable. We create the $FirmSize_{i,t}$ variable by taking the natural logarithm of the net total assets that insurer i holds in year t. We also extend this model by including a State Domiciled-Year interaction term as an additional fixed effect.

Table 3 presents our results when applying our models to the combined sample of life and P&C insurers. Columns 1-3 in the table utilize models 1-3, respectively, to perform our regression analysis. Column 4 in the table utilizes model 3, but substitutes Year fixed effects with a State Domiciled-Year interaction fixed effects term. For each fixed-effects regression, standard errors are multi-way clustered on insurance company and year. When utilizing model 1 (column 1), we find that, on average, insurers who were mandated within the past two years lower their holdings of high climate risk corporate bonds by a significant amount.

In particular, insurers who were mandated to file a survey in the previous year lowered their high climate risk corporate bond holdings by 0.69 percent. If an insurer was mandated to file a survey from two years ago, then the percentage of holdings for high climate risk bonds decreased by another 1.25 percent in the second year. We do not find a significant change in corporate bond holdings if an insurer was mandated to file in that year. These result are unsurprising, given the fact that the survey is not administered until the year after the reporting year (see Section 2 for more details on naming convention of reporting year). These results, therefore, suggest that we see a continuing decline in high-climate risk bond holdings amongst mandated insurers after the survey is administered, but not leading up to its administration.

[TABLE 3 HERE]

Columns 2-4 in Table 3 provide evidence that our results are robust, even when applying different models to our analysis. In model 2 (column 2), we see that adding the $Voluntary_{i,t}$ indicator variable, along with its first and second lags, strengthens the negative relationship between mandated insurers and their holdings of high climate risk corporate bonds. In model 3, controlling for firm size serves to strengthen this negative relationship even more than in model 2. Finally, even after adding in a State Domiciled-Year interaction fixed effects term into model 3 (column 4), we still see a significant negative relationship between mandated insurers from the past two reporting years, and their holdings of high climate risk corporate bonds.

To bolster our analysis, we perform the same analytical exercise on the two types of insurers. Table 4 and Table 5 illustrate our results for our analysis on a sub-sample of only life insurers and only P&C insurers respectively. For both types of insurers, we see that there is a significant negative relationship between insurers' high-climate-risk corporate bond holdings, and their mandated status within the last two reporting years. In Table 4,

we see that the effect of being mandated in the previous year on high climate risk holdings is negative and significant at the 1% level in all 4 columns. Moreover, we see that the effect of being mandated two years ago on holdings remains negative and large across different models, albeit with lower statistical significance. This lower significance can be attributed to the smaller sample size. We also see, similar to the results in Table 3, that there is no significant change in corporate bond holdings if the insurer was mandated to file in that year.

[TABLE 4 HERE]

In Table 5, we see that the effects of mandatory filing on P&C insurers' high climate risk bond holdings is more prominent for the second lag than for the first lag. We find for P&C insurers that the effect of being mandated in the previous reporting year on high climate risk bond holdings is negative and significant at the 10% level in all four columns. We also find that the effect of being mandated two reporting years ago is negative and significant at the 5% level for columns 1-3, and significant at the 10% level for the fourth column.

[TABLE 5 HERE]

As another robustness check, we use the staggered difference-in-difference (DID) model presented by Sun and Abraham (2021). In recent literature, there has been push-back on DID studies with dynamic heterogeneous treatment effects that use standard two-way fixed effects models (Callaway and Sant'Anna 2021; Sun and Abraham 2021). To show that our results are robust, we use the alternative estimator from Sun and Abraham (2021) to control for the potential biases that the two-way fixed effect model may induce in a dynamic staggered DID setting. Accordingly, we define the treatment group to be any insurer who gets mandated to file survey responses, and we define the initial treatment to be the first reporting year in which an insurer becomes mandated to file. Our control group is the "soon-to-be-treated"

insurance companies, or in this case any insurer who receives its first treatment in 2019 (the last year of our sample).[10] As a result, our regression sample ends in 2018, since insurers first treated in 2019 must be used for the control group.[11] Moreover, we begin our regression sample in 2006, which is the year our regression sample in Table 3 starts because we use the second lag of the variable *Mandatory*. Using this setting, we estimate the dynamic effect of the mandated disclosure treatment.

[FIGURE 2 HERE]

Figure 2 shows the results of this exercise. We find that leading up to the treatment, there is no significant difference in high climate risk bond holdings compared to the control group. The period immediately following the treatment, we begin to see a small difference in high climate risk bond holdings between the treatment group and the control group. The difference continues to grow in magnitude and becomes more significant. Overall, Figure 2 confirms our previous results and shows that the cumulative magnitude of the effect of mandated disclosure reaches about 5% in seven years. We conclude that climate regulatory actions as simple as mandated disclosure can affect the investment behavior of institutional investors and thereby impact credit allocation.

5 Conclusion

Our paper shows that climate-change-related regulatory actions, even when they are as simple as mandated disclosure, impacts credit allocation decisions of institutional investors. We find that insurers who were subjected to mandatory climate risk disclosure within the past two reporting years significantly decreased their holdings of high climate risk corporate bonds.

[10] Using the "soon-to-be-treated" insurers as the control group allows us to relax the parallel trend assumption that is necessary for difference-in-difference models. This method is also used in both the Sun and Abraham (2021) and Callaway and Sant'Anna (2021).

[11] This is also why we designate insurers first treated in 2019, rather than in a prior year, as "soon-to-be-treated": choosing a prior year would reduce our sample size further.

Our findings have important implications in financial markets. There have been multiple studies which provide evidence of a decreased price for corporate bonds with higher climate risk (Allman 2021, Duan et al. 2021). Our study indicates that insurers are likely to divest from high climate risk corporate bonds in the face of climate-change-related regulations. This change in investment behavior may further lower the price of high climate risk corporate bonds in the future, as well as restricting access of high-climate-risk borrowers to funding.

Our findings also have important implications for policymakers. The FIO, in their request for more information, was looking for information on how insurers manage climate risk, and to better improve climate related regulation for insurance companies. Our results would then suggest that the FIO may find it useful to encourage policies that make climate risk disclosure mandatory for all insurers, as well as increasing the level of detail provided by insurance companies in their survey responses. This would in turn help the policymakers with managing the climate risk of insurers, while also obtaining more information on how the insurance industry incorporates climate change into their investment decisions. We hope that our results encourage future research in this and related topics.

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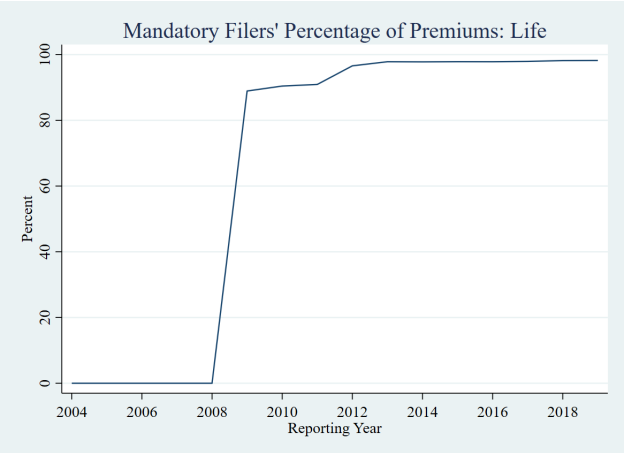
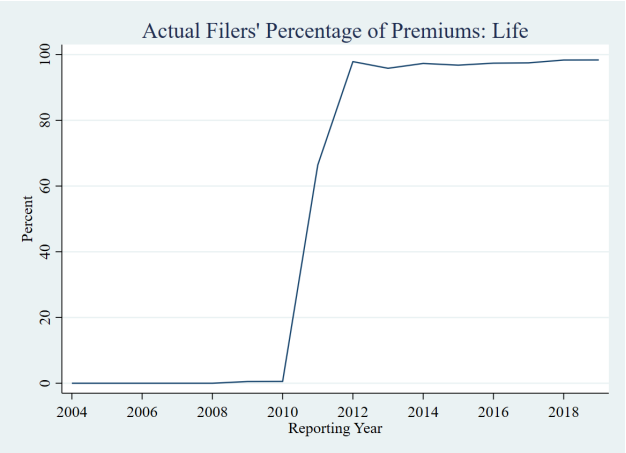
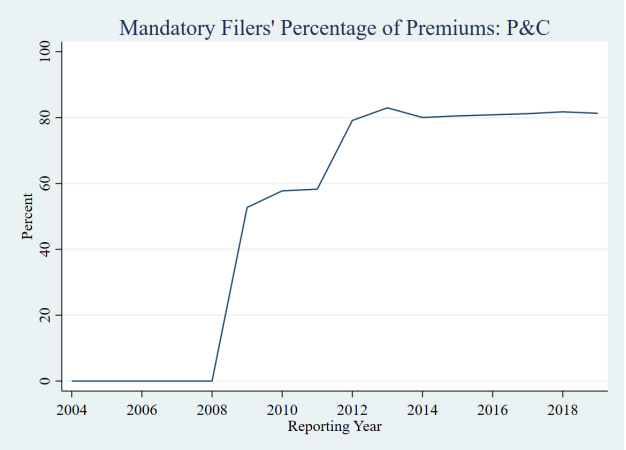
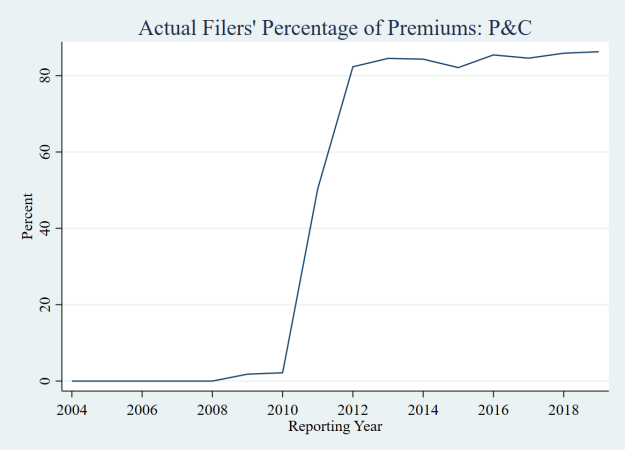
Figure 1: Percentage of Direct Premiums Written: Mandated vs Filed





(a) Life Insurers





(b) Property & Casualty Insurers

Figure 2: Dynamic Panel: Difference-In-Difference

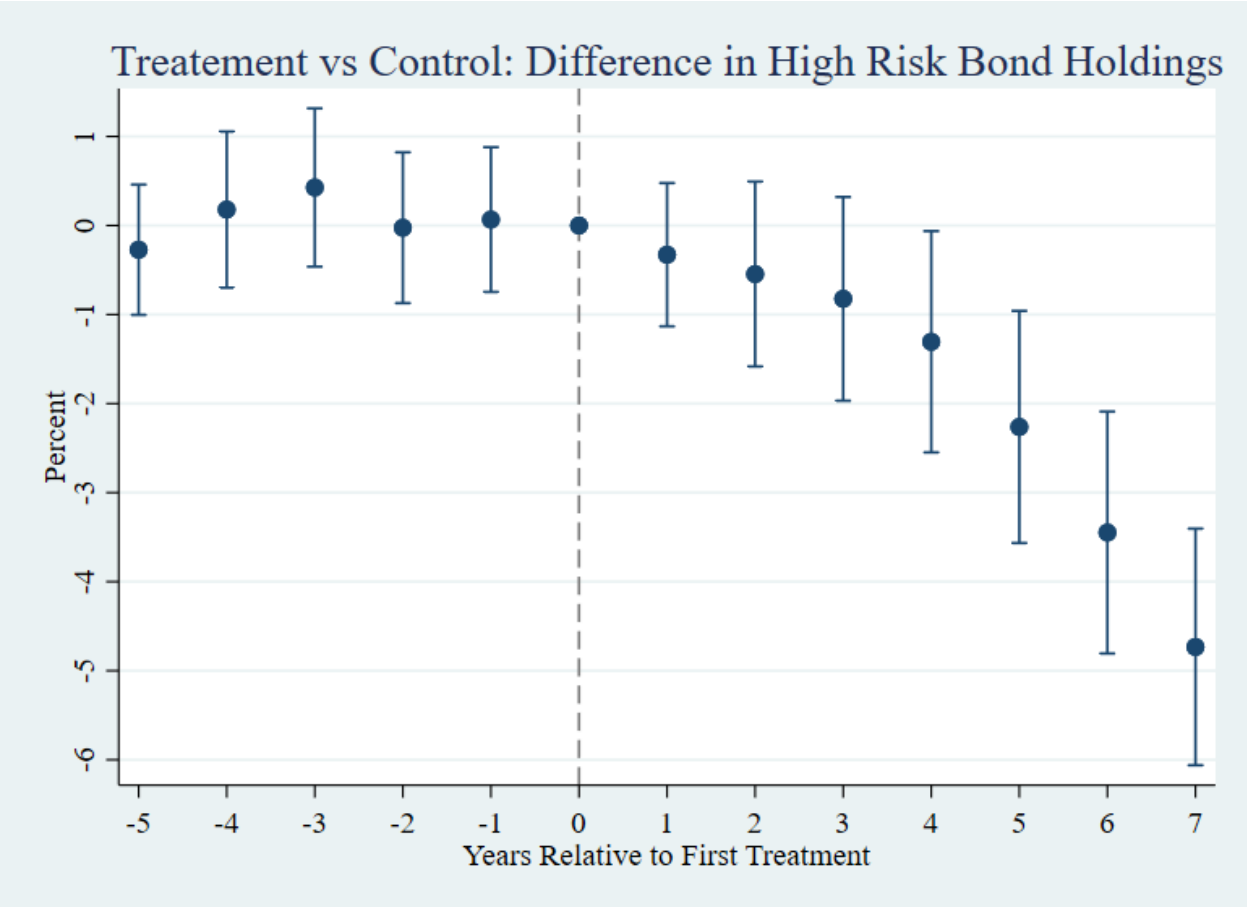


Table 1: NAIC Climate Risk Survey: Mandate Requirements

Reporting Year	***States Participating***	***National Premium Requirement***
2009	CA	500 Million
2010	CA	300 Million
2011	CA, NY, WA	300 Million
2012	CA, CT, IL, MD, MN, NM, NY, WA	100 Million
2013	CA, CT, IL, MD, MN, NM, NY, WA	100 Million
2014	CA, CT, MN, NM NY, WA	100 Million
2015	CA, CT, MN, NM NY, WA	100 Million
2016	CA, CT, MN, NM NY, WA	100 Million
2017	CA, CT, MN, NM NY, WA	100 Million
2018	CA, CT, MN, NM NY, WA	100 Million
2018	CA, CT, MN, NM NY, WA	100 Million

.

Table 2: Summary Statistic of Filers

Reporting Year	***Firms***	***Filers***	***Mandatory (Filed)***	***Voluntary***	***Mandatory (Not Filed)***
2009	3053	12	7	5	239
2010	3024	22	10	12	330
2011	2994	303	282	21	74
2012	2953	942	740	202	28
2013	2915	1005	799	206	33
2014	2886	1023	788	235	17
2015	2845	977	777	200	37
2016	2833	999	818	181	12
2017	2815	985	803	182	42
2018	2769	1057	852	205	1
2019	2755	1095	869	226	6

Table 3: Effect of Mandatory Disclosure on High Climate Risk Bonds for All Insurers

VARIABLES	(1) PercentageHighRisk	(2) PercentageHighRisk	(3) PercentageHighRisk	(4) PercentageHighRisk
Mandatory	0.495	0.564	-0.202	-0.0712
	(0.385)	(0.393)	(0.405)	(0.441)
MandatoryLag	-0.691***	-0.769***	-0.950***	-0.865**
	(0.215)	(0.233)	(0.282)	(0.337)
MandatorySecondLag	-1.245**	-1.343**	-1.436**	-1.097**
	(0.456)	(0.465)	(0.491)	(0.457)
Voluntary		0.280	0.118	0.156
		(0.691)	(0.667)	(0.636)
VoluntaryLag		-0.652	-0.675	-0.621
		(0.420)	(0.445)	(0.487)
VoluntarySecondLag		-0.760	-0.634	-0.313
		(0.494)	(0.476)	(0.468)
FirmSize			3.857***	3.595***
			(0.369)	(0.356)
Observations	22,932	22,932	22,932	22,901
R-squared	0.700	0.700	0.712	0.730
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	No
State Domiciled-Year Interaction FE	No	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Each observation corresponds to an Insurance Company-Year pair. PercentageHighRisk represents the par-value weighted portion of high climate risk bonds in an insurer's total corporate bond portfolio. FirmSize is equal to the natural log a firm's net total asset. Columns 1-3 of the table utilize Models 1-3, respectively, to perform our analysis. Column 4 utilizes model 3, but substitutes Year Fixed Effects with a State Domiciled-Year interaction fixed effects term. All standard errors are multi-way clustered on Insurance Company and Year.

Table 4: Effect of Mandatory Disclosure on High Climate Risk Bonds for Life Insurers

VARIABLES	(1) PercentageHighRisk	(2) PercentageHighRisk	(3) PercentageHighRisk	(4) PercentageHighRisk
Mandatory	-0.274	-0.101	-0.767	-0.875
	(0.533)	(0.566)	(0.620)	(0.639)
MandatoryLag	-1.030***	-1.019***	-1.188***	-1.080***
	(0.232)	(0.270)	(0.294)	(0.292)
MandatorySecondLag	-1.164**	-1.173**	-1.371**	-0.746
	(0.462)	(0.511)	(0.537)	(0.542)
Voluntary		1.812*	1.607	1.333*
		(0.967)	(0.974)	(0.732)
VoluntaryLag		0.0397	0.0308	0.0449
		(0.835)	(0.826)	(0.753)
VoluntarySecondLag		0.206	0.239	1.030
		(1.179)	(1.144)	(1.119)
FirmSize			3.286***	3.202***
			(0.646)	(0.626)
Observations	6,818	6,818	6,818	6,750
R-squared	0.745	0.745	0.755	0.785
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	No
State Domiciled-Year Interaction FE	No	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Each observation corresponds to an Insurance Company-Year pair. PercentageHighRisk represents the par-value weighted portion of high climate risk bonds in an insurer's total corporate bond portfolio. FirmSize is equal to the natural log a firm's net total asset. Columns 1-3 of the table utilize Models 1-3, respectively, to perform our analysis. Column 4 utilizes model 3, but substitutes Year Fixed Effects with a State Domiciled-Year interaction fixed effects term. All standard errors are multi-way clustered on Insurance Company and Year.

Table 5: Effect of Mandatory Disclosure on High Climate Risk Bonds for P&C Insurers

VARIABLES	(1) PercentageHighRisk	(2) PercentageHighRisk	(3) PercentageHighRisk	(4) PercentageHighRisk
Mandatory	0.776*	0.814*	0.0430	0.119
	(0.374)	(0.396)	(0.408)	(0.463)
MandatoryLag	-0.619*	-0.724*	-0.883*	-0.873*
	(0.350)	(0.403)	(0.429)	(0.490)
MandatorySecondLag	-1.439**	-1.560**	-1.524**	-1.184*
	(0.625)	(0.630)	(0.616)	(0.613)
Voluntary		-0.0379	-0.196	-0.168
		(0.747)	(0.734)	(0.739)
VoluntaryLag		-0.764	-0.800	-0.803
		(0.589)	(0.605)	(0.632)
VoluntarySecondLag		-0.934*	-0.795	-0.529
		(0.492)	(0.491)	(0.497)
FirmSize			4.056***	3.838***
			(0.440)	(0.416)
Observations	16,114	16,114	16,114	16,076
R-squared	0.605	0.605	0.621	0.652
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	No
State Domiciled-Year Interaction FE	No	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Each observation corresponds to an Insurance Company-Year pair. PercentageHighRisk represents the par-value weighted portion of high climate risk bonds in an insurer's total corporate bond portfolio. FirmSize is equal to the natural log a firm's net total asset. Columns 1-3 of the table utilize Models 1-3, respectively, to perform our analysis. Column 4 utilizes model 3, but substitutes Year Fixed Effects with a State Domiciled-Year interaction fixed effects term. All standard errors are multi-way clustered on Insurance Company and Year.

Appendix

Table A1: List of NAIC Survey Questions

Question Number	***Survey Question***
Question 1	Does the company have a plan to assess, reduce or mitigate its emissions in its operations or organizations?
Question 2	Does the company have a climate change policy with respect to risk management and investment management? If yes, please summarize. If no, how do you account for climate change in your risk management?
Question 3	Describe your company's process for identifying climate change-related risks and assessing the degree that they could affect your business, including financial implications.
Question 4	Summarize the current or anticipated risks that climate change poses to your company. Explain the ways that these risks could affect your business. Include identification of the geographical areas affected by these risks.
Question 5A	Has the company considered the impact of climate change on its investment portfolio?
Question 5B	Has it altered its investment strategy in response to these considerations? If so, please summarize steps you have taken.
Question 6	Summarize steps the company has taken to encourage policyholders to reduce the losses caused by climate change-influenced events
Question 7	Discuss steps, if any, the company has taken to engage key constituencies on the topic of climate change
Question 8	Describe actions the company is taking to manage the risk of climate change poses to your business including, in general terms, the use of computer modeling

Table A2: NAICS Codes for CFTC Sectors

CFTC Sector	***NAICS Code Used***
Automotive	3361, 33611, 336111, 336112, 33612, 336120, 3362, 33621, 336211, 336212, 336213, 336214, 3363, 33631, 336310, 33632, 336320, 33633, 336330, 33634, 336340, 33635, 336350, 33636, 336360, 33637, 336370, 33639, 336390, 4231, 42311, 423110, 42312, 423120, 42313, 423130, 42314, 423140, 4413, 44131, 441310, 44132, 441320, 484, 4841, 48411, 484110, 48412, 484121, 484122, 4842, 48422, 484220, 48423, 484230, 485113, 4411, 44111, 441110, 44112, 441120, 4413, 44131, 441310
Aviation	3364, 336411, 336412, 336413, 481, 4811, 48111, 481111, 481112, 4812, 48121, 481211, 481212, 481219
Cement	3273, 32731, 327310, 32732, 327320, 32733, 327331, 327332, 32739, 327390
Coal	2121, 21211, 212111, 212112, 212113, 324, 42352, 423520, 32419, 324199
Oil & Gas	211, 2111, 21112, 211120, 21113, 211130, 231111, 32512, 325120, 33313, 333132, 23712, 237120, 324191, 32512, 325120, 3241, 32411, 324110, 324191
Power	2211, 221112, 221118, 23713, 237130, 44421, 444210, 22112, 221121, 221122 , 23713, 237130
Steel	3311, 33111, 331110, 3312, 33121, 331210, 33122, 331221, 331222, 331512, 331513, 332111, 23812, 238120

Shipping	484, 4841, 48411, 484110, 48412, 484121, 484122, 4842, 48421, 484210, 48422, 484220, 48423, 484230, 481112, 481212, 483111, 483113, 486, 4861, 48611, 486110, 4862, 48621, 486210, 48691, 486910, 48699, 486990, 491, 4911, 49111, 491110, 4922, 49221, 492210 , 4869 , 4921 , 49211 , 492110
Agriculture	111, 1111, 11111, 111110, 11112, 111120, 11113, 111130, 11114, 111140, 11115, 111150, 11116, 111160, 11119, 111191, 111199, 1112, 11121, 111211, 111219, 1113, 11131, 111310, 11132, 111320, 11133, 111331, 111332, 111333, 111334, 111335, 111336, 111339, 1114, 11141, 111411, 111419, 11142, 111421, 111422, 1119, 11191, 111910, 11192, 111920, 33311, 333111, 333112, 42382, 423820, 1151, 11511, 115111, 115112, 115113, 115114, 115115, 115116, 11193, 111930, 11194, 111940, 11199, 111991, 111992, 111998
Communications	3342, 33421, 334210, 33422, 334220, 33429, 334290
Chemicals	325, 3251, 32511, 325110, 32512, 325120, 32513, 325130, 32518, 325180, 32519, 325193, 325194, 325199, 3253, 32531, 325311, 325312, 325314, 32532, 325320, 3254, 32541, 325411, 325412, 325413, 325414, 3255, 32551, 325510, 32552, 325520, 3256, 32561, 325611, 325612, 325613, 32562, 325620, 3259, 32591, 325910, 32592, 325920, 32599, 325991, 325992, 325998 , 3252, 32521, 325211, 325212, 32522, 325220
Plastics	3261, 32611, 326111, 326112, 326113, 32612, 326121, 326122, 32613, 326130, 32614, 326140, 32615, 326150, 32616, 326160, 32619, 326191, 326199, 4246, 42461, 424610, 42469, 424690

Tourism/Real Estate	7211, 7211, 72111, 721110, 72112, 721120, 72119, 721191, 721199, 5615, 56151, 561510, 56152, 561520, 56159, 561591, 561599, 531, 5311, 53111, 531110, 53112, 531120, 53113, 531130, 53119, 531190
Metals/Mining	33313, 333131, 2122, 21221, 212210, 21222, 212221, 212222, 21223, 212230, 21229, 212291, 212299, 2123, 21231, 212311, 212312, 212313, 212319, 21232, 212321, 212322, 212324, 212325, 21239, 212391, 212392, 212393, 212399, 213, 2131, 21311, 213111, 213112, 213113, 213114, 213115, 331, 3311, 33111, 331110, 3312, 33121, 331210, 33122, 331221, 331222, 3313, 33131, 331313, 331314, 331315, 331318, 3314, 33141, 331410, 33142, 331420, 33149, 331491, 331492, 4235, 42351, 423510, 42352, 423520, 42381, 423810, 2121, 21211, 212111, 212112, 212113
Water	22131, 221310 , 23711, 237110
Service/Infrastructure: Oil and Gas	2212, 22121, 221210, 33313, 333132, 23712, 237120, 32419, 324191, 324199, 4247, 42471, 424710, 42472, 424720 , 447, 4471, 44711, 447110, 44719, 447190, 333132

Service/Infrastructure: Transportation	3361, 33611, 336111, 336112, 33612, 336120, 3362, 33621, 336211, 336212, 336213, 336214, 3363, 33631, 336310, 33632, 336320, 33633, 336330, 33634, 336340, 33635, 336350, 33636, 336360, 33637, 336370, 33639, 336390, 3365, 33651, 336510, 3366, 33661, 336611, 336612, 3369, 33699, 336991, 336992, 336999, 482, 4821, 48211, 482111, 482112, 483, 4831, 48311, 483111, 483112, 483113, 483114, 4832, 48321, 483211, 483212, 4851, 48511, 485112, 485113, 485119, 4852, 48521, 485210, 4859, 48599, 485991, 485999, 488, 4881, 48811, 488111, 488119, 48819, 488190, 4882, 48821, 488210, 4883, 48831, 488310, 48832, 488320, 48833, 488330, 48839, 488390, 4884, 48841, 488410, 48849, 488490, 4885, 48851, 488510, 4889, 48899, 488991, 488999, 481, 4811, 48111, 481111, 481112, 4812, 48121, 481211, 481212, 481219, 336411, 336412, 336413, 484, 4841, 48411, 484110, 48412, 484121, 484122, 4842,48421, 484210 48422, 484220, 48423, 484230