# Insurers' Coal Underwriting Policies*

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**Abstract**

Insurance companies can facilitate the net-zero transition by restricting insurance coverage for fossil fuel projects. We study the adoption, structure, and effects of carbon underwriting policies by the world's largest insurance groups. While such policies have become more prevalent and restrictive over time, their design and enforcement remain highly heterogeneous. Leveraging new data on U.S. coal mine insurance, we document that coal policies reduce the number of insured coal mines by 17%, insured coal volumes by 58%, and increase insurer-mine relationship terminations by 20pp. Nonetheless, some insurers with coal policies expand their coal underwriting.

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"*As insurers and as investors, the insurance sector has a key role to play. [...] We need net zero commitments to cover your underwriting portfolios, and this should include the underwriting of coal – and all fossil fuels.*"
António Guterres, United Nations Secretary-General at the Insurance Development Forum 2021.

# 1 Introduction

For the fight against climate change to succeed, a significant reduction in carbon emissions is required. In response, some insurers have begun to restrict or exit insurance coverage for coal, oil, and gas projects through formalized "carbon underwriting policies." Although expectations for the effectiveness of these policies are high, as underscored by the remarks of UN Secretary-General António Guterres, it remains ambiguous whether the insurance sector meaningfully influences decarbonization via underwriting decisions. On the one hand, the insurance sector has strong incentives to fight climate change, as it bears significant costs of climate-related disasters and because operating licenses for fossil fuel projects are often tied to insurance coverage. On the other hand, the effectiveness of any actions by individual insurers to restrict the underwriting of fossil fuel projects may be undermined by coordination and horizon challenges, as the costs of climate change build up in the future, while insurers may profit from underwriting fossil fuel projects in the short run. This paper provides the first systematic analysis of insurers' carbon underwriting policies and their effects on fossil fuel producers, seeking to determine whether insurance companies facilitate the net-zero transition via their carbon underwriting policies.

An empirical analysis of carbon underwriting policies and their implications faces three major challenges. First, carbon underwriting policies are a recent phenomenon in the insurance sector and lack a standardized format, making a systematic assessment difficult. Second, insurance contracts for fossil fuel projects are not publicly disclosed, making it difficult to assess whether carbon underwriting restrictions are implemented in line with public commitments and how they affect these projects. Third, comprehensive data on insured fossil fuel

projects are necessary to evaluate the real effects of carbon underwriting policies, but such data are difficult to obtain and assess.

This study exploits a setting that allows us to make significant progress on each of these three challenges. Specifically, we link data on insurers' carbon underwriting policies to rich data on insured fossil fuel projects via insurance certificates. First, we utilize scorecards from Insure Our Future (IOF), a coalition of NGOs, which assess and standardize the carbon underwriting policies of the world's major Property & Casualty (P&C) insurers. These data enable us to analyze the structure, stringency, and determinants of these policies.[1] Second, we file state-level Freedom of Information Act (FOIA) requests to obtain insurance certificates for all coal mines in the U.S. since 2014, as possessed by state-level regulators. This dataset allows us to assess whether insurers' underwriting practices align with public commitments and how they affect fossil fuel projects, focusing on coal mining as a critical upstream activity for coal combustion, which is the largest single source of human-induced climate change (IEA, 2021; ClientEarth, 2022). Third, we utilize quarterly mine-level data from the Mine Safety and Health Administration (MSHA). These data allow us to study the real effects of coal underwriting policies.

We present two main findings. First, we show that carbon underwriting policies have become more common and stringent since 2017 but remain highly heterogeneous across insurers in terms of scope, ambition, and adoption, particularly between European and non-European firms. To document this, we trace the evolution of policies for coal as well as oil & gas assets, examining their prevalence, structure, and stringency. Early adopters in 2017 primarily targeted coal assets, while policies addressing oil & gas began to emerge from 2020 onward. However, many policies remain vague, often excluding only specific projects rather than entire fossil fuel clients. Though coal policies are increasingly widespread, only a minority of

[1] Green and Vallee (2025) use similar data on the exit policies of banks for fossil fuel lending collected by Reclaim Finance, an NGO that is part of IOF.

insurers commit to a full coal phase-out with a clear transition strategy, and even fewer actively engage clients to support decarbonization. Adoption is significantly more common among European insurers and less so among specialty and unlisted firms that face limited public scrutiny. We also document that carbon underwriting policies do not simply reflect insurers' ESG-related divestment or screening policies on the investment side, as studied in prior literature (e.g. Berk and van Binsbergen, 2025).

Second, we show that insurers reduce their underwriting activity of coal assets following the adoption of coal underwriting policies. On average, insurers reduce the number of insured coal mines by 17.2% (about 3.4 mines) following the adoption of a coal policy (relative to non-adopting insurers). In terms of the associated coal quantity, we estimate a reduction in the volume of insured coal by 58.2% (about 3.45 million short tons, MMst) after a coal policy is introduced (again relative to non-adopters).[2]

To address the concern that some of these results reflect time-varying sorting effects between insurers and mines, rather than the causal effects of coal policies, we conduct tests that identify effects from changes in insurer–mine relationships. These tests allow us to hold constant the mine-insurer matching as well as mine characteristics. Specifically, we test whether the likelihood of an active insurance relationship between a mine and an insurer changes around the adoption of a coal policy. If coal policies affect insurers' coverage decisions, we would expect a higher probability of an inactive relationship between a mine and a policy-adopting insurer, relative to that same mine's relationships with non-policy-adopting insurers. We find that the relationship between a mine and insurance group is 12.8pp more likely to become inactive in the six quarters following adoption of coal underwriting policies. While this effect is non-zero, it is also not overly large, indicating that coal policies are often

[2]For comparison, about 513 MMst of coal were consumed in the U.S. in 2022. Almost 92% of that consumption was used for electricity production. We obtain similar effects if we restrict the sample to mines that remain operationally active throughout the entire sample period, to ensure results are not driven by mine closures or production slowdowns due to market conditions.

not strictly enforced.

Overall, our findings provide the first systematic evidence on insurers' carbon underwriting policies and their impact on insured fossil fuel assets. Our results suggest that while carbon underwriting policies have become more prevalent, their implementation remains heterogeneous, with insurers differing in their commitment and enforcement levels. This finding suggests that there is little coordination among insurers.

Our paper contributes to two streams of the literature. First, we contribute to a burgeoning literature on how financial institutions manage climate-related risks. While much of this research has focused on banks (e.g., Kacperczyk and Peydró, 2022; Haushalter et al., 2023; Sastry et al., 2023; Green and Vallee, 2025; Morse and Sastry, 2024), there is a growing call to examine the role of insurance companies (see, for example, Acharya et al., 2023). However, research on how insurers manage climate risk remains limited, with existing studies primarily quantifying insurers' exposure to and pricing of climate risks (e.g., Ge, 2022; Jung et al., 2024; Boomhower et al., 2024; Sastry et al., 2024; Oh et al., 2025; Ge et al., 2025a,b). This paper is the first to investigate insurers' adoption of carbon underwriting policies and their consequences for insured fossil fuel projects, shedding light on the effectiveness of a potentially powerful yet understudied tool of financial institutions to manage climate-related risks and contribute to the net-zero transition.

Our study also contributes to the literature on how insurance companies shape firm behavior. While theoretical work highlights insurers' potential role as private regulators (e.g., Ben-Sahar and Logue, 2012), empirical evidence remains limited. Existing studies focus largely on insurers' responses to immediate environmental risks (e.g., Yin et al., 2011) or their role in mitigating judgment-proof problems, where firms in hazardous industries take on excessive environmental risks while limiting liability through bankruptcy protection (e.g., Shavell, 1982, 2000, 2005; Boomhower, 2019). We extend this literature by showing that

insurers can address systemic and long-term risks posed by firms, such as those arising from climate change, through strategic underwriting decisions.

# 2 Data and sample

## 2.1 Data on insurers' carbon underwriting policies

We use data on the underwriting policies of fossil fuel projects ("carbon underwriting") by the world's leading insurance and reinsurance groups[3] in the P&C business.[4] The data are made available to us for the years from 2017 to 2023 by IOF, a global coalition of NGOs. Green and Vallee (2025) use similar data on banks' exit policies for fossil fuel lending. These data are collected by Reclaim Finance, an NGO that is part of IOF and performed some of the data collection. IOF publishes annual reports that include a scorecard that evaluates insurers' carbon underwriting policies in a quantitative and standardized way. One of the goals of publishing the scorecards is to put pressure on insurers to restrict the underwriting business of fossil fuel projects, which is why IOF focuses on underwriting policies for coal and oil % gas projects. The data are assembled from insurers' responses to an IOF survey and a manual review of publicly available information. During our sample period, IOF evaluates the underwriting policies of 37 global insurance groups. According to IOF, these insurers represent the leading fossil fuel underwriters in the global P&C business.[5] The number of insurance groups evaluated varies across sample years, ranging from 24 to 30. For our analysis, we treat insurance groups not listed in IOF's annual report in a year as having

[3]We use "insurance groups" and "insurers" interchangeably. In some of the tests below, we ensure that the data are consolidated at the group level, which is where underwriting policies are formulated.

[4]IOF also collects data on the exit policies for coal and oil & gas projects in the investment portfolios of insurers. We do not focus on those policies, but analyze how they correlate with underwriting policies.

[5]A 2023 market study by S&P Global, listing the top 50 global P&C insurers by insurance premia, includes 25 insurers that are in our sample (S&P Global, 2023). Insurance groups missing from the sample but included in the S&P list typically focus on businesses unrelated to the underwriting of fossil fuel projects. Conversely, insurers in our sample but absent from the S&P study are typically specialty line insurers, such as Axis Capital, which focus on specific corporate insurance lines. According to IOF, the set of insurance groups covered by the scorecard is compiled based on a market analysis of the key players in the fossil fuel underwriting business.

no underwriting policies. We validate this assumption through extensive online searches.[6]

We construct two sets of variables for each insurance group and year based on IOF's scorecards. The first set indicates whether an insurance group has a carbon underwriting policy in place in a given year. Since 2017, the IOF scorecards provide information on coal underwriting policies, and beginning in 2020, IOF also scores oil & gas policies. Based on this information, we construct two separate dummy variables: one indicating the presence of a coal underwriting policy and one indicating the presence of an oil & gas underwriting policy.

The second set of variables reflects the stringency of underwriting policies. Stringency scores range from 0 to 10, with higher values denoting more restrictive policies. The scores assess insurers' policies along multiple economically relevant design features grouped into five dimensions (see Table IA.1 for details). These design features include, among others, whether insurance groups exclude all or only certain fossil fuel projects, the degree of exclusion for high-emission projects, or whether emissions reduction targets are specified for new or ongoing projects. Coal-related stringency scores are available from 2018 onward, while oil & gas scores are available from 2020.[7]

We supplement the IOF data with hand-collected information on the announcement dates of insurers' underwriting policies. These dates are sourced from insurers' websites and news articles referencing the announcements.[8] As coal policies are adopted earlier than oil & gas policies, the first policy announcement pertains to coal. In addition, we enrich the IOF data

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[7]IOF defines that an insurer has a carbon underwriting policy in place if the respective policy score exceeds the value of zero. An exception is Lloyd's in 2022, which had a coal policy in place but received a score of zero due to IOF's assessment of its weakness.

[8]We are able to identify precise announcement dates for 23 out of 25 insurers that have policies in place according to the IOF scorecards. For Aviva, no specific announcement date could be determined. For Ping An, we found no official public policy announcement or media reporting on such an announcement. The missing data on the announcement dates of these two insurers does not affect the results that focus on coal mining, as neither of them underwrites the risk of coal mines in our sample.

by collecting insurer-level characteristics, including financial information from ORBIS and hand-collected insurer characteristics (e.g., country of origin). The insurer characteristics are reported in Table IA.2.

## 2.2 Data on U.S. coal mines

A key part of our paper studies the effects of coal underwriting policies on coal mining. This analysis focuses on coal mining in U.S. because this setting allows us to access granular operational data at the mine level for the complete set of coal mines in the country. Specifically, under federal regulation, the Mine Safety and Health Administration (MSHA) collects data on coal production, employment, operating status, and various other operational metrics at the mine-quarter level.[9] Such data are not available publicly and at scale for other major coal mining countries. Using these data, we construct a quarterly panel dataset of U.S. coal mines that report at least one quarter of non-zero coal production between 2014Q1 and 2024Q2. By starting in 2014, we can include data prior to the introduction of coal underwriting policies to compare mine behavior before and after policy adoptions.

## 2.3 Data on liability insurance of U.S. coal mines

We obtain information on mines' insurance coverage by leveraging a legal requirement under Title 30 of the Code of Federal Regulations, which mandates that coal mine operators certify their insurance statuses with the state agency responsible for mine licensing. Based on this requirement, we filed Freedom of Information Act (FOIA) requests with the relevant regulatory agencies in each state.[10] Specifically, we requested the release of certificates of liability

[9]We obtain the data directly from MSHA's Mine Data Retrieval System. For further information on these data, see Gilje and Wittry (2022), Qiu et al. (2024), and Wittry and Chen (2025).

[10]A FOIA request is a formal petition to a government agency for access to public records, grounded in transparency and open government laws. FOIA provisions vary across U.S. states in terms of scope and eligibility. For our sample of states, Alabama, Arkansas, Kansas, Kentucky, Oklahoma, Pennsylvania, and Tennessee do not accept FOIA requests from non-U.S. citizens/residents or out-of-state requesters. We are grateful to the two requesters and FOIA advocacy groups who assisted us in obtaining records from these states. We verified that the obtained data can be used by non-U.S. citizens/residents.

insurance for all mines in the MSHA database since 2014.

Not all state agencies responded to the FOIA requests with usable data. As a result, we have to exclude twelve states from the sample. However, these states play a negligible role in U.S. coal mining. Using MSHA data, we calculate that the sampled insurance certificates refer to mines that produce 78% of U.S. coal during the sample period from 2014Q1 to 2024Q2.[11] The remaining states provided us with Certificates of Liability Insurance in the form of ACORD 25 filings. We collect data from the relevant state agencies to identify whether a certificate pertains to a specific mine or to an operator covering multiple mines.

Figure IA.1 presents an example of an insurance certificate for the Black Butte Coal Mine in Wyoming. Each insurance certificate comprises three main sections. The top section lists the insurance broker ("producer"), the insured entity ("insured"), and up to six insurers ("insurer(s) affording coverage").[12] The middle section details policy-level information, including the start and end dates of coverage. The filings categorize each insurance policy into one of five types: commercial and general liability, automobile liability, umbrella/excess liability, workers' compensation and employer's liability, and other liability types. The bottom section identifies the regulatory agency responsible for oversight and compliance.

Linking mine-level insurance policies issued by various insurance groups to insurance group-level coal underwriting policies requires mapping the insurers listed on a certificate to their corresponding groups. This represents a challenge because insurance groups typically

[11] Maryland and New Mexico responded to our FOIA requests but only provided the most recent certificates and no historical records, despite follow-up efforts. We also exclude Alaska, Arizona, Louisiana, Missouri, Mississippi, and Oklahoma, states that each have five or fewer mines, as we did not receive a response to the FOIA requests. Finally, we exclude Ohio, Kentucky, and Texas because their agencies do not use standardized certificate forms, making their data difficult to compare with that of other states. Indiana did not provide any information.

[12] Mining companies may opt for self-insurance, also known as captive insurance. We identify such cases either when the top section of the certificate explicitly mentions a captive insurance company or when it explicitly states that the mine is self-insured. Fewer than 20 certificates in our sample indicate self-insurance. This low number may reflect the substantial costs and regulatory requirements associated with establishing and maintaining captive insurers.

consist of various separate legal entities that issue policies. We perform the mapping using the 5-digit NAIC company codes provided in the insurance certificates. For each code, we refer to the NAIC's semiannual publication *Listing of Companies* and assign group affiliations as of June 2017, prior to the announcement of any carbon underwriting policies.[13] Policies that cannot be matched to an insurance group are excluded from the analysis, although such cases are rare (less than 2% of all policies).

While the insurance certificates describe the period of coverage with start and end dates, the MSHA data are at the mine-quarter level. To merge the two datasets, we assume that a mine is covered by an insurance policy in a particular quarter if the policy's coverage period includes the start date of that quarter.[14] For mines listed in MSHA that lack insurance certificates or show incomplete coverage following our initial FOIA request, we submitted follow-up FOIA requests asking specifically for the missing data. These follow-ups yielded additional filings, helping us improve the completeness of the dataset.

Overall, our dataset comprises 9,745 insurance policies of 458 coal mines, which are insured by 112 insurance companies that can be linked to 46 distinct insurance groups.

## 2.4 Descriptive statistics

Table 1, Panel A presents descriptive statistics on the insurers in the annual IOF scorecards. Definitions of all variables are provided in Table A.1. Across the sample period from 2017 to 2023, coal underwriting policies are in place in 66% of insurer-years. Oil & gas policies are less frequent, existing in 55% of insurer-years. Coal policies tend to be stricter than oil & gas policies (mean strictness scores of 2.44 versus 1.06). A total of 36% of all observations pertain to insurers from Europe, 33% from the U.S., 19% from Asia, and the remaining from

[13] We assess the possibility of ownership changes over time (e.g., through mergers and acquisitions) and find them to be rare in our sample. Specifically, we identify only one case in which a coal-mine-insuring subsidiary changes group affiliation after 2017, the year of the first coal underwriting policy announcement.

[14] This approach effectively lags mine-level outcomes by up to one quarter, as it requires the quarter's start date to fall within the coverage of a policy.

the rest of the world. About one-fifth of the observations are from unlisted insurance groups, a quarter are from reinsurance companies, and another quarter are from specialty insurers. Insurers are part of the Net-Zero Insurance Alliance (NZIA) in around 8% of all sample years. Insurers in the sample have total assets of around USD 293 billion and achieve a return on assets of approximately 1.67%.

Panel B reports descriptive statistics on the insurance policies of U.S. coal mines based on information provided on the respective insurance certificates. Across the sample of insurance policies, 37% cover commercial and general liability, 22% umbrella/excess liability, 17% automobile liability, 16% workers' compensation and employer's liability, and 8% other liability types. Roughly 90% of all policies have a duration of one year, with additional bunching around quarters and full years. Coverage of 45% of all policies is provided by insurance groups that have a coal policy in place at some point during our sample period.

Panel C presents descriptive statistics at the insurance-quarter level based on the data linking coal mines and insurance groups via the Certificates of Liability Insurance. For each insurance group, we count the number of unique coal mines it insures and calculate the coal volume in million short tons (MMst) produced by those mines. On average, an insurance group provides insurance to almost 20 coal mines producing close to 6 MMst of coal. In 28% of insurer-years, the group has a coal underwriting policy in place.

Finally, Panel D presents descriptive statistics at the insurance-mine-quarter level. We utilize the dataset linking coal mines and insurance groups via the liability certificates and construct a mine–insurer relationship panel. We consider all types of insurance policies listed on the certificates. To ensure a balanced panel structure, we fill in observations for quarters in which a relationship is not active, provided that the mine already exists. The average duration of a mine–insurer relationship is 14.2 quarters. A relationship is active in 57% of all mine–insurer–quarter observations. In 47% of all observations, the insurance group has a

coal underwriting policy in place.

# 3 Anatomy of carbon underwriting policies

## 3.1 Prevalence and components of carbon underwriting policies

In Table 2, we list the presence of coal underwriting policies from 2017 to 2023 for the insurers in IOF's scorecards. For each year and insurer, we report a dummy variable which equals one if a coal underwriting policy is in place according to IOF, and zero otherwise. Missing values reflect that an insurer was either not included in the scorecard in a year or its policies were not assessed by IOF. We observe that only four insurers—AXA, SCOR, Swiss Re, and Zurich—maintain a coal underwriting policy throughout the entire sample period. In contrast, Berkshire Hathaway, PICC, Sinosure, and WR Berkley never implemented such a policy (and are in the sample for at least three years). By 2023, 24 out of 30 insurers (80%) had implemented some form of coal policy. Overall, we observe a gradual trend toward the adoption of coal-related underwriting restrictions across the insurance sector.

In Table IA.3, we provide corresponding statistics for oil & gas policies. Compared to coal policies, restrictions on oil & gas assets are less prevalent, with coal policies generally preceding them. In fact, oil & gas policies only began to emerge from 2020 onward. One explanation is that coal underwriting typically accounts for a smaller share of total premiums written, making it less costly for insurers to restrict coal projects. In addition, as coal combustion generates more carbon emissions than oil or gas (MIT Climate Portal, 2022), the "social license to operate", which reflects the societal acceptance of fossil fuel-related activities, has eroded earlier for coal than for oil or gas.[15]

In Figure 1, we plot the number of insurers with coal policies and decompose these policies into key structural components. Over time, coal policies have become more specific. Early

[15]The erosion of the social license to operate is repeatedly considered a top-3 risk for mining companies according to a survey among mining executives (EY, 2023).

policies were relatively generic, but more recent ones increasingly feature explicit commitments such as exiting from new coal projects (e.g., the expansion of existing coal mines) or, less commonly, terminating coverage for clients in the coal sector altogether. Insurers now more frequently pledge to phase out certain coal clients (e.g., those generating a large share of their revenues from coal), while a smaller subset commits to adopting detailed phase-out plans over time. Engagement strategies aimed at the closure of certain coal projects remain rare.

In Figure IA.2, we plot corresponding dynamics for oil & gas policies. Compared to coal, oil & gas policies have evolved more slowly. Their structure remains less standardized, with the only consistently observed feature being the commitment to exit new oil & gas projects.

## 3.2 Stringency of carbon underwriting policies

As underwriting policies can vary substantially in stringency, it is important to document and quantify such variation. Some insurers may adopt policies primarily to signal environmental commitment without imposing material restrictions on their business activities. In Table 3, we report the stringency scores of coal policies for each insurer and year, ranking insurers based on their 2023 scores from high to low. Allianz, AXA, and Swiss Re lead the ranking, achieving scores close to the maximum value of 10 in 2023, whereas scores in earlier years are generally lower. Many insurers' scores fall below 10 due to fine-print exceptions that weaken the policies' strictness. For instance, Lloyd's coal policy scored a value of 0 in 2022 because it was not mandatory, and Chubb's 2021 policy scored a value of 1.47 due to multiple exceptions, such as exemptions for regions lacking near-term alternative energy sources.

In Table IA.4, we present corresponding statistics for oil & gas policies. These policies are less restrictive overall, with even the top-ranked insurer, Generali, scoring a value of only 4 by 2023. Overall, many insurers retain considerable discretion in how strictly they commit to restricting underwriting of fossil fuel projects.

In Figure 2, we plot the stringency scores of coal policies over time. For each year, we display average scores and scores by insurer. The figure shows a clear upward trajectory in policy stringency since 2020, but also reveals substantial variation across insurers. The mean coal policy scores declined between 2018 to 2019, largely due to the entry of insurers with weaker policies (Aviva, HDI, and Ping An). While policy heterogeneity persists, some insurers have emerged as clear leaders or laggards. Allianz, for instance, became a benchmark for coal policy stringency between 2021 and 2023, after having matched the industry average between 2018 and 2020 before strengthening its policy significantly. Insurers such as Generali followed Allianz's lead with a lag of about one year.

In Figure IA.3, we display the dynamics for oil & gas policies. In contrast with coal policies, the stringency of oil & gas policies increased only modestly, remaining at a low average level. Dispersion in stringency has widened over time, suggesting a lack of global convergence in the adoption of strict underwriting policies. The oil & gas policies of insurers with stringent coal policies, such as Allianz and Generali, evolved similarly over time, showing modest improvements in stringency. In contrast, insurers like Liberty Mutual and Lloyd's exhibit persistently low scores, with little evidence of policy tightening throughout the sample period.

## 3.3 Carbon underwriting and investment policies

In Table IA.5, we report correlations between insurers' underwriting and investment policies for coal and oil & gas. Panel A shows correlations based on the existence of such policies, while Panel B examines their stringency. Although correlations are positive, observed combinations often deviate from the diagonal, indicating that correlations are far from perfect and suggesting substantial within-insurer variation in how carbon policies are adopted on the asset (investment) and liability (underwriting) side of the balance sheet. Figure IA.4 offers a more granular perspective, plotting individual insurers' underwriting and investment policy stringency for 2023. For some insurers, observed combinations of policy stringency lie close to

the diagonal, indicating that they align closely across underwriting and investment activities, such as AXA for coal policies (Panel A) and Generali for oil & gas policies (Panel B). In other cases, however, underwriting policies are relatively stronger, exemplified by Allianz's coal policies (Panel A), or investment policies are stronger, as seen with SCOR's oil & gas policy (Panel B). These patterns highlight that underwriting policies do not merely reflect ESG-related divestment or screening strategies on the investment side, as studied in prior literature (e.g. Berk and van Binsbergen, 2025).

## 3.4 Determinants of carbon underwriting policies

The large variation in the presence and design of carbon underwriting policies raises the question of what drives insurers to adopt such policies. To provide some suggestive evidence, we analyze the role of some salient external and internal factors. External factors that may affect the decision to adopt a carbon policy could relate to peer effects in the insurance sector, industry-level initiatives related to decarbonization efforts, or pressure from important external stakeholders, such as retail insurance customers or institutional shareholders. Internal drivers may be the overall profitability of an insurer or pressure from employees with green preferences. To assess the relevance of these determinants, we estimate the following OLS regression at the insurer-year level:

$$Y_{i,t} = \beta \times X_{i,t-1} + \alpha_k + \alpha_t + \epsilon_{i,t}, \tag{1}$$

where $i$ indexes an insurer and $t$ a year. $Y$ is either a dummy that equals one if an insurer has a coal or oil & gas underwriting policy, and zero otherwise, or a score that reflects the stringency of the coal or oil & gas underwriting policy. When using the stringency score as the outcome variable, we restrict the sample to insurers with such underwriting policies, thus focusing on the intensive margin. $X$ is a vector of insurer-level characteristics, indicating whether: (i) *NZIA* identifies whether an insurer is a member of the Net-Zero Insurance Alliance, a sector-level insurer initiative whose members commit to reduce carbon emissions of their un-

derwriting portfolios to net-zero; (ii) *Speciality insurer* reflects whether an insurer is primarily a specialty insurer (i.e., focuses on specific corporate business) or serves a wider range of insurance products, including retail products; (iii) *Unlisted insurer* captures whether an insurer is listed; (iv) *Total assets (log)* reflects an insurers size; and (v) *ROA* measures profitability. $\alpha_k$ are indicators reflecting the origin of insurers across world regions (we include indicators for U.S., Asia, and RoW, i.e., estimate effects relative to European insurers). $\alpha_t$ are year indicators to capture sector-wide trends. Standard errors are clustered at the insurer level.

In Table 4, we report estimates of Eq. (1) for coal underwriting policies. In Columns 1–3, which focus on *Coal policy*, the sample period is from 2017 to 2023, and in Columns 4–6, which consider *Coal policy score*, it is from 2018 to 2023. Four main insights emerge from Columns 1–3. First, there has been a broad upward trend in the prevalence of underwriting policies over time. Second, relative to European insurers, insurers in other world regions have a lower propensity to introduce underwriting policies, with U.S. insurers having the lowest propensity, followed by companies from Asia and the rest of the world. These effects may in part reflect green preferences or norms in the home country or the local labor force, which have been shown to vary substantially and persistently across world regions (Dechezleprêtre et al., 2025). Third, potential reputation effects and/or stakeholder pressure seem to play a role in the adoption decision, as insurers with retail business and listed insurers have a higher propensity to restrict coal underwriting. Fourth, coal underwriting policies are negatively related to company-wide profitability, as measured by ROA.

Turning to the intensive margin, Columns 4–6, show that among insurers with coal policies, U.S. and Asian insurers have less stringent policies compared to their European counterparts. Publicly listed insurers exhibit stricter policies. Different from the extensive margin results, once a policy is in place, it appears that policy stringency is unrelated to a retail customer base or profitability. The lower scores observed in 2019 and 2020, relative to 2018,

reflect a temporary decline in policy stringency during the early sample years (see Figure 2).

In Table IA.6, we present corresponding results for oil & gas policies, which can only be studied from 2020 onward and over a smaller sample of insurers, due to their late and less prevalent adoption. However, the estimated coefficients are similar, both at the extensive (Columns 1–3) and at the intensive margin (Columns 4–6). Hence, the determinants for the existence and the stringency of coal as well as oil & gas policies seem to be very similar.

Taken together, the results suggest that carbon underwriting policies have become more common and stringent since 2017, but nevertheless remain highly heterogeneous across insurers in terms of scope, ambition, and adoption, particularly between European and non-European firms. Early adopters in 2017 focused on coal, while oil & gas policies began to emerge from 2020 onward.

# 4 Implementation of coal underwriting policies

The previous section shows that public commitments to restrict coal underwriting have become a prominent element of many insurers' climate strategies. Yet, in an industry where underwriting portfolios are opaque and underwriting policies heterogeneous in terms of scope, ambition, and timing, it is unclear whether these commitments lead to tangible changes in underwriting behavior.[16] To investigate this question, we test whether insurers with public coal policies subsequently underwrite less insurance for coal mines in the U.S.

## 4.1 The market for insuring U.S. coal mines

Coal mining provides an ideal setting to study whether public carbon underwriting commitments translate into real changes in insurer behavior. The mining of coal is a critical upstream activity for coal combustion, the largest single source of human-induced climate

[16] Such misalignment has been documented in other areas, for example, when it comes to banks' public environmental statements in their corporate disclosures and their actual lending activities (Giannetti et al., 2024).

change (IEA, 2021; ClientEarth, 2022), and because insurance plays a crucial role in enabling mining operations. We focus on coal mining in the United States because it offers a rare opportunity to access data that allows for a direct link between the providers of insurance coverage and mine-level outcomes.

Our dataset covers 456 coal mines insured between 2014Q1 and 2024Q2 by 46 distinct insurance groups. Of these, 15 insurers are covered by IOF scorecards, while 31 are not. Among the 15 insurance groups covered by IOF, 11 introduced a coal policy at some point during the sample period. We assume that insurance groups not covered by IOF do not have a carbon underwriting policy, an assumption we validate through extensive news searches. Hence, there are (4+31=) 35 insurers without a coal policy in this missing sample. Although this sample omits some insurers from the IOF scorecards who may insure coal mines outside of the United States or implement carbon underwriting policies differently in other markets, our analysis reliably captures the main insurance active in the U.S. coal mining industry during the sample period.

To provide an overview of the insurance activity over time, Figure 3 plots the number of unique coal mines insured by insurers that adopted a coal policy at some point during the sample period (Panel A) and those that did not (Panel B). In Panel A, the number of insured mines remains relatively stable at around 200 mines throughout most of the sample period. Within the insurers with an underwriting policy, AIG and Chubb dominate the market in the early years of the sample, while Zurich and Chubb emerge as the main insurers in later years. In the fourth quarter of 2019, there is a visible shift in the number of insured mines from AIG to Zurich.[17] In Panel B, among the insurers that never adopted a coal policy, the number of insured mines shows a steady and nearly linear increase over time. The number of mines starts at approximately 100 at the beginning of the sample period and increases to nearly 300 by the

[17]We manually reviewed these entries and found no indication that Zurich acquired a subsidiary of AIG. A more likely explanation for this shift is that AIG chose not to renew policies covering a substantial number of mines, and Zurich subsequently stepped in to provide coverage for several of them.

end. Among insurers without a policy, Houston and BrickStreet are the primary underwriters of coal mines throughout the entire sample period. The contrasting trends between the two groups of insurers offer suggestive evidence that insurers with coal underwriting policies may have reduced their coverage of coal mines, while insurers without policies offered coverage for these mines.[18] At the same time, there are interesting decomposition effects among the set of insurers with coal policy, notably the increased underwriting activity by Zurich.

## 4.2 Implementation at the insurer level

To test more formally whether insurance groups reduce the underwriting of coal projects following the adoption of coal underwriting policies, we estimate the following OLS regression:

$$Coal\ insurance_{i,t} = \beta \times Post\ coal\ policy_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t}, \tag{2}$$

where $i$ indexes an insurer and $t$ a quarter. $Coal\ insurance_{i,t}$ denotes either the log of the number of insured coal mines by insurer $i$ in quarter $t$ (*# Coal mines insured*) or the log of the volume of produced coal at the insured mines (*Coal volume insured*). *Post coal policy* equals one for insurers and quarters after an insurer has introduced a coal underwriting policy, and zero otherwise. $\alpha_i$ and $\alpha_t$ are insurer and time fixed effects, respectively. We use robust standard errors.[19] The coefficient $\beta$ captures the change in coal underwriting activity for insurers that adopt a coal policy, relative to those that do not. If insurers adjust their underwriting behavior in line with their public commitments, then $\beta$ should be negative and statistically significant.

Table 5 reports estimates of Eq. (2). In Column 1, which uses *# Coal mines insured*, the estimate for $\beta$ is negative and statistically significant. The coefficient suggests that insurer,

[18] In Figure IA.5, we replicate these figures using the volume of insured coal production. We observe similar patterns when using this metric.

[19] We do not use cluster standard errors at the insurer level because our sample includes only 46 insurers. As Angrist and Pischke (2009) note, inference based on cluster-robust standard errors can become unreliable when the number of clusters falls below 42, a threshold commonly invoked in applied work. With 46 clusters, we are just above that informal cutoff, but still close enough to justify caution.

on average, reduce the number of insured coal mines by 17.2% (about 3.4 mines) following the adoption of a coal policy (relative to non-adopting insurers). In Column 2, using *Coal volume insured*, the estimate continues to be negative and statistically significant, implying a reduction in the volume of insured coal by 58.2% (about 3.45 MMst) after a coal policy is adopted (again relative to non-adopters). These results indicate that insurers reduce their coal underwriting activity following the adoption of coal policies.

A concern with results in Columns 1–2 is that we only observe whether insurance contracts are renewed, not the underlying reason why insurance coverage ends. Changes in the number of insured mines could reflect insurers' responses to coal policies, but they could also be driven by mine-level factors—such as closures or production slowdowns due to market conditions. In particular, we cannot distinguish whether a mine is no longer insured because the insurer adopted a restrictive policy, or instead because the mine operator chose not to renew coverage due to operational or financial considerations. To address this issue, Columns 3 and 4 restrict the sample to mines that remain operationally active throughout the entire sample period. The estimates confirm that our main findings are not driven by changes in mine operating status.

## 4.3 Implementation at the mine level

The evidence in the prior section is informative in providing insurer-level estimates for the reduction in insurance activity following the adoption of coal policies. However, it does not allow for a causal interpretation for two reasons. First, without accounting for the endogenous matching of coal mines to insurers, we cannot rule out that insurers adopt coal policies because of the specific mines they insure. Second, we do not control for time-varying mine characteristics that could influence insurers' decisions not to renew contracts, for example, poor mine performance or increased operational risk.

To address these issues, we leverage the granularity of our data to identify effects from changes in insurer–mine relationships, thereby holding constant the mine-insurer matching and mine characteristics. Specifically, we test whether the likelihood of observing an active insurance relationship between a mine and an insurer changes around the policy adoption. If coal policies affect insurers' coverage decisions, we would expect a higher probability of an inactive relationship between a mine and a policy-adopting insurer, relative to that same mine's relationships with non-policy-adopting insurers.

We implement this strategy using a stacked difference-in-differences design. A stack is defined as an insurance group that adopts a coal policy and the set of coal mines it insures. For each mine–insurer pair within that stack, we construct a balanced panel of 13 quarterly observations—six quarters before and six quarters after the policy adoption quarter, whenever information on the liability insurance certificates of a given mine is available. These mine–insurer pairs form the treated observations. As the control group, we include all other relationships that the same mines have with insurers that never adopt a coal policy. Intuitively, each stack tracks how a mine's relationships with different insurers evolve around the adoption of a policy by one of them, and compares changes depending on whether the insurer adopts a policy or not. We repeat this procedure for each policy-adopting insurer and stack the resulting samples to estimate the average effect of coal policies on the likelihood of observing inactive insurer–mine relationships. Hence, we perform the following OLS regression:

$$\begin{aligned} Inactive\ insurance_{s,m,i,t} = \sum_{t=-6}^{t=6} \beta_t \times Coal\ policy_i \times Event\ quarter_{s,t} + \\ \alpha_{s,m,i} + \alpha_{s,m,t} + \epsilon_{s,m,i,t}, \end{aligned} \tag{3}$$

where $s$ indexes a stack, $m$ indexes a mine, $i$ an insurer, and $t$ a quarter. *Inactive insurance* equals one if an insurance group does not insure a mine in a given quarter, and zero if it does. *Coal policy* equals one for mines insured by an insurer adopting a carbon underwriting policy, and zero otherwise. *Event quarter* are dummy variables indicating quarters relative to the

policy adoption quarter. $\alpha_{s,m,i}$ are interacted stack-mine-insurers fixed effects, while $\alpha_{s,m,t}$ are interacted stack-mine-time fixed effects. These fixed effects ensure that we compare the evolution of mine-insurer relationships within the same mine across insurers (to account for the endogenous matching of mines to insurance groups) and they control for observable and unobservable time-varying characteristics at the mine level.[20] Standard errors are clustered at the insurance group-stack level. If insurers adjust their underwriting behavior according to their public commitments, we would expect the $\beta_t$ coefficients to be insignificant before the adoption of a coal policy, and positive and statistically significant afterwards.

Figure 4 shows the estimated quarterly regression coefficients from Eq. (3), relative to the (omitted) quarter preceding the adoption of a coal underwriting policy. In the quarters prior to the policy adoption and in the adoption quarter, there are no significant differences in the probabilities of having inactive insurance relationships. These estimates support the parallel trends assumption. Starting with the first quarter after the adoption of a coal policy, relationships between mines and policy-adopting insurers have statistically different likelihoods of becoming inactive. The differences in probabilities increase over time, starting with 8.4pp in the first quarter to 18.3pp four quarters after the policy adoption. After the fourth quarter, the estimates level off, consistent with the typical one-year term of insurance certificates observed in our data. Since most certificates run for one year, all insurers would have had an opportunity to end relationships through non-renewal within that timeframe. These results provide evidence that coal policies lead to meaningful changes in insurers' underwriting behavior. They also confirm our insurer-level findings.

To quantify average changes of the estimated probabilities, we define an indicator variable that equals one for the quarters after the adoption of a coal policy (*Post*) and create an interaction term of this variable with a dummy variable indicating a coal underwriting

[20] The fixed effects absorb the standalone effect of *Coal policy* and the *Event quarter* dummies.

policy. This OLS regression is specified as:

$$Inactive\ insurance_{s,m,i,t} = \beta \times Coal\ policy_i \times Post_{s,t} + \alpha_{s,m,i} + \alpha_{s,m,t} + \epsilon_{s,m,i,t}, \quad (4)$$

The results of Eq. (4) are reported in Table 6. In Column 1, the coefficient on the interaction term shows that relationships between a mine and insurance group are 12.8pp more likely to become inactive in the six quarters following adoptions of coal underwriting policies. The coefficient estimate increases to 18.5pp if we restrict the sample to mines active throughout the whole sample period, as in Column 2. These results provide strong evidence of a causal effect of coal underwriting policies on the underwriting behavior of insurance groups.

# 5 Conclusion

Insurance companies can facilitate the net-zero transition by restricting insurance coverage of fossil fuel projects. We study the adoption, structure, and effects of insurers' carbon underwriting policies, focusing on their role in shaping U.S. coal mining. While such policies have become increasingly common among the world's major insurance groups, their design, stringency, and enforcement remain highly heterogeneous across insurers. Using novel mine-level insurance data, we show that coal underwriting policies reduce insurance coverage of coal mines, lower insured coal volumes, and increase insurer–mine relationship terminations. However, implementation is often incomplete, with some insurers continuing to expand coal underwriting. Our findings provide the first systematic evidence on insurers' carbon underwriting policies and their impact on insured fossil fuel projects. The findings suggest that the impact of carbon underwriting policies depends critically on policy design, implementation, and coordination across insurers.

**Table A.1:** Variable definitions

| Variable | Definition | Source |
|---|---|---|
| | Panel A: Insurer characteristics | |
| *Coal policy* | Dummy variable equal to one for insurance groups with a coal underwriting policy in place and zero for insurance groups without a coal underwriting policy | IOF scorecards |
| *Coal policy score* | Score ranging from 0 to 10 reflecting the stringency of coal underwriting policies, higher values indicate stricter policies | IOF scorecards |
| *Oil & gas policy* | Dummy variable equal to one for insurance groups with an oil & gas underwriting policy and zero for insurance groups without an oil & gas underwriting policy | IOF scorecards |
| *Oil & gas policy score* | Score ranging from 0 to 10 reflecting the stringency of oil & gas underwriting policies, higher values indicate stricter policies | IOF scorecards |
| *Europe* | Dummy variable equal to one if parent company of an insurance group is headquartered in Europe, zero otherwise | IOF scorecards |
| *US* | Dummy variable equal to one if parent company of an insurance group is headquartered in the U.S., zero otherwise | IOF scorecards |
| *Asia* | Dummy variable equal to one if parent company of an insurance group is headquartered in Asia, zero otherwise | IOF scorecards |
| *RoW* | Dummy variable equal to one if parent company of an insurance group is headquartered outside Europe, the U.S, or Asia, zero otherwise | IOF scorecards |
| *Unlisted insurer* | Dummy variable equal to one if parent company of an insurance group is listed, zero otherwise | Orbis |
| *Reinsurer* | Dummy variable equal to one if parent company of an insurance group is a reinsurer, zero otherwise | IOF scorecards |
| *Specialty insurer* | Dummy variable equal to one if parent company of an insurance group is a specialty insurer, zero otherwise | Online searches |
| *NZIA* | Dummy variable equal to one for insurance groups in which the parent insurer is a member of the Net Zero Insurance Alliance (NZIA), zero otherwise | NZIA's website |
| *Total assets* (billion $) | Consolidated total assets of the insurance group | Orbis |
| *ROA* (%) | Consolidated pre-tax return on assets of the insurance group | Orbis |
| *# Coal mines insured* | Number of unique coal mines insured in a given quarter | Certificates of Liability Insurance |
| *Coal volume insured* | Million short tons of coal produced by the mines insured in a given quarter | Certificates of Liability Insurance |

*(Continued)*

**Table A1:** Variable definitions

| Variable | Definition | Source |
|---|---|---|
| | Panel B: Insurance policy characteristics | |
| *Coal policy* | Dummy variable equal to one if insurance policy is granted by an insurance group with a coal underwriting policy in place, zero otherwise | Certificates of Liability Insurance |
| *Commercial & general insurance* | Dummy variable equal to one of insurance policy covers commercial and general liability insurance coverage, zero otherwise | Certificates of Liability Insurance |
| *Automobile insurance* | Dummy variable equal to one if insurance policy covers automobile insurance, zero otherwise | Certificates of Liability Insurance |
| *Umbrella & excess insurance* | Dummy variable equal to one if insurance policy covers umbrella and excess insurance, zero otherwise | Certificates of Liability Insurance |
| *Workers compensation insurance* | Dummy variable equal to one if insurance policy covers workers compensation insurance, zero otherwise | Certificates of Liability Insurance |
| *Other liabilities insurance* | Dummy variable equal to one if insurance policy covers other insurance coverage (e.g., pollution liability insurance), zero otherwise | Certificates of Liability Insurance |
| *Policy duration* (years) | Duration of the insurance policy in years | Certificates of Liability Insurance |
| | Panel C: Insurance-mine relationship characteristics | |
| *Coal policy* | Dummy variable equal to one for quarters in which the insurer has a coal underwriting policy in place, zero otherwise | Certificates of Liability Insurance |
| *Inactive insurance* | Dummy variable equal to one for quarters in which the insurer does not insure the mine, zero if it does | Certificates of Liability Insurance |
| *Length active insurance* (quarters) | The time in quarters since which the insurance group insures the mine | Certificates of Liability Insurance |

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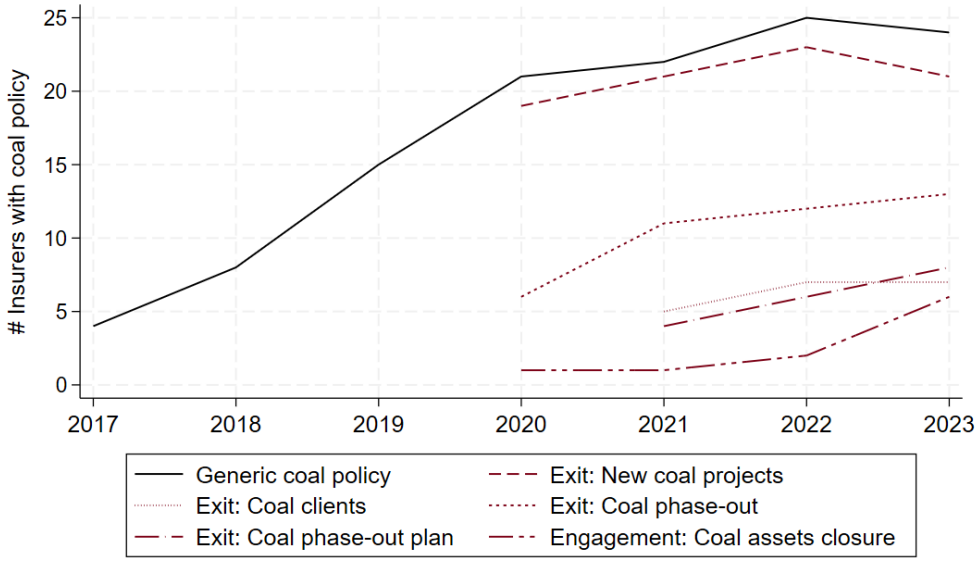
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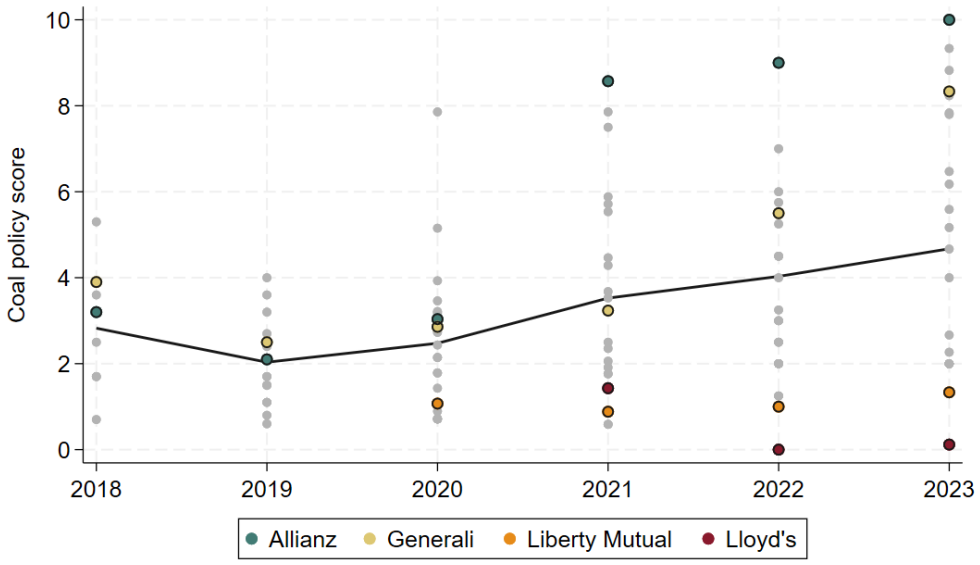
## Figure 1: Prevalence and structure of coal underwriting policies over time

The figure shows the number of insurers whose coal underwriting policies incorporate specific policy features. The sample is based on annual scorecards compiled by Insure Our Future (IOF) and includes up to 25 insurers with coal underwriting policies in place.



## Figure 2: Stringency of coal underwriting policies over time

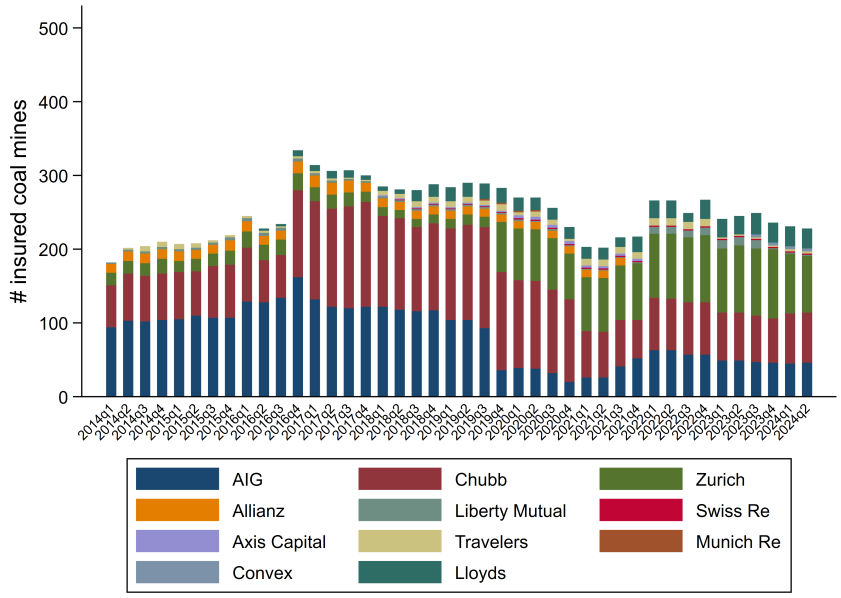
The figure displays scores capturing the stringency of coal underwriting policies over time. Scores range from 0 to 10, with higher values indicating more restrictive policies. Each dot represents an individual insurer in a given year. The solid line connects average scores by year. The two insurers with the highest and lowest policy scores in the final sample year (2023) are highlighted with colored dots. The sample is based on annual scorecards compiled by Insure Our Future (IOF) and includes 25 insurers with coal underwriting policies in place.



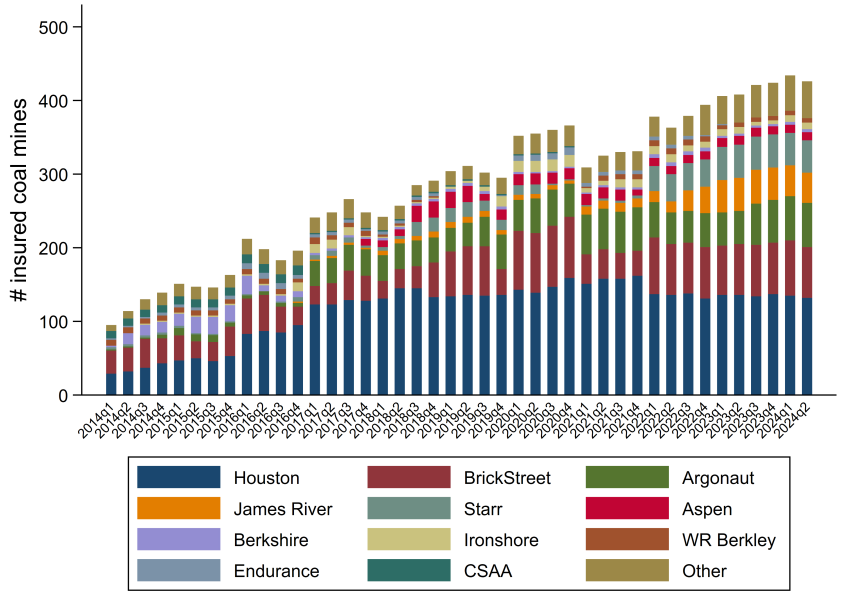
## Figure 3: Number of insured coal mines over time

The figure displays the number of insured coal mines over time. For each quarter, we count the number of unique mines insured by each insurance group. Panel A presents this information for insurers that adopted a coal underwriting policy at any point during the sample period, while Panel B presents this information for those that never did. The sample includes all coal mines listed in MSHA's Mine Data Retrieval System between 2014Q1 and 2024Q2, provided they report at least one quarter of non-zero coal production and for which we successfully obtained ACORD 25 certificates of liability insurance from state-level agencies.

Panel A: Insurance groups with a coal underwriting policy




Panel B: Insurance groups without a coal underwriting policy

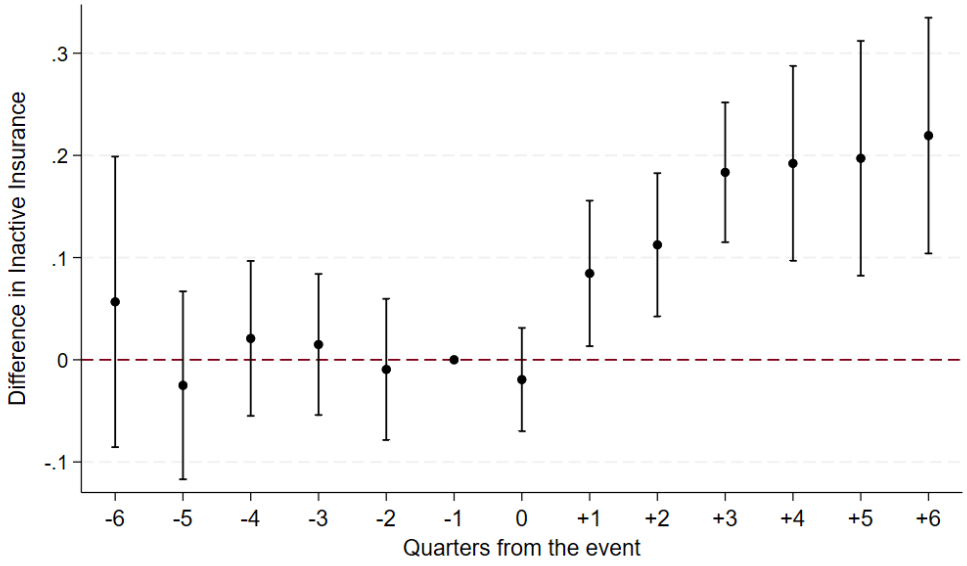


## Figure 4: Coal mines' insurance status and coal underwriting policies

This figure displays 90% confidence intervals and coefficient estimates from the following OLS regression:

$$Inactive\ insurance_{s,m,i,t} = \sum_{t=-6}^{t=6} \beta_t \times Coal\ policy_i \times Event\ quarter_{s,t} + \alpha_{s,m,i} + \alpha_{s,m,t} + \epsilon_{s,m,i,t},$$

where $s$ indexes a stack, $m$ indexes a mine, $i$ an insurer, and $t$ a quarter. The dependent variable, *Inactive insurance*, equals one if an insurance group does not insure a mine in a given quarter, and zero if it does. *Coal policy* equals one for mines insured by an insurance group adopting a coal underwriting policy, and zero otherwise. $\alpha_{s,m,i}$ are interacted stack-mine-insurer fixed effects, while $\alpha_{s,m,t}$ are interacted stack-mine-time fixed effects. The initial sample of mines includes all coal mines listed in MSHA's Mine Data Retrieval System between 2014Q1 and 2024Q2, provided they reporte at least one quarter of non-zero coal production and for which we successfully obtained ACORD 25 certificates of liability insurance from state-level agencies. For each insurance group that adopts a coal underwriting policy, we identify all mines it insures and construct a balanced sample of 13 quarterly observations per mine-insurance pair, six quarters before and six quarters after the policy adoption quarter, whenever information on the liability insurance certificates of a given mine is available. These mine–insurer pairs form the treated relationships in the stack. As a control group, we include all other relationships that the same mines have with insurance groups that never adopt a coal underwriting policy. Standard errors are clustered at the insurance group-stack level. Table A.1 provides descriptions of all variables.



## Table 1: Descriptive statistics

This table presents descriptive statistics. In Panel A, the annual insurance group sample is based on IOF scorecards from 2017 to 2023. In Panel B, the sample is based on insurance certificates obtained via FOIA requests from various states for the time period 2014 to 2024. In Panel C, the sample is obtained by merging the insurance certificates sample with quarterly mine data from MSHA for the time period from 2014Q1 to 2024Q2, and then collapsing the sample at the insurance-quarter level. In Panel D, the sample is obtained by merging the insurance certificates sample with quarterly mine data from MSHA for the time period from 2014Q1 to 2024Q2, and then maintaining the sample at the insurance-mine-quarter level. Table A.1 provides descriptions of all variables.

| | Obs. | Mean | Std. | 25th | Median | 75th |
|---|---|---|---|---|---|---|
| Panel A: Insurer-year sample | | | | | | |
| *Coal policy* | 181 | 0.66 | | | | |
| *Coal policy score* | 162 | 2.44 | 2.59 | 0.00 | 1.85 | 3.60 |
| *Oil & gas policy* | 117 | 0.55 | | | | |
| *Oil & gas policy score* | 117 | 0.90 | 1.09 | 0.00 | 0.59 | 1.43 |
| *Europe* | 289 | 0.36 | | | | |
| *US* | 289 | 0.33 | | | | |
| *Asia* | 289 | 0.19 | | | | |
| *RoW* | 289 | 0.11 | | | | |
| *Unlisted insurer* | 289 | 0.22 | | | | |
| *Reinsurer* | 289 | 0.25 | | | | |
| *Specialty insurer* | 289 | 0.25 | | | | |
| *NZIA* | 288 | 0.08 | | | | |
| *Total assets* (billion $) | 269 | 293.56 | 332.80 | 49.50 | 149.82 | 491.98 |
| *ROA* (%) | 269 | 1.67 | 2.04 | 0.53 | 1.29 | 2.47 |
| Panel B: Mine-insurance policy sample | | | | | | |
| *Coal policy* | 9,745 | 0.45 | | | | |
| *Commercial & general insurance* | 9,745 | 0.37 | | | | |
| *Automobile insurance* | 9,745 | 0.17 | | | | |
| *Umbrella & excess insurance* | 9,745 | 0.22 | | | | |
| *Workers compensation insurance* | 9,745 | 0.16 | | | | |
| *Other liabilities insurance* | 9,745 | 0.08 | | | | |
| *Policy duration* (years) | 9,745 | 1.02 | 0.23 | 1.00 | 1.00 | 1.00 |
| Panel C: Insurance-quarter sample | | | | | | |
| *Coal policy* | 1,145 | 0.28 | | | | |
| *# Coal mines insured* | 1,145 | 19.61 | 33.65 | 2.00 | 4.00 | 16.00 |
| *Coal volume insured* | 1,145 | 5.94 | 10.85 | 0.04 | 1.13 | 4.91 |
| Panel D: Insurance-mine-quarter sample | | | | | | |
| *Coal policy* | 51,710 | 0.47 | | | | |
| *Inactive insurance* | 51,710 | 0.57 | | | | |
| *Length active insurance* (quarters) | 51,710 | 14.20 | 8.91 | 8.00 | 12.00 | 19.00 |

## Table 2: Prevalence of coal underwriting policies by insurer

This table lists coal underwriting policies over time for the insurers in the sample. A value of one indicates that an insurer has a coal underwriting policy in place in a year, and a value of zero indicates that an insurer has no coal underwriting policy. Missing values reflect that an insurer was not included in the IOF scorecards or that its policies were not assessed by IOF in a year. The sample is based on annual scorecards compiled by Insure Our Future (IOF).

| Name | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | % Years w/ policy |
|---|---|---|---|---|---|---|---|---|
| AIG | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 29 |
| AXA | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| Allianz | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 86 |
| Aviva | | | 1 | 1 | 1 | 1 | 1 | 100 |
| Axis Capital | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 71 |
| Berkshire Hathaway | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chubb | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 71 |
| Convex | | | | | 0 | 1 | | 50 |
| Everest Re | | | | | 0 | 0 | 0 | 0 |
| FM Global | | | 0 | | | | | 0 |
| Generali | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 86 |
| HDI | | | 1 | 1 | 1 | 1 | 1 | 100 |
| Hannover Re | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 71 |
| Legal and General | | | | | | | | |
| Liberty Mutual | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 57 |
| Lloyd's | | 0 | 0 | 0 | 1 | 1 | 1 | 50 |
| MS&AD | | | 0 | 1 | 1 | 1 | 1 | 80 |
| Mapfre | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 86 |
| MetLife | | | | | | | | |
| Munich Re | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 86 |
| PICC | | | | | 0 | 0 | 0 | 0 |
| Ping An | | | 1 | 1 | 1 | 1 | 1 | 100 |
| Prudential | | | | | | | | |
| QBE | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 71 |
| SCOR | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| Samsung FM | | | 0 | 1 | 1 | 1 | 1 | 80 |
| Sinosure | | | 0 | 0 | 0 | 0 | 0 | 0 |
| Sompo | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 57 |
| Starr | | | | | | 0 | 0 | 0 |
| Swiss Re | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| TIAA | | | | | | | | |
| The Hartford | | | | 1 | 1 | 1 | 1 | 100 |
| Tokio Marine | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 57 |
| Travelers | | | | 0 | 0 | 1 | 1 | 50 |
| WR Berkley | 0 | 0 | 0 | 0 | 0 | | 0 | 0 |
| XL Catlin | 0 | | | | | | | 0 |
| Zurich | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 |
| % Insurance groups w/ policy | 21 | 42 | 58 | 78 | 73 | 80 | 80 | |
| # Insurance groups | 25 | 24 | 30 | 30 | 30 | 30 | 30 | |

## Table 3: Stringency of coal underwriting policies by insurer

This table reports scores reflecting the stringency of coal underwriting policies over time of the insurers in the sample. The scores range from 0 to 10, with higher values reflecting stricter coal underwriting policies. Insurers are ranked based on 2023 score values, from high to low. The sample period starts in 2018 because policy strength was not assessed before. The sample is based on annual scorecards compiled by Insure Our Future (IOF).

| Name | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Average score |
|---|---|---|---|---|---|---|---|---|
| Allianz | | 3.20 | 2.10 | 1.33 | 8.57 | 9.00 | 10.00 | 5.70 |
| AXA | | 2.50 | 3.20 | 4.38 | 7.86 | 9.00 | 9.33 | 6.05 |
| Swiss Re | | 5.30 | 4.00 | 4.29 | 5.54 | 6.00 | 8.82 | 5.66 |
| Generali | | 3.90 | 2.50 | 2.34 | 3.24 | 5.50 | 8.33 | 4.30 |
| Axis Capital | | 0.00 | 2.70 | 2.17 | 7.50 | 9.00 | 8.24 | 4.93 |
| Aviva | | | 1.10 | 1.09 | 3.68 | 5.75 | 7.83 | 3.89 |
| Zurich | | 3.60 | 3.60 | 2.66 | 5.88 | 7.00 | 7.80 | 5.09 |
| SCOR | | 1.70 | 1.70 | 1.67 | 4.29 | 4.50 | 6.47 | 3.39 |
| Hannover Re | | 0.00 | 1.50 | 2.86 | 5.71 | 5.25 | 6.18 | 3.58 |
| Munich Re | | 1.70 | 1.10 | 2.62 | 2.50 | 4.50 | 5.59 | 3.00 |
| Mapfre | | 0.70 | 0.80 | 0.63 | 4.46 | 5.50 | 5.17 | 2.88 |
| HDI | | | 1.50 | 1.48 | 1.91 | 3.25 | 4.67 | 2.56 |
| QBE | | 0.00 | 2.40 | 1.41 | 3.53 | 4.00 | 4.00 | 2.56 |
| AIG | | 0.00 | 0.00 | 0.00 | 0.00 | 3.00 | 2.67 | 0.94 |
| Samsung FM | | | 0.00 | 0.78 | 1.76 | 2.50 | 2.27 | 1.46 |
| Travelers | | | | 0.00 | 0.00 | 2.00 | 2.00 | 1.00 |
| The Hartford | | | | 1.25 | 2.06 | 2.00 | 2.00 | 1.83 |
| Sompo | | 0.00 | 0.00 | 0.31 | 0.59 | 2.00 | 2.00 | 0.82 |
| Tokio Marine | | 0.00 | 0.00 | 0.31 | 2.35 | 2.00 | 2.00 | 1.11 |
| MS&AD | | | 0.00 | 0.31 | 1.76 | 3.00 | 2.00 | 1.41 |
| Chubb | | 0.00 | 1.70 | 0.39 | 1.47 | 1.25 | 2.00 | 1.14 |
| Liberty Mutual | | 0.00 | 0.00 | 0.47 | 0.88 | 1.00 | 1.33 | 0.61 |
| Ping An | | | 0.60 | 0.31 | 0.59 | 1.25 | 1.33 | 0.82 |
| Lloyd's | | 0.00 | 0.00 | 0.00 | 1.43 | 0.00 | 0.12 | 0.26 |
| Starr | | | | | | 0.00 | 0.00 | 0.00 |
| PICC | | | | | 0.00 | 0.00 | 0.00 | 0.00 |
| WR Berkley | | 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 | 0.00 |
| Sinosure | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Berkshire Hathaway | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Everest Re | | | | | 0.00 | 0.00 | 0.00 | 0.00 |
| Legal and General | | | | | | | | |
| TIAA | | | | | | | | |
| MetLife | | | | | | | | |
| XL Catlin | | | | | | | | |
| Prudential | | | | | | | | |
| Convex | | | | | 0.00 | 2.50 | | 1.25 |
| FM Global | | | 0.00 | | | | | 0.00 |
| Average score | | 1.19 | 1.17 | 1.22 | 2.59 | 3.36 | 3.74 | |
| # Insurance groups | 25 | 24 | 30 | 30 | 30 | 30 | 30 | |
| # Missing scores | 25 | 5 | 4 | 3 | 0 | 0 | 0 | |

## Table 4: Determinants of coal underwriting policies

This table presents results from the following OLS regression:

$$Y_{i,t} = \beta \times X_{i,t-1} + \alpha_k + \alpha_t + \epsilon_{i,t},$$

where $i$ indexes an insurer and $t$ a year. In Columns 1–3, $Y$ is *Coal policy*, which equals one if the insurer has a coal underwriting policy, and zero otherwise. In Columns 4–6, $Y$ is *Coal policy score*, which is a score ranging from 0 to 10, with higher scores indicating stricter coal underwriting policies. $X$ is a vector of insurer-level characteristics. The sample is based on annual scorecards compiled by Insure Our Future (IOF). Standard errors are clustered at the insurer level and reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively. Table A.1 provides descriptions of all variables.

| | *Coal policy* | | | *Coal policy score* | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *2018* | 0.211** | 0.211* | 0.158 | | | |
| | (0.099) | (0.105) | (0.112) | | | |
| *2019* | 0.366*** | 0.388*** | 0.380*** | -0.792** | -0.352 | -0.129 |
| | (0.116) | (0.119) | (0.124) | (0.377) | (0.440) | (0.446) |
| *2020* | 0.567*** | 0.599*** | 0.598*** | -0.351 | 0.898 | 1.222* |
| | (0.115) | (0.117) | (0.113) | (0.553) | (0.584) | (0.610) |
| *2021* | 0.523*** | 0.565*** | 0.544*** | 0.701 | 1.892** | 2.187*** |
| | (0.117) | (0.109) | (0.114) | (0.684) | (0.686) | (0.639) |
| *2022* | 0.623*** | 0.665*** | 0.754*** | 1.205* | 2.515*** | 2.752*** |
| | (0.115) | (0.104) | (0.104) | (0.697) | (0.714) | (0.673) |
| *2023* | 0.589*** | 0.638*** | 0.715*** | 1.848** | 3.211*** | 3.056*** |
| | (0.115) | (0.107) | (0.133) | (0.720) | (0.688) | (0.655) |
| *US* | | -0.516*** | -0.482*** | | -3.247*** | -2.332*** |
| | | (0.119) | (0.136) | | (0.601) | (0.597) |
| *Asia* | | -0.378*** | -0.468*** | | -3.281*** | -3.408*** |
| | | (0.128) | (0.108) | | (0.563) | (0.506) |
| *RoW* | | -0.327** | -0.350* | | -0.037 | 0.402 |
| | | (0.159) | (0.174) | | (1.055) | (1.230) |
| *NZIA* | | | -0.164* | | | 0.853 |
| | | | (0.088) | | | (0.531) |
| *Specialty insurer* | | | -0.243** | | | -0.357 |
| | | | (0.101) | | | (0.830) |
| *Unlisted insurer* | | | -0.316** | | | -2.498** |
| | | | (0.149) | | | (1.091) |
| *Total assets (log)* | | | -0.020 | | | 0.179 |
| | | | (0.048) | | | (0.284) |
| *ROA* | | | -0.044** | | | -0.218 |
| | | | (0.020) | | | (0.173) |
| Obs. | 181 | 181 | 180 | 115 | 115 | 115 |
| Adj. $R^2$ | 0.146 | 0.359 | 0.441 | 0.103 | 0.471 | 0.606 |
| # Insurers in sample | 33 | 33 | 32 | 25 | 25 | 25 |

## Table 5: Insurers' coal underwriting activity and coal underwriting policies

This table presents results from the following OLS regression:

$$Coal\ insurance_{i,t} = \beta \times Post\ coal\ policy_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t},$$

where $i$ indexes an insurer and $t$ a quarter. In Columns 1 and 3, the dependent variable, *Coal insurance*, is *# Coal mines insured*, which is the number of mines insured by an insurance group in a given quarter. In Columns 2 and 4, *Coal insurance* is *Coal volume insured*, which is the volume of insured coal that is produced. *Post coal policy* equals one for insurers and quarters after an insurer has introduced a coal underwriting policy, and zero otherwise. The sample includes all coal mines listed in MSHA's Mine Data Retrieval System between 2014Q1 and 2024Q2, provided they report at least one quarter of non-zero coal production and for which we successfully obtained ACORD 25 certificates of liability insurance from state-level agencies. Robust standard errors are reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively. Table A.1 provides descriptions of all variables.

| | *# Coal mines insured* (log) | *Coal volume insured* (log) | *# Coal mines insured* (log) | *Coal volume insured* (log) |
|---|---|---|---|---|
| | All coal mines | | Active coal mines | |
| | (1) | (2) | (3) | (4) |
| *Post coal policy* | -0.172** | -0.824*** | -0.582*** | -0.651*** |
| | (0.080) | (0.145) | (0.085) | (0.152) |
| Insurance group FE | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes |
| Obs. | 1,145 | 951 | 680 | 671 |
| Adj. $R^2$ | 0.828 | 0.767 | 0.750 | 0.754 |
| # Insurance groups | 46 | 40 | 29 | 28 |

## Table 6: Coal mines' insurance status and coal underwriting policies

This table presents results from the following OLS regression:

$$Inactive\ insurance_{s,m,i,t} = \beta \times Coal\ policy_i \times Post_{s,t} + \alpha_{s,m,i} + \alpha_{s,m,t} + \epsilon_{s,m,i,t},$$

where $s$ indexes a stack, $m$ indexes a mine, $i$ an insurer, and $t$ a quarter. The dependent variable, *Inactive insurance*, equals one if an insurance group does not insure a mine in a given quarter, and zero if it does. *Coal policy* equals one for mines insured by an insurance group adopting a carbon underwriting policy, and zero otherwise. *Post* equals one for the quarter of the adoption of coal policy and all quarters thereafter, and zero otherwise. The initial sample of mines includes all coal mines listed in MSHA's Mine Data Retrieval System between 2014Q1 and 2024Q2, provided they report at least one quarter of non-zero coal production and for which we successfully obtained ACORD 25 certificates of liability insurance from state-level agencies. For each insurance group that adopts a coal underwriting policy, we identify all mines it insures and construct a balanced sample of 13 quarterly observations per mine-insurance pair, six quarters before and six quarters after the policy adoption quarter, whenever information on the liability insurance certificates of a given mine is available. These mine–insurer pairs form the treated relationships in the stack. As a control group, we include all other relationships that the same mines have with insurance groups that never adopt a coal underwriting policy. Standard errors are clustered at the insurance group-stack level. Standard errors are clustered at the insurance group-stack level. Table A.1 provides descriptions of all variables.

| | *Inactive insurance* | |
|---|---|---|
| | All coal mines | Active coal mines |
| | (1) | (2) |
| *Coal policy* × *Post* | 0.128** | 0.185* |
| | (0.055) | (0.095) |
| Stack × Insurance group × Coal mine FE | Yes | Yes |
| Stack × Coal mine × Time FE | Yes | Yes |
| Obs. | 24,907 | 7,428 |
| Adj. $R^2$ | 0.587 | 0.569 |
| # Insurance groups | 46 | 34 |

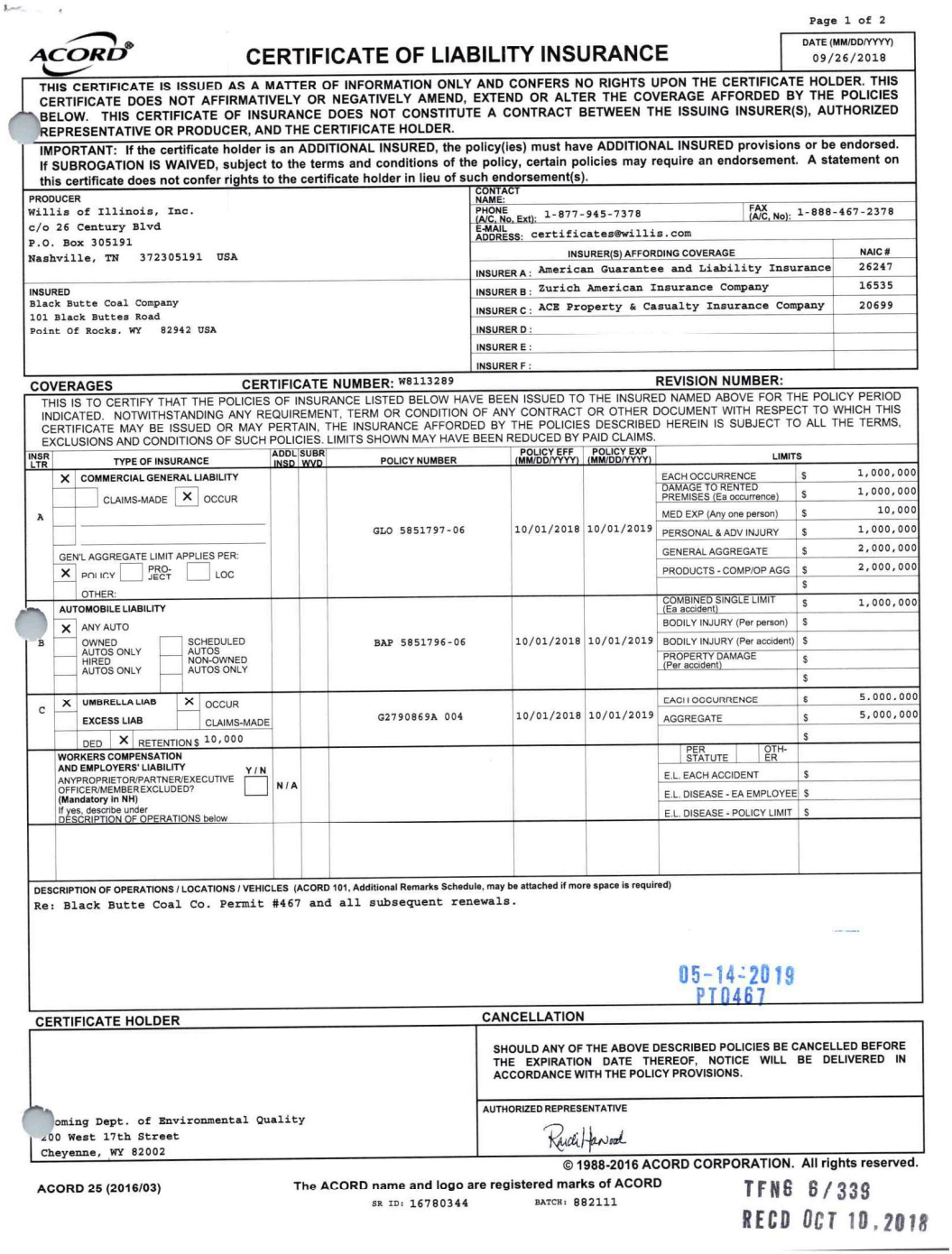
# Internet Appendix

for

# Insurers' Coal Underwriting Policies

## Figure IA.1: Certificate of Liability Insurance of Black Butte Coal Mine

The figure shows the Certificate of Liability Insurance of Black Butte Coal Mine dated September 26, 2018, on a standardized ACORD 25 form filed with the Wyoming Department of Environmental Quality.



Page 1 of 2

ACORD

**CERTIFICATE OF LIABILITY INSURANCE**

DATE (MM/DD/YYYY): 09/26/2018

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Willis of Illinois, Inc.
c/o 26 Century Blvd
P.O. Box 305191
Nashville, TN 372305191 USA

CONTACT NAME:
PHONE (A/C, No, Ext): 1-877-945-7378 FAX (A/C, No): 1-888-467-2378
E-MAIL ADDRESS: certificates@willis.com

| INSURER(S) AFFORDING COVERAGE | NAIC # |
|---|---|
| INSURER A: American Guarantee and Liability Insurance | 26247 |
| INSURER B: Zurich American Insurance Company | 16535 |
| INSURER C: ACE Property & Casualty Insurance Company | 20699 |
| INSURER D: | |
| INSURER E: | |
| INSURER F: | |

INSURED
Black Butte Coal Company
101 Black Buttes Road
Point Of Rocks, WY 82942 USA

**COVERAGES** **CERTIFICATE NUMBER:** W8113289 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

| INSR LTR | TYPE OF INSURANCE | ADDL INSD | SUBR WVD | POLICY NUMBER | POLICY EFF (MM/DD/YYYY) | POLICY EXP (MM/DD/YYYY) | LIMITS | |
|---|---|---|---|---|---|---|---|---|
| A | X COMMERCIAL GENERAL LIABILITY<br>CLAIMS-MADE X OCCUR<br>GEN'L AGGREGATE LIMIT APPLIES PER:<br>X POLICY PRO-JECT LOC<br>OTHER: | | | GLO 5851797-06 | 10/01/2018 | 10/01/2019 | EACH OCCURRENCE<br>DAMAGE TO RENTED PREMISES (Ea occurrence)<br>MED EXP (Any one person)<br>PERSONAL & ADV INJURY<br>GENERAL AGGREGATE<br>PRODUCTS - COMP/OP AGG | $ 1,000,000<br>$ 1,000,000<br>$ 10,000<br>$ 1,000,000<br>$ 2,000,000<br>$ 2,000,000 |
| B | AUTOMOBILE LIABILITY<br>X ANY AUTO<br>OWNED AUTOS ONLY<br>HIRED AUTOS ONLY<br>SCHEDULED AUTOS<br>NON-OWNED AUTOS ONLY | | | BAP 5851796-06 | 10/01/2018 | 10/01/2019 | COMBINED SINGLE LIMIT (Ea accident)<br>BODILY INJURY (Per person)<br>BODILY INJURY (Per accident)<br>PROPERTY DAMAGE (Per accident) | $ 1,000,000<br>$<br>$<br>$ |
| C | X UMBRELLA LIAB X OCCUR<br>EXCESS LIAB CLAIMS-MADE<br>DED X RETENTION $ 10,000 | | | G2790869A 004 | 10/01/2018 | 10/01/2019 | EACH OCCURRENCE<br>AGGREGATE | $ 5,000,000<br>$ 5,000,000<br>$ |
| | WORKERS COMPENSATION AND EMPLOYERS' LIABILITY<br>ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH)<br>If yes, describe under DESCRIPTION OF OPERATIONS below | Y/N | N/A | | | | PER STATUTE OTH-ER<br>E.L. EACH ACCIDENT<br>E.L. DISEASE - EA EMPLOYEE<br>E.L. DISEASE - POLICY LIMIT | $<br>$<br>$ |

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
Re: Black Butte Coal Co. Permit #467 and all subsequent renewals.

05-14-2019
PT0467

**CERTIFICATE HOLDER**

oming Dept. of Environmental Quality
200 West 17th Street
Cheyenne, WY 82002

**CANCELLATION**

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE
Randi Harwood

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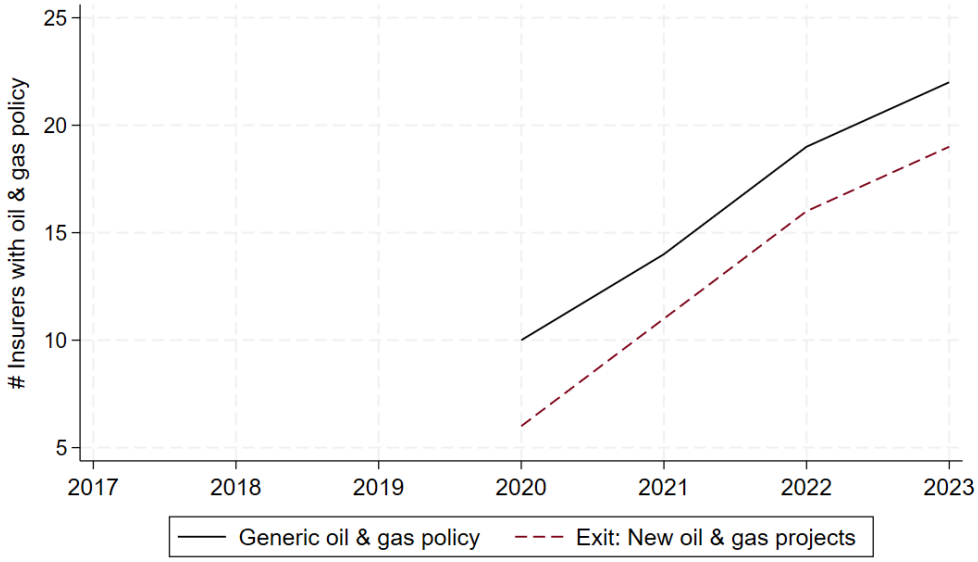
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SR ID: 16780344 BATCH: 882111

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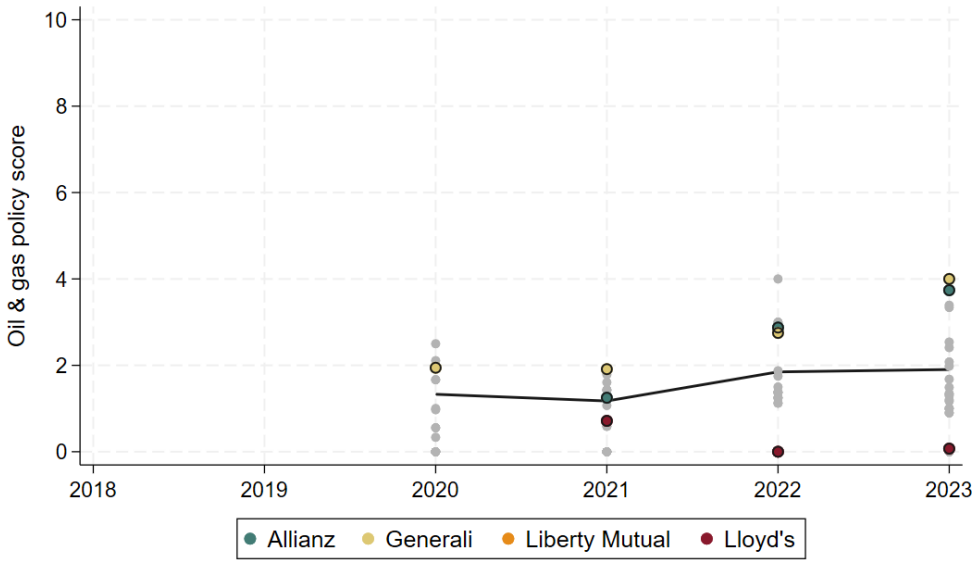
## Figure IA.2: Prevalence and structure of oil & gas underwriting policies over time

The figure shows the number of insurers whose oil & gas underwriting policies incorporate specific policy features. The sample is based on annual scorecards compiled by Insure Our Future (IOF) and includes up to 22 insurers with oil & gas underwriting policies in place.



## Figure IA.3: Stringency of oil & gas underwriting policies over time

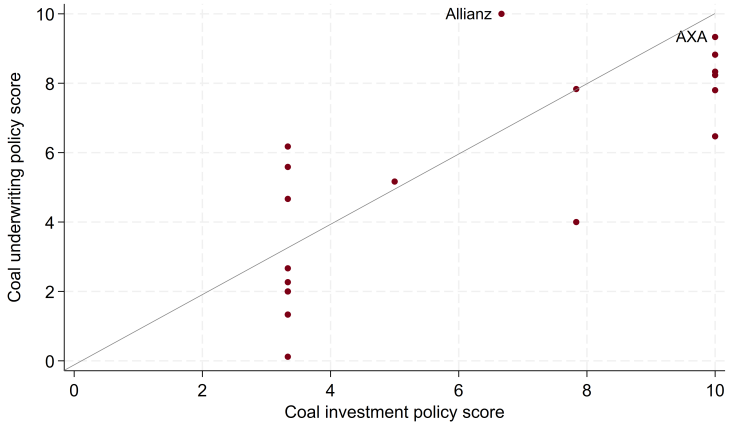
The figure displays scores capturing the stringency of oil & gas underwriting policies over time. Scores range from 0 to 10, with higher values indicating more restrictive policies. Each dot represents an individual insurer in a given year. The solid line connects average scores by year. The two insurers with the highest and lowest policy scores in the final sample year (2023) are highlighted with colored dots. The sample is based on annual scorecards compiled by Insure Our Future (IOF) and includes 22 insurers with oil & gas underwriting policies in place.



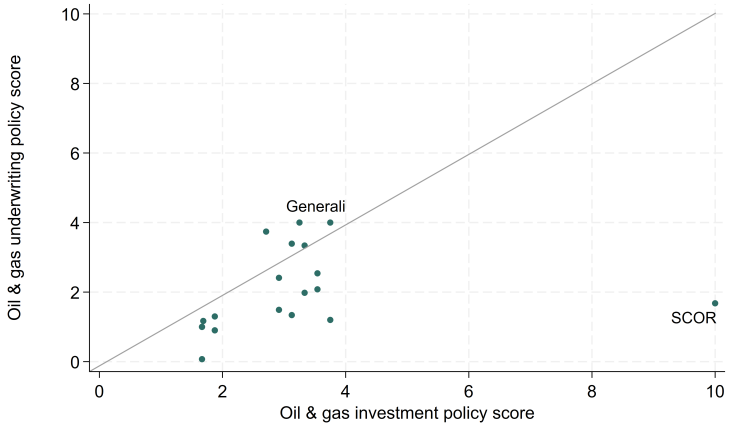
## Figure IA.4: Alignment of carbon underwriting and investment policy stringency

The figure shows the relationship between the stringency of carbon underwriting and carbon investment policies for the year sample 2023. Each dot represents the combination of underwriting and investment policies of an insurer. Panel A shows the relationship for coal policies, while Panel B shows the relationship for oil & gas policies. The sample is based on annual scorecards compiled by Insure Our Future (IOF) and comprises 25 insurers with carbon policies in place.

Panel A: Coal underwriting policies



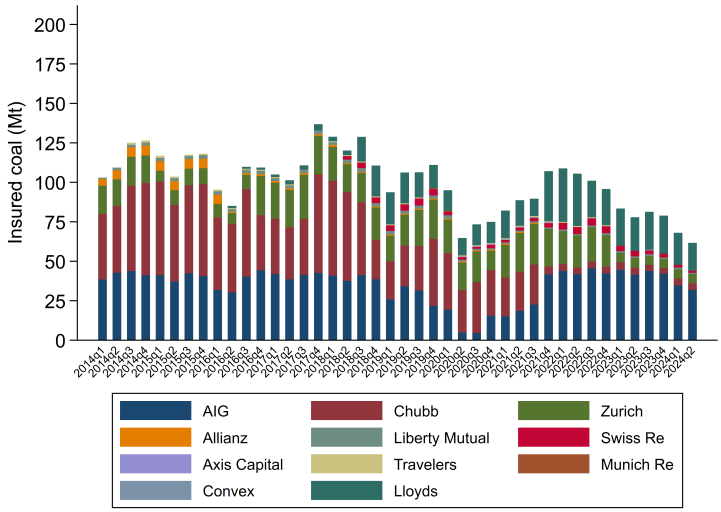

Panel B: Oil & gas underwriting policies



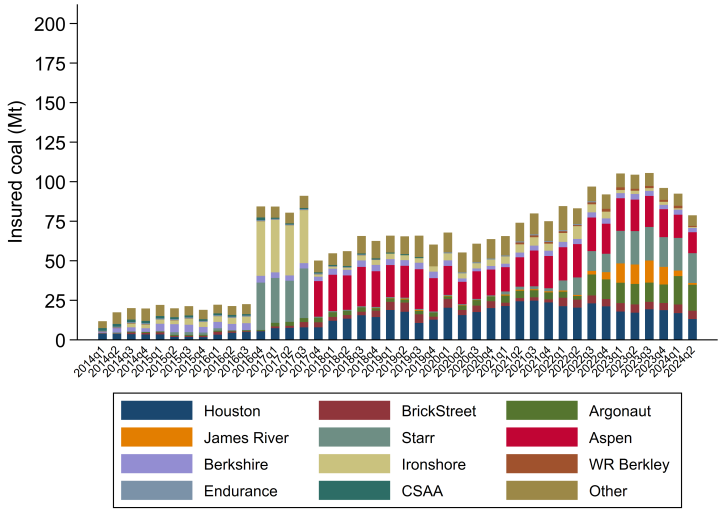
## Figure IA.5: Volume of coal insured by insurance group

The figure displays the volume of coal insured by insurance group. For each quarter, we aggregate the volume of coal produced by the mines that are insured by each insurance group. Panel A presents insurers that adopted a coal underwriting policy at any point during the sample period, while Panel B presents those that never did. The sample includes all coal mines listed in MSHA's Mine Data Retrieval System between the first quarter of 2014 and the second quarter of 2024, provided they reporte at least one quarter of non-zero coal production and for which we successfully obtained ACORD 25 certificates of liability insurance from state-level agencies.

Panel A: Insurance groups with a coal policy




Panel B: Insurance groups without a coal policy



## Table IA.1: Assessment of carbon underwriting policies

This table reports the five dimensions over which carbon underwriting policies are assessed by IOF and the respective description.

| IOF scoring dimension | Description |
|---|---|
| Scope | Whether policies rule out insurance for (i) all types of new coal infrastructure (including mines and power plants as well as transport facilities); (ii) extreme fossil fuels such as tar sands, associated pipelines, Arctic and ultra-deepwater drilling; and (iii) any oil and gas expansion projects that drive increased production. |
| Types of cover | Whether policies apply to all lines of business for new and existing projects and companies, except cover for protecting workers, ringfenced renewable energy projects, and existing mine reclamation surety bonds. Reinsurers' policies should apply to treaty as well as facultative reinsurance. |
| Fossil fuel companies | Whether policies apply comprehensive criteria to define companies operating in coal, oil and gas, and tighten cover over time in line with the need to phase out these fossil fuels completely. Whether policies immediately exclude new customers from the fossil fuel sector not aligned with a 1.5°C pathway and phase out all insurance services within two years for existing fossil fuel company customers not aligned with such a pathway. |
| Emissions reduction targets | Whether insurers set emissions reduction targets for new projects as well as ongoing operations which they insure, and define short- and medium-term targets across their entire commercial property & casualty portfolio. The targets must cover the Scope 3 emissions of all carbon-intensive sectors, including energy and power, and aim for a reduction of insured emissions of at least 43% by 2030, in line with IPCC findings. |
| Human rights | Whether policies include robust due diligence to ensure that clients fully respect all human rights, including a requirement that they obtain and document the Free, Prior, and Informed Consent of impacted Indigenous Peoples. |

## Table IA.2: Insurer characteristics

This table reports insurance characteristics for all insurers in IOF's scorecard.

| Name | Adoption date | Country | Listing status | Category | Specialty | NZIA |
|---|---|---|---|---|---|---|
| AIG | 01-03-2022 | United States | Listed | Insurer | No | No |
| AXA | 12-12-2017 | France | Listed | Insurer | No | Yes |
| Allianz | 04-05-2018 | Germany | Listed | Insurer | No | Yes |
| Aviva | | United Kingdom | Listed | Insurer | No | Yes |
| Axis Capital | 16-10-2019 | Bermuda | Listed | Reinsurer | Yes | No |
| Berkshire Hathaway | | United States | Listed | Reinsurer | No | No |
| Chubb | 01-07-2019 | United States | Listed | Insurer | No | No |
| Convex | 01-02-2022 | Bermuda | Unlisted | Reinsurer | Yes | No |
| Everest Re | | Bermuda | Listed | Reinsurer | Yes | No |
| FM Global | | United States | Unlisted | Insurer | Yes | No |
| Generali | 21-02-2018 | Italy | Listed | Insurer | No | Yes |
| HDI | 18-04-2019 | Germany | Unlisted | Insurer | No | No |
| Hannover Re | 18-04-2019 | Germany | Acquired by HDI | Reinsurer | Yes | Yes |
| Legal and General | | United Kingdom | Listed | Insurer | No | No |
| Liberty Mutual | 13-12-2019 | United States | Unlisted | Insurer | No | No |
| Lloyd's | 16-12-2020 | United Kingdom | Unlisted | Reinsurer | Yes | Yes |
| MS&AD | 30-09-2020 | Japan | Listed | Insurer | No | No |
| Mapfre | 11-03-2019 | Spain | Listed | Insurer | No | Yes |
| MetLife | | United States | Listed | Insurer | No | No |
| Munich Re | 06-08-2018 | Germany | Listed | Reinsurer | No | Yes |
| PICC | | China | Listed | Insurer | No | No |
| Ping An | | China | Listed | Insurer | No | No |
| Prudential | | United States | Listed | Insurer | No | No |
| QBE | 01-04-2019 | Australia | Listed | Insurer | No | Yes |
| SCOR | 06-09-2017 | France | Listed | Reinsurer | Yes | Yes |
| Samsung FM | 12-11-2020 | Korea, Rep. | Listed | Insurer | No | No |
| Sinosure | | China | Unlisted | Insurer | No | No |
| Sompo | 23-09-2020 | Japan | Listed | Insurer | No | Yes |
| Starr | | United States | Unlisted | Insurer | Yes | No |
| Swiss Re | 02-07-2018 | Switzerland | Listed | Reinsurer | No | Yes |
| TIAA | | United States | Unlisted | Insurer | No | No |
| The Hartford | 20-12-2019 | United States | Listed | Insurer | No | No |
| Tokio Marine | 28-09-2020 | Japan | Listed | Insurer | No | Yes |
| Travelers | 07-02-2022 | United States | Listed | Insurer | No | No |
| WR Berkley | | United States | Listed | Insurer | Yes | No |
| XL Catlin | | Bermuda | Acquired by AXA | Insurer | | |
| Zurich | 13-11-2017 | Switzerland | Listed | Insurer | No | Yes |

## Table IA.3: Prevalence of oil & gas underwriting policies by insurer

This table lists oil & gas underwriting policies over time for the insurers in the sample. A value of one indicates that an insurer has an oil & gas underwriting policy in place in a year, and a value of zero indicates that an insurer has no underwriting policy. Missing values reflect that an insurer was not included in the IOF scorecards or that its policies were not assessed by IOF in a year. The sample is based on annual scorecards compiled by Insure Our Future (IOF).

| Name | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | % Years w/ policy |
|---|---|---|---|---|---|---|---|---|
| AIG | | | | 0 | 0 | 1 | 1 | 50 |
| AXA | | | | 1 | 1 | 1 | 1 | 100 |
| Allianz | | | | 0 | 1 | 1 | 1 | 75 |
| Aviva | | | | 1 | 0 | 1 | 1 | 75 |
| Axis Capital | | | | 1 | 1 | 1 | 1 | 100 |
| Berkshire Hathaway | | | | 0 | 0 | 0 | 0 | 0 |
| Chubb | | | | 0 | 0 | 0 | 1 | 25 |
| Convex | | | | | 0 | 0 | | 0 |
| Everest Re | | | | | 0 | 0 | 0 | 0 |
| FM Global | | | | | | | | |
| Generali | | | | 1 | 1 | 1 | 1 | 100 |
| HDI | | | | 1 | 1 | 1 | 1 | 100 |
| Hannover Re | | | | 1 | 1 | 1 | 1 | 100 |
| Legal and General | | | | | | | | |
| Liberty Mutual | | | | 0 | 0 | 0 | 0 | 0 |
| Lloyd's | | | | 0 | 1 | 1 | 1 | 75 |
| MS&AD | | | | 0 | 0 | 0 | 1 | 25 |
| Mapfre | | | | 0 | 1 | 1 | 1 | 75 |
| MetLife | | | | | | | | |
| Munich Re | | | | 1 | 1 | 1 | 1 | 100 |
| PICC | | | | | 0 | 0 | 0 | 0 |
| Ping An | | | | 0 | 0 | 0 | 0 | 0 |
| Prudential | | | | | | | | |
| QBE | | | | 0 | 1 | 1 | 1 | 75 |
| SCOR | | | | 0 | 0 | 1 | 1 | 50 |
| Samsung FM | | | | 0 | 0 | 0 | 1 | 25 |
| Sinosure | | | | 0 | 0 | 0 | 0 | 0 |
| Sompo | | | | 0 | 0 | 1 | 1 | 50 |
| Starr | | | | | | 0 | 0 | 0 |
| Swiss Re | | | | 1 | 1 | 1 | 1 | 100 |
| TIAA | | | | | | | | |
| The Hartford | | | | 1 | 1 | 1 | 1 | 100 |
| Tokio Marine | | | | 0 | 0 | 1 | 1 | 50 |
| Travelers | | | | 0 | 0 | 1 | 1 | 50 |
| WR Berkley | | | | 0 | 0 | | 0 | 0 |
| XL Catlin | | | | | | | | |
| Zurich | | | | 1 | 1 | 1 | 1 | 100 |
| % Insurance groups w/ policy | | | | 37 | 43 | 60 | 73 | |
| # Insurance groups | 25 | 24 | 30 | 30 | 30 | 30 | 30 | |

## Table IA.4: Stringency of oil & gas underwriting policies by insurer

This table reports scores reflecting the stringency of oil & gas underwriting policies over time of the insurers in the sample. The scores range from 0 to 10, with higher values reflecting stricter policies. We rank insurers in all panels based on the 2023 score values (from high to low). The sample period starts in 2020 because policy strength was not assessed before. The sample is based on annual scorecards compiled by Insure Our Future (IOF).

| Name | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Average score |
|---|---|---|---|---|---|---|---|---|
| Generali | | | | 1.94 | 1.91 | 2.75 | 4.00 | 2.65 |
| Aviva | | | | 0.56 | 0.00 | 4.00 | 4.00 | 2.14 |
| Allianz | | | | 0.00 | 1.25 | 2.88 | 3.74 | 1.97 |
| Hannover Re | | | | 1.00 | 1.43 | 3.00 | 3.39 | 2.21 |
| Swiss Re | | | | 0.33 | 1.61 | 2.88 | 3.34 | 2.04 |
| HDI | | | | 0.97 | 0.74 | 1.75 | 2.54 | 1.50 |
| Munich Re | | | | 2.50 | 1.43 | 3.00 | 2.41 | 2.33 |
| Mapfre | | | | 0.00 | 1.43 | 1.50 | 2.08 | 1.25 |
| AXA | | | | 1.67 | 1.79 | 1.88 | 1.98 | 1.83 |
| SCOR | | | | 0.00 | 0.00 | 1.25 | 1.68 | 0.73 |
| Zurich | | | | 1.67 | 0.59 | 1.38 | 1.49 | 1.28 |
| Chubb | | | | 0.00 | 0.00 | 0.00 | 1.34 | 0.34 |
| Axis Capital | | | | 2.11 | 1.07 | 1.38 | 1.34 | 1.47 |
| AIG | | | | 0.00 | 0.00 | 1.25 | 1.30 | 0.64 |
| QBE | | | | 0.00 | 0.74 | 1.38 | 1.20 | 0.83 |
| Sompo | | | | 0.00 | 0.00 | 1.38 | 1.17 | 0.64 |
| Tokio Marine | | | | 0.00 | 0.00 | 1.25 | 1.00 | 0.56 |
| Samsung FM | | | | 0.00 | 0.00 | 0.00 | 1.00 | 0.25 |
| MS&AD | | | | 0.00 | 0.00 | 0.00 | 1.00 | 0.25 |
| The Hartford | | | | 0.56 | 0.59 | 1.12 | 0.90 | 0.79 |
| Travelers | | | | 0.00 | 0.00 | 1.12 | 0.90 | 0.51 |
| Lloyd's | | | | 0.00 | 0.71 | 0.00 | 0.07 | 0.20 |
| Everest Re | | | | | 0.00 | 0.00 | 0.00 | 0.00 |
| WR Berkley | | | | 0.00 | 0.00 | | 0.00 | 0.00 |
| Sinosure | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Liberty Mutual | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ping An | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Berkshire Hathaway | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| PICC | | | | | 0.00 | 0.00 | 0.00 | 0.00 |
| Starr | | | | | | 0.00 | 0.00 | 0.00 |
| MetLife | | | | | | | | |
| Legal and General | | | | | | | | |
| Prudential | | | | | | | | |
| FM Global | | | | | | | | |
| XL Catlin | | | | | | | | |
| Convex | | | | | | 0.00 | 0.00 | 0.00 |
| TIAA | | | | | | | | |
| Average score | | | | 0.49 | 0.51 | 1.17 | 1.40 | |
| # Insurance groups | 25 | 24 | 30 | 30 | 30 | 30 | 30 | |
| # Missing scores | 25 | 24 | 30 | 3 | 0 | 0 | 0 | |

## Table IA.5: Correlations between carbon underwriting and investment policies

This table reports correlations between carbon underwriting and investment policies. In Panel A, the table reports the correlations between carbon underwriting policies and carbon investment policies. The sample comprises 32 insurers and spans the period from 2017 to 2023. In Panel B, the table reports the correlations between the scores assigned to carbon underwriting policies and carbon investment policies of insurers. The sample comprises 25 insurers with carbon policies in place and spans the period from 2018 to 2023.

| Panel A: Prevalence of policies | | | | |
|---|---|---|---|---|
| | *Coal policy* | *Oil & gas policy* | *Coal inv. policy* | *Oil & gas inv. policy* |
| *Coal policy* | 1.00 | | | |
| *Oil & gas policy* | 0.62 | 1.00 | | |
| *Coal investment policy* | 0.79 | 0.65 | 1.00 | |
| *Oil & gas investment policy* | 0.59 | 0.87 | 0.62 | 1.00 |
| Panel B: Stringency of policies | | | | |
| | *Coal score* | *Oil & gas score* | *Coal inv. score* | *Oil & gas inv. score* |
| *Coal score* | 1.00 | | | |
| *Oil & gas score* | 0.55 | 1.00 | | |
| *Coal investment score* | 0.81 | 0.34 | 1.00 | |
| *Oil & gas investment score* | 0.36 | 0.33 | 0.55 | 1.00 |

## Table IA.6: Determinants of oil & gas underwriting policies

This table presents results from the following OLS regression:

$$Y_{i,t} = \beta \times X_{i,t-1} + \alpha_k + \alpha_t + \epsilon_{i,t},$$

where $i$ indexes an insurer and $t$ a year. In Columns 1 to 3, $Y$ is *Oil & gas policy*, which equals one if the insurer has an oil & gas underwriting policy, and zero otherwise. In Columns 4 to 6, $Y$ is *Oil & gas policy score*, which is a score ranging from 0 to 10, with higher scores indicating stricter oil & gas underwriting policies. $X$ is a vector of insurer-level characteristics. The sample is based on annual scorecards compiled by Insure Our Future (IOF). Standard errors are clustered at the insurer level and reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively. Table A.1 provides descriptions of all variables.

| | *Oil & gas policy* | | | *Oil & gas policy score* | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *2021* | 0.063 | 0.076 | 0.073 | -0.156 | -0.149 | -0.161 |
| | (0.083) | (0.081) | (0.079) | (0.243) | (0.262) | (0.311) |
| *2022* | 0.263** | 0.276*** | 0.308*** | 0.518 | 0.710* | 0.735* |
| | (0.101) | (0.095) | (0.097) | (0.345) | (0.398) | (0.398) |
| *2023* | 0.363*** | 0.384*** | 0.390*** | 0.573 | 0.873* | 0.814* |
| | (0.106) | (0.100) | (0.122) | (0.366) | (0.428) | (0.435) |
| *US* | | -0.572*** | -0.566*** | | -1.098*** | -1.100*** |
| | | (0.140) | (0.132) | | (0.253) | (0.388) |
| *Asia* | | -0.660*** | -0.750*** | | -1.186*** | -1.368*** |
| | | (0.097) | (0.110) | | (0.317) | (0.322) |
| *RoW* | | -0.349 | -0.390 | | -0.594** | -0.759 |
| | | (0.239) | (0.239) | | (0.280) | (0.609) |
| *NZIA* | | | -0.002 | | | 0.130 |
| | | | (0.109) | | | (0.300) |
| *Specialty insurer* | | | -0.275* | | | -0.333 |
| | | | (0.154) | | | (0.399) |
| *Unlisted insurer* | | | -0.324** | | | -1.149* |
| | | | (0.152) | | | (0.564) |
| *Total assets (log)* | | | -0.069 | | | -0.055 |
| | | | (0.053) | | | (0.148) |
| *ROA* | | | -0.021 | | | -0.103 |
| | | | (0.017) | | | (0.131) |
| Obs. | 117 | 117 | 117 | 64 | 64 | 64 |
| Adj. $R^2$ | 0.062 | 0.395 | 0.451 | 0.061 | 0.275 | 0.395 |
| # Insurance groups | 31 | 31 | 31 | 22 | 22 | 22 |