# Being Stranded on the Carbon Bubble? Climate Policy Risk and the Pricing of Bank Loans

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**Abstract**

Does neglecting the possibility that fossil fuel reserves become "stranded" result in a "carbon bubble", i.e., an overvaluation of fossil fuel firms? To address this question, we study whether banks price the climate policy risk. We hand collect global data on corporate fossil fuel reserves, match it with syndicated loans, and subsequently compare the loan rate charged to fossil fuel firms — along their climate policy exposure — to non-fossil fuel firms. We find that before 2015 banks did not price climate policy risk. After 2015, however, the risk is priced, especially for firms holding more fossil fuel reserves. We also provide some evidence that "green banks" charge marginally higher loan rates to fossil fuel firms.

*Keywords*: Environmental policy; Climate policy risk; Loan pricing; Loan maturity; Carbon bubble; Fossil fuel firms; Stranded assets
*JEL classification*: G2; Q3; Q5

## 1. Introduction

The carbon bubble is a hypothesized bubble in the valuation of firms that heavily depend on fossil fuels as factors of production. The term first appeared in a media article published by Le Page (2011) and in a report by the Carbon Tracker Initiative (2011). Subsequently, there has been an ongoing public discussion on the possibility that this hypothesized bubble affects financial stability (e.g., Bank of England 2015; ESRB 2016). Theoretically, higher than intrinsic values of fossil fuel firms might occur owing to ongoing policy initiatives to move to cleaner technology in the near future, so that fossil fuel reserves will lose their economic value and become unburnable or "stranded". This would imply considerable losses for fossil fuel firms, especially vis-à-vis other firms.

In this paper we examine the existence of a carbon bubble using the corporate loan market. We empirically study whether banks price in the risk that fossil fuel reserves will become stranded (i.e., banks price in the climate policy risk or exposure of fossil fuel firms). Our hypothesis is that a carbon bubble does not exist if banks place considerable weight on climate policy exposure when formulating the terms of lending to fossil fuel firms. Despite the potential importance for financial and economic stability of such loan pricing decisions of banks, there are no studies aiming at identifying a carbon bubble in the credit market.

The syndicated loan market provides an ideal setting to test our hypothesis for at least two interrelated reasons. First, banks are well-informed economic agents and, in principle, should price in the possibility that fossil fuel reserves will be stranded and the involved firms will incur losses. If they do not, then they clearly disregard an important source of risk for the sake of offering more competitive loan rates. In addition, syndicated loans are large loan contracts, potentially implying large or even crippling losses for the involved lenders if they are

mispriced. This holds especially for the lead arrangers, who usually hold large shares of the loans and are the ones responsible for pricing decisions.

Second, in the formation of the loan syndicate, lead banks are liable to participant banks for the pricing of all relevant risks, and the effective screening and monitoring of borrowing firms. Thus, despite any moral hazard issues in the formation of the syndicate (Sufi 2007; Ivashina 2009), lead arrangers have additional reputational incentives to price loans accurately and face associated reputational costs if they do not.

To conduct our analysis, we match syndicated loans data from Dealscan with firm-year data from Compustat. We concentrate on the period from 2007 onward because the appropriate environmental policy initiatives are relatively recent and data on country-specific climate stringency indicators become readily available. Our main outcome variable is the all-in-spread-drawn (AISD), defined as the loan spread plus any facility fee, but in sensitivity tests we also use information on commitment fees. Subsequently, we hand-collect firm-year data on fossil fuel reserves from firms' annual reports. Some firms hold fossil fuel reserves in more than one country and thus we construct a relative measure of reserves for each firm, in each country, and in each year. Finally, we generate a firm-year measure of climate policy exposure (risk) from the product of relative reserves and either one of the Climate Change Cooperation Index (C3I) by Bernauer and Böhmelt (2013) or the Climate Change Policy Index (CCPI) by Germanwatch. These country-year indices, respectively available for the periods 1996-2014 and 2007-2017, reflect environmental policy stringency and thus risk.

To ensure empirical identification, we mainly use a framework, whereby we compare (i) the loan pricing of fossil fuel firms (treatment group) to non-fossil fuel firms (control group), and (ii) fossil fuel firms according to their different country-specific climate policy exposure. This is

a robust empirical model, as long as our measure of climate policy exposure is independent from other idiosyncratic shocks that also affect loan spreads and fees. To this end, the validity of our identification method is significantly strengthened via the fielding of several loan and firm-year characteristics and fixed effects (e.g., loan type and purpose, country and year fixed effects, etc.). Important fixed effects are the bank*year ones, which saturate the model with time-varying supply-side characteristics that might affect loan spreads, and the firms' country effects, which imply identification before and after changes in the country-specific climate policy exposure. These controls and fixed effects make it unlikely that our model suffers from a violation of its identifying assumptions.

Our results, drawn from the full sample, show that the AISD of fossil fuel firms that are more exposed to climate policy risk are not significantly higher compared to non-fossil fuel firms and fossil fuel firms with relatively low risk. This result holds irrespective of the mix of firm controls and fixed effects, and the measure of environmental policy stringency used (C3I or CCPI). We posit that this finding either suggests the existence of a carbon bubble due to the non-pricing of environmental policy exposure of fossil fuel firms or shows that banks specifically disregard the possibility that environmental policy will lead to considerable losses from stranded assets.

As the notion of a carbon bubble is relatively recent, originating in 2011 and gaining in prominence only after the Paris Agreement in December 2015, we subsequently focus on the most recent years of our sample. Specifically, we examine a model, where we compare the AISD (i) of fossil fuel firms according to their environmental policy exposure, (ii) of fossil fuel to non-fossil fuel firms, and (iii) before and after each year from 2011 onward. When using the CCPI-based measure of climate policy exposure, which is available for the most recent years of our

sample, we find the first evidence for pricing of climate policy risk in the post-2015 period. However, the economic significance is rather small: a one standard deviation increase in our measure of climate policy exposure implies that risky fossil fuel firms from 2015 onward are on average given a 2-basis points higher AISD compared to less exposed fossil fuel firms, non-fossil fuel firms, and themselves before 2015.

To give a feeling about the magnitude of this effect, we first show that the 2-basis point increase implies an increase in the total cost of the loan with a mean amount and maturity (of USD 19 million and 4 years) by around USD 0.2 million. Then, we hand collect data on the dollar value of fossil fuel reserves and find that the mean fossil fuel firm in our sample holds approximately USD 4,679 million of such reserves. Thus, it seems unlikely that the corresponding increase that we identify in the post-2015 period covers the potential losses from stranded assets.

We further investigate this finding by using the actual value of the holdings of proved fossil fuel reserves, instead of simply examining average differences between the fossil fuel and non-fossil fuel firms. Retaining the dichotomy between the pre-2015 and post-2015 periods, we find that a one standard deviation increase in our measure of climate policy exposure implies an AISD that is higher by approximately 16 basis points for the fossil firm with mean proved reserves scaled by total firm assets in the post-2015 period vs. the non-fossil fuel firm. This implies an increase in the total cost of borrowing for the mean loan by USD 1.5 million. This extra cost of borrowing represents salient evidence that banks are aware of the climate policy issue and started pricing the relevant risk post-2015.

The results on the all-in-spread-undrawn (AISU) reveal similar (albeit not fully robust) evidence for higher facility and commitment fees to fossil fuel firms; however, the economic

effect is again too small not to be concerned about a carbon bubble. We also conduct several other robustness tests related to the location of reserves (in one versus multiple countries), our measure of fossil fuel reserves, the mix of control variables and fixed effects used, etc.

Moreover, we look into the role of loan maturity, given the potential higher importance of environmental policy risk for long-term loans. We find that the role of loan maturity either in the loan-pricing equations or as dependent variable (i.e., examining the direct effect of climate policy exposure on loan maturity) is very small. We document two last interesting findings. First, we show a tendency of fossil fuel firms to obtain slightly larger loans compared to non-fossil fuel firms when environmental policy becomes more stringent. Even though the respective increase in loan amounts is economically rather small, our finding is in line with a substitution effect due to higher environmental policy risk from "lost" access to equity finance toward bank credit. Second, we document a slightly higher loan pricing to fossil fuel firms by "green banks" (i.e., those participating in the United Nations Environment Programme Finance Initiative) when climate policy risk increases.

The rest of the paper is structured as follows. In section 2, we further motivate our paper based on the existing qualitative literature and show that the existing academic literature is quite distant from identifying a carbon bubble in the lending market. In section 3, we discuss our data set and the empirical model, with an emphasis on our identification method. In section 4, we analyze our empirical results and section 5 concludes.

## 2. Context, motivation and existing literature

### *2.1. A carbon bubble?*

Researchers and most policy makers identify climate change as anthropogenic (IPCC 2014). Economic and population growth in the industrial era has caused extreme increases in greenhouse gas (GHG) emissions, which are identified as the main source of the observed global warming (IPCC 2014). Since 1750, the major fraction of anthropogenic GHG emissions is carbon dioxide (CO2) emissions to the atmosphere and half of those have been emitted during the last 40 years.

The IPCC (2014) evaluates future impacts of emission scenarios with different temperature rises until 2100. Changes in global mean surface temperature up to the mid-21st century are similar for all considered scenarios in the absence of any major extreme weather events. However, from the mid-21st century onward, the global temperature, extreme weather events, and the sea level depend substantially on the choice of the emission path. The panel further identifies an almost linear dependency of global warming in 2100 on cumulative CO2 emissions.

In December 2015, the United Nations Framework Convention on Climate Change (UNFCCC) established the Paris Climate Agreement to limit the rise in global warming to 2°C compared to pre-industrial levels by the end of the century and further put forward an even more ambitious limit of 1.5°C. Limiting global warming to 2°C above pre-industrial temperature requires massive reductions in CO2 emissions in the next decades and near zero overall GHG emissions from the next century onward. To meet the 2°C limit in 2100 with a probability larger than 66%, the total cumulative emissions must not exceed 2900 gigatonnes CO2 (GtCO2). By 2011 already about 1900 GtCO2 have been emitted, leaving a budget of about 1000 GtCO2 for

the remaining 89 years (IPCC 2014). For comparison, combusting all of the remaining (ultimately recoverable) fossil fuel resources would lead to emissions of nearly 11,000 GtCO2, while the combustion of current reserves (recoverable under current economic conditions) would lead to nearly 2900 GtCO2 (McGlade and Ekins 2015).

The limiting of total carbon emissions will leave the majority of fossil fuel reserves as "stranded assets". That is, companies owing fossil fuel will not be able to use most of their reserves. The Carbon Tracker Initiative (2011; 2013) is the first effort to estimate the amount of stranded assets of listed companies based on the global carbon budget from 2000-2050, resulting from limiting global warming to 2°C above the pre-industrial level. The findings show that 60% to 80% of current carbon reserves of listed firms will become stranded assets. Similarly, McGlade and Ekins (2015) estimate that 33% to 35% of current global oil reserves, 49% to 52% of current global gas reserves, and 82% to 88% of global coal reserves will be unusable. The large fraction of potentially unburnable fossil fuels poses risks of substantial financial losses to fossil fuel companies.

Despite the big fraction of potentially stranded assets, the Carbon Tracker Initiative (2013) further highlights that listed oil, gas, and coal companies still largely invest into locating and developing new fossil fuel reserves. This ongoing investment, together with the already large fraction of potentially stranded assets, suggests that the risks of stranded fossil fuels due to climate policies might be inaccurately priced by markets. Further, fossil fuel companies themselves find it "highly unlikely" that carbon emissions are cut to reach the 2°C target by 2050 (ExxonMobil 2014, 16). Therefore, financial markets might carry a carbon bubble, i.e., an overvaluation of fossil fuel reserves and related assets due to neglecting the possibility of those

assets becoming unusable or "unburnable", especially under the target of limiting global warming to 2°C above pre-industrial levels.

*2.2. Existing empirical literature and the cost of loans*

Empirical evidence on the existence of a carbon bubble is limited. In stark contrast, the potential effect of a carbon bubble on financial stability is vigorously discussed by researchers (Weyzig, Kuepper, van Gelder, and van Tilburg 2014; Schoenmaker, van Tilburg, and Wijffels 2015; Batten, Sowerbutts, and Tanaka 2016) and increasingly enters the agenda of regulators and supervisors (Bank of England 2015; Carney 2015; ESRB 2016). Thus, while discussing potential implications of a carbon bubble, the clarification of the existence and the extent of a carbon bubble are essential.

As one of the first, HSBC (2013) estimate the value-at-risk (VaR) from stranded assets of six oil and gas companies (Shell, BP, Total, Statoil, Eni, and BG). They measure unburnable assets according to their costs using data from Wood Mackenzie and show that the fraction of stranded assets varies among those companies. The VaR of stranded assets is calculated by aggregating the values of all unburnable projects. They show that a moderate reduction in the oil and gas demand could reduce the firms' equity value by 40% to 60% due to stranded oil and by 6% to 9% due to stranded gas reserves.

The event study by Batten, Sowerbutts, and Tanaka (2016) analyzes the market reaction to climate change news that covers the period 2011-2016. They classify an event as a news story in a major newspaper or energy-specific investment press, which contains the words "carbon bubble", "unburnable carbon", or "fossil fuel divestment". They find a positive and significant effect on the abnormal return for renewable energy companies, and a negative but insignificant effect on the abnormal return of oil and gas companies. They suggest that the insignificant effect

could result from investors' difficulties to assess credible future climate policies and their impact on the carbon-intense sectors.

Similarly, Byrd and Cooperman (2016) use as events announcements (between 2011 and 2015) concerning developments in the Carbon Capture and Storage (CCS) technologies. They find a positive and significant effect on the stock price from breakthroughs in CCS developments. However, setbacks in CCS technologies have a negative but insignificant effect on abnormal returns of the coal companies. The authors conclude that, either investors already price in the potential risk of climate-related stranded fossil fuels, or investors believe that governments would never limit the production of coal.

Carbon-intense sectors are largely debt financed, implying that the impact of stranded fossil fuels can easily spill over to the banking sector. This almost naturally generates a question on whether banks consider the risk that fossil fuel reserves will become stranded when originating or extending credit to fossil fuel firms. *Essentially, this implies that if banks thoroughly consider the risk of climate policy exposure in the pricing of corporate loans, then no carbon bubble exists in the credit market.* This is the hypothesis we test in this paper.

Furthermore, the paper adds to the literature on environmental, social, and governance issues in banking. Studying the impact of corporate social responsibility of firms on their cost of credit, Goss and Roberts (2011) find that banks charge significantly higher loan spreads to firms with below average corporate social responsibly. Similar, Hasan et al (2014) study the impact of tax avoidance by firms on their cost of credit. They conclude that tax avoidance increases the firm's loan rate. Focusing on firms' exposure to climate change, Kleimeier and Viehs (2016) analyze the effect of extra non-financial information by firms on their cost of credit. They show that firms that voluntarily disclose their carbon emissions are charged lower loan spreads than

non-disclosing firms. Moreover, firms disclosing larger carbon emissions face higher cost of credit than firms with low emissions. Battiston et al (2016) analyze the systemic impact of climate risks in the banking sector using an environmental stress-test. While they identify a small direct exposure of the banking sector to the fossil fuel sector, the exposure to all high-carbon sectors is much larger, especially due to the indirect exposure via financial counterparties.

## 3. Data and empirical model

### *3.1. Data and main variables*

To test the existence of a carbon bubble in the corporate loan market we use syndicated loans from Dealscan. These data are ideal because they provide information on new large loan facilities from large well-informed banks to large firms for which industry SIC codes are available. The loan pricing decisions in a loan syndicate are taken by lead banks (lead arrangers), who are liable to other participant banks for their decisions and thus bear reputational costs if they misprice loans. Thus, if anything, and despite moral hazard issues in the formation of the syndicate (Sufi 2007; Ivashina 2009), we expect that identifying a carbon bubble in the syndicated loans market, would probably imply that the bubble will be bigger in other smaller corporate loans.

We consider only loan facilities with information on loan spreads. In total, we have a cross-section of 72,742 loans in the period 2007-2016, but this number will be lower in our empirical analysis given data availability mainly on variables reflecting fossil fuel reserves. We match loans to firm-year accounting data from Compustat to identify general risk and performance indicators of firms. We provide detailed definitions of all variables in Table 1.

[Insert Table 1 about here]

Our main outcome variable is the so called all-in-spread-drawn, *AISD*, which equals the spread of the loan facility over LIBOR plus any facility fee. Berg, Saunders, and Steffen (2016) show the importance of fees in the overall pricing of loans. Thus, in robustness checks, we use the all-in-spread-undrawn (*AISU*) as dependent variable to assess the impact of climate policy exposure on fees. The *AISU* is the sum of the facility fee and the commitment fee.[1]

Ideally, our main explanatory variable illustrating climate policy exposure would be the amount of stranded assets of a fossil fuel firm $f$ in year $t$.[2] However, such estimates are only given as snap shots in time (Carbon Tracker Initiative 2011, 2013, McGlade and Ekins 2015). In principle, a devaluation of fossil fuel reserves can be caused due to changes in regulation (policies), technologies or carbon prices. Climate policies involve direct environmental regulations, e.g., pollution outputs and inputs, as well as stimulating the development of alternative technologies, by, e.g., subsidizing instruments. The probability of stranded fossil fuel reserves is thus higher in countries with higher climate policy stringency. Therefore, we can proxy the risk of stranded fossil fuel reserves by the risk of climate policies stringency, i.e., whether a country places considerable effort in climate change policies. That is, a fossil fuel firm owing exploration rights for reserves in a country with strict climate policy faces a higher probability of reserves being stranded than a firm with fossil fuel reserves in a country with loose climate policy.

This also implies that we require information on the total amount of fossil fuel reserves of firms across countries. As these data are not readily available in conventional databases, we hand-collect them from firms' annual reports. To get the most comprehensive data, we only

[1] Due to lack of information for several countries, we cannot utilize other types of fees, such as the utilization fee (paid on the drawn amount once a threshold has been exceeded), or cancellation and upfront fees.

[2] Parts of a firm's climate policy exposure might also be affected by climate policy in their customers' countries. However, such foreign country policy is unlikely to reflect a firms' climate policy exposure because fossil fuel firms are unlikely to decline profitable business opportunities (and thus lower fossil fuel production) based on these risks.

consider the amount of proved oil and gas reserves and proven and probable coal reserves.[3] Proved oil and gas reserves are "the estimated quantities of oil and gas, which, by analysis of geoscience and engineering data, can be estimated with "reasonable certainty" to be economically producible from a given date forward, from known reservoirs, and under existing economic conditions, operating methods, and government regulations" (US Security and Exchange Commission-SEC).[4] We convert the amount of coal, gas, and oil reserves into barrels of oil-equivalent according to common approximate conversion factors.[5]

A further problem is that large firms could hold fossil fuel reserves in more than one country or even exploit loose policies of countries to move their exploration activities there. To capture the differences in the firms' allocation of fossil fuel reserves by country, we first hand-collect data (from firms' annual reports) on the location of these assets. Then, we define the climate policy exposure of a firm *f* in year *t* as:

$$Climate\ policy\ exposure_{ft} = \sum_c Relative\ reserves_{fct} \times Climate\ policy\ index_{ct}\ , \qquad (1)$$

In equation (1) *Relative reserves* is the relative amount of fossil fuel reserves of firm *f* in country *c* in year *t*.

[3] SEC uses the term "proved reserves" for oil and gas reserves and "proven" reserves for coal reserves. In the remainder of the paper, we use the term "proved reserves" for all kinds of reserves (oil, gas, and coal).

[4] Similarly, proven coal reserves are "reserves for which (a) quantity is computed from dimensions revealed in outcrops, trenches, workings or drill holes; grade and/or quality are computed from the results of detailed sampling and (b) the sites for inspection, sampling and measurement are spaced so closely and the geologic character is so well defined that size, shape, depth and mineral content of reserves are well-established." Probable coal reserves are "reserves for which quantity and grade and/or quality are computed form information similar to that used for proven (measure) reserves, but the sites for inspection, sampling, and measurement are farther apart or are otherwise less adequately spaced. The degree of assurance, although lower than that for proven (measured) reserves, is high enough to assume continuity between points of observation" (US Security and Exchange Commission-SEC).

[5] See additional material to BP Statistical Review of World Energy June 2017, http://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review-2017/bp-statistical-review-of%20world%20energy-2017-approximate-conversion-factors.pdf, accessed June 29, 2017.

In turn, *Climate policy index* is the climate policy index of country *c* in year *t*. A thorough measure of a country's climate policy stringency should include both its climate policy ambition and its climate policy effort. The former is measured by the efficiency in climate policy implementation while the latter is measured by climate policy outcomes such as CO2 emissions. There are two such indices available for our analysis.[6] The first is the Climate Change Cooperation Index (C3I) by Bernauer and Böhmelt (2013). The C3I evaluates countries' overall climate policy performance, as well as performance in terms of political behavior (output) and emissions (outcome). Currently, the index covers the period 1996-2014 for up to 172 countries, and takes values between 0 and 100 (inclusive) with higher values indicating stricter climate policy (more climate-friendly countries). An alternative is the Climate Change Performance Index (CCPI) by Germanwatch (Burck, Hermwille, and Bals 2016).[7] This index, available for the period 2007-2017 and covering 58 countries, takes values on the interval [0,100], with higher values reflecting higher climate policy effort by countries. The countries covered produce the majority of global energy-related CO2 emissions. As analyzed by Bernauer and Böhmelt (2013) the two climate policy indices are positively correlated and useful empirical measures.

Based on the above, a higher *Climate policy exposure* indicates a higher average level of fossil fuel reserves in countries with stricter climate policy.

### *3.2. Empirical identification and control variables*

[6] An alternative measure is the OECD's Environmental Policy Stringency (EPS) index (Botta and Kozluk 2014). However, the EPS index primarily considers policies in the energy sector, especially policies applying to electricity generation. Stricter policies for the electricity sector of a country do not necessarily affect fossil fuel reserves in that country. Therefore, the EPS index is not a good proxy for the risk of stranded fossil fuel reserves.

[7] The publicly available CCPI time series includes changes in weightings within the sample period; however, we have received a CCPI data set by Germanwatch that is based on a uniform weighting method introduced in 2013 and covers the period 2007-2017. The CCPI comprises of fifteen measures that are classified into the five categories, namely Emissions Level, Development of Emissions, Efficiency, Renewable Energies, and Climate Policy. 80% of the measures are based on objective indicators and 20% on national and international climate policy assessments from about 300 experts from the respective countries.

We estimate the effect of a firm's *Climate policy exposure* on the cost of loans, using an empirical model of the following form:

$$CL_{lbft} = a + a_1 FossilFuel_{ft} + a_2 Climate\ policy\ exposure_{ft} + \quad (2)$$
$$a_3 FossilFuel_{ft} \times Climate\ policy\ exposure_{ft} + a_4 L_{lt} + a_5 F_{ft} + u_{lbft}$$

In equation (2), *CL* is the cost (*AISD* or *AISU*) of a loan facility. The loan is given by lead bank(s) *b* of the syndicate to firm *f* in year *t*. *FossilFuel* is a dummy variable that equals 1 if firm *f* owns fossil fuel reserves in year *t* and 0 otherwise. As an alternative to *FossilFuel*, we can use the dollar value of proved reserves scaled for firm size (named *Proved Reserves over Total Assets*) but we reserve this for sensitivity tests, as it is hard to calculate these reserves for coal firms. *L* and *F* are vectors of loan and firm-year characteristics that might affect the cost of loans. Further, *a* is a vector of fixed effects and $u$ is the remainder disturbance.

At the loan-level, we control for the loan amount, the maturity of the loan facility, whether a loan has collateral, the number of lenders in the syndicate, whether a loan has performance pricing provisions, the number of general covenants, and a number of dummy variables that indicate the loan type and the purpose of the loan. Moreover, we control for the effect of unobserved loan-specific characteristics using loan type and loan purpose fixed effects. Typical control variables of borrowing firms that affect the cost of loans are firm size, market-to-book ratio, leverage, and tangibility. At the country-level, we control for borrower's country GDP per capita and the GDP growth rate. For definitions of these variables, see Table 1; for similar control variables in loan pricing equations, see e.g., Ivashina (2009) and Delis, Hasan, and Ongena (2017).

If the terms of lending are affected by the risk of fossil fuel reserves to become unburnable, then we should observe $a_3 > 0$. That is, firms with a larger average exposure to climate-policy stringency face a higher risk that their fossil fuel reserves become stranded. Consequently, if banks price in this risk, firms with larger average exposure should face higher cost of loans. Thus, our model compares the terms of lending of fossil fuel firms to other firms that bear no risk of stranded reserves and the risk of fossil fuel reserves to become stranded based on the exposure to country-specific climate-policy stringency.

A potential identification issue in equation (2) could be the presence of an omitted-variable bias emerging from other risk characteristics of banks and firms. First, it might be that the time-varying supply-side policies of banks drive the results. The fact that in our data every lead bank gives multiple loans within a year, allows using bank*year fixed effects, which saturate the model from supply-side explanations of the findings. Considering demand-side potential omitted variables, the usual time-varying firm-specific measures of risk and performance, along with the use of the interaction term, mitigate such concerns. Thus, along with the fielding of our model with firm-year indicators of risk and performance, it is unlikely that coefficient $a_3$ would capture anything other than a shift due to climate policy exposure of fossil fuel firms vis-à-vis other firms.

If we identify an effect, this should be more pronounced in the recent years in which environmental policy intensified and the notion of a carbon bubble appeared. Thus, in a more stringent identification method, we can distinguish the periods before and after 2011, which is the first year that the term carbon bubble appeared (Le Page, 2011; Carbon Tracker Initiative report, 2011). This implies a specification, where the triple interaction between *FossilFuel*,

*Climate policy exposure*, and *Post2011* (along with relevant double interactions) enters our estimated model. *Post2011* takes the value 0 before 2012 and the value 1 from 2012 onward.

The model takes the form:

$$CL_{lbft} = a'_{bt} + a'_1 L_{lt} + a'_2 F_{ft} + + a'_3 FossilFuel_{ft} + a'_4 Post2011_t + a'_5 Climate\ policy\ exposure_{ft} + a'_6\ FossilFuel_{ft} \times Post2011_t + a'_7 FossilFuel_{ft} \times Climate\ policy\ exposure_{ft} + a'_8 Post2011_t \times Climate\ policy\ exposure_{ft} + a'_9 FossilFuel_{ft} \times Post2011_t \times Climate\ policy\ exposure_{ft} + u'_{lbft} \quad (3)$$

This approach compares, in the pre- and post-2011 periods, the terms of lending of fossil fuel to non-fossil fuel firms based on their climate policy exposure. Because the notion of a carbon bubble has publicly emerged, we should observe that financial intermediaries increasingly factor post-2011 the risk of fossil fuel reserves to become unburnable into the terms of lending of these firms (relative to non-fossil fuel firms). That is we should observe $a'_9 > 0$. In further tests, we include equivalent triple interactions with post-2012 and post-2013 dummies.

## 4. Empirical results

### *4.1. Summary statistics and anecdotal evidence*

We provide basic summary statistics of our data set in Table 2 for the period 2007 to 2016. The mean C3I is 54.80 and the mean CCPI 42.11. Overall, we have fossil fuel reserves data for 217 fossil fuel firms, of which 25 operate in the coal-mining sector, and our reserves data covers 2/3 of the listed fossil fuel firms in the Dealscan data set. Moreover, in Table A.1 we provide

summary statistics on the firms' relative amount of fossil fuel reserves by country. As highlighted in these statistics, in the period 2007-2016 firms in our sample own fossil fuel reserves in 59 different countries, with each firm owning fossil fuel reserves in 1.39 countries on average. Table A.2 reports fossil fuel firms' country of headquarter and Table A.3 lists all fossil fuel firms in our sample that own oil, gas, and coal reserves. Table A.4 reports summary statistics for the C3I for countries in which firms in our sample own fossil fuel reserves in the period 2007-2014. Table A.5 provides the equivalent for the CCPI over the period 2007-2016. The evolution over time of the two climate policy indices is illustrated in Figure A.1 for eight representative countries.

[Insert Table 2 about here]

Figure 1 illustrates the relation of the firms' climate policy exposure and *AISD* and Figure 2 the respective between climate policy exposure and *AISU*. The results do not reflect a strong correlation between climate policy risk and each of the measures of the cost of credit. In what follows, we aim to examine causal effects.

[Insert Figures 1 & 2 about here]

*4.2. Empirical results*

We first use the C3I and the period 2007-2014 and report the results in Table 3. All specifications control for loan type and loan purpose fixed effects as well as for supply-side effects using bank*year fixed effects. To exclude a potential effect of bad controls, specification (1) includes only loan characteristics, specification (2) firm and macro controls, and specification (3) our full set of controls. All specifications yield very similar inferences. Based on the specification (3), being a fossil fuel firm does not imply a significantly higher cost of credit. Further, throughout specifications (1) to (3), the interaction term between *FossilFuel* and *Climate*

*Policy Exposure* is statistically insignificant,[8] implying no differential effect of climate policy risk on the cost of credit between fossil fuel (treated) and non-fossil fuel (control) firms. The findings remain unchanged when we include bank's country, time, and firm's country fixed effects in specification (4).

[Insert Table 3 about here]

In Table 4, we replicate the results of Table 3 using the CCPI to measure country policy risk. The results are somewhat different in that the main term of *Fossil Fuel* is positive and statistically significant across all specifications (i.e., irrespective of using different controls and/or fixed effects). This finding is intuitive because especially oil and gas projects are capital intensive and have long lead times. Further, the exploration of oil and gas is inherently risky, with an average exploration success of approximately 33% (Tordo, Johnston, and Johnston, 2010). However, we still do not find that this effect is due to climate policy risk, as the interaction term between *FossilFuel* and *Climate Policy Exposure* is statistically insignificant. In sum, our results so far are indicative of a carbon bubble, as banks in our full sample period did not price in the climate policy exposure of fossil fuel firms and the possibility that fossil fuel reserves will become stranded.[9]

[Insert Table 4 about here]

The debate on climate policy risk carried by fossil fuel firms has arisen toward the end of our sample period. Using equation (3), we therefore examine whether a fossil fuel firm's exposure to climate policy risk affects its cost of borrowing after the emergence of the notion of a carbon bubble. Columns (1) and (2) of Table 5 report the results when focusing on the period

[8] The main term of *Climate Policy Exposure* drops out due to multicollinearity.
[9] In this paper, we do not examine credit rationing to fossil fuel firms (loan-level data, including loan denials, for many countries are not available). We should note, however, that the first buffer of banks toward climate policy risk should be reflected in loan pricing. Indeed, as we find limited evidence for increased lending rates, banks are unlikely to disrupt lending altogether because of climate policy exposure.

directly following the emergence of the carbon bubble discussion in 2011. The interaction term *FossilFuel×Post2011×Climate policy exposure* captures the difference in cost of credit due to a fossil fuel firms' climate policy exposure after 2011. As there might be a time lag until the notion of the carbon bubble reached a wider audience, in specifications (3) and (4) we consider the equivalent effect post 2012; and in specifications (5) and (6) post 2013. However, our results on the triple interaction terms do not identify a significant relation between climate policy exposure and the firm's costs of credit in the years after the emergence of the notion of the carbon bubble.

In Table 6, we use the CCPI to measure climate policy exposure. As the CCPI covers the period 2007 to 2017, we can extend the time window of our analysis to include the most recent years. Again, specifications (1) and (2) report the results just after the emergence of the notion of a carbon bubble in 2011; in columns (3) and (4) we use 2013 as the threshold year; and in columns (5) and (6), we use 2015. The first four specifications yield once more insignificant estimates on the triple interaction term. However, in the post-2015 period, there is a positive and significant effect (at the 10% level). This is the first evidence that banks started pricing in the climate policy exposure of fossil fuel firms from 2015 onward. Interestingly, 2015 coincides with the Paris Agreement and the denser series of reports and academic articles on the carbon bubble until that time (Dyer, 2015; Jacob and Hilaire, 2015; McGlade and Ekins, 2015; King et al., 2015).

[Insert Tables 5 and 6 about here]

This analysis by itself does not provide evidence for or against a carbon bubble. To inquire into this, we hand-collect data on the dollar value of proved reserves. Essentially, *Proved Reserves* is the standardized measure of discounted future net cash flows related to proved oil and gas reserves (see Table 1). As shown in Table 2, the mean *Proved Reserves* for the firms in

our sample equals 4,679.24 million USD. At the same time, column (6) of Table 6 documents that a one standard-deviation increase in *Climate Policy Exposure* yields a 2 basis-point increase in the cost of loans to fossil fuel firms relative to firms with stable CCPI and non-fossil fuel firms in the post-2015 period. Based on this estimate and the statistics reported in Table 2.b, for the loan with the mean amount and maturity, this implies an increase in the total cost by approximately USD 188,628 (calculated from $0.0002 \times 258{,}395{,}004.4 \times 3.65$).[10] Comparing the increase in the cost of loans to fossil fuel firms with the mean *Proved Reserves*, it seems unlikely that this extra cost covers the potential losses from stranded assets.

Could it be that an increased cost of borrowing is hiding in the loan fees and not the spreads? Berg, Saunders, and Steffen (2016) note the importance of fees in syndicate loan pricing. Even though information on fees in the global syndicate sample is limited, we do have some information on *AISU*. Figure 2 illustrates the relation of the loan's *AISU* and the exposure to climate policy but, as in Figure 1, we do not observe a strong relation between the two variables.

We then replicate our baseline regression analysis using *AISU* as dependent variable and report the results in Table 7. From this point onward, we use the CCPI given its availability for the most recent period. The estimates on the interaction term are statistically insignificant. These results are not driven by the smaller sample: redoing our baseline analysis on *AISD* and the sample where *AISU* is non-missing, yields very similar results with those of Tables 3 and 4 (the interaction term between *FossilFuel* and *Climate Policy Exposure* is statistically insignificant). We can conclude that there is no evidence that climate policy risk matters in terms of higher commitment and facility fees paid by fossil fuel firms.

[10] This is derived from the 2 basis points (=0.0002) and the inverse logarithms of the loan amount and loan maturity (in years=3.65), respectively.

[Insert Table 7 about here]

An important alternative specification comes from using *Proved Reserves over Total Assets* instead of *FossilFuel*. *Proved Reserves* are the standardized measure of discounted future net cash flow from proved oil and gas reserves (see Table 1). The advantage of this approach is that we have a continuous measure for fossil fuel reserves and thus we do not simply treat all fossil fuel firms similarly with a dummy variable: firms owning more such reserves are more exposed to climate policy risk. The disadvantage of this measure is that we have limited information for coal firms.

As we do not identify any evidence for a significant double interaction term when estimating equation (2), we focus on the results from equation (3) and especially those for the post-2015 period. We report them in Table 8. Our findings reinforce those of Table 6 (the triple interaction is positive and statistically significant at the 1% level) but provide a clearer picture on the economic significance of differential pricing based on the actual amount of fossil fuel reserves. Specifically, based on column (4), a one standard deviation increase in *Climate Policy Exposure* implies a higher *AISD* by approximately 16 basis points for the fossil firm with mean *Proved Reserves over Total Assets* in the post-2015 period vs. the non-fossil fuel firm.

Working in the same way as in Table 6, this implies an increase in the total cost of borrowing by USD 1,517,295. If we alternatively take the marginal effect with respect to *Proved Reserves over Total Assets*, we find that only a 1% point increase in these reserves implies a 6.9 basis points increase in *AISD*, or USD 650,768.

Concisely, the analysis of Table 8 indicates a considerably higher cost of borrowing for fossil fuel firms due to either increased climate policy exposure or increase in the actual amount of fossil fuel reserves. Despite the fact that this extra cost of borrowing is still small compared to

the mean *Proved Reserves* of fossil fuel firms in our sample (equal to 4,679.24 million USD), the analysis of Table 8 provides the first salient evidence that banks are aware of the climate policy issue and start pricing the relevant risk, especially for firms that own a large portfolio of proved reserves.

[Insert Table 8 about here]

To ensure that our results hold for oil and gas reserves (for which we have the cleanest data on proved reserves) and are not driven by coal reserves, we repeat the analysis of Table 8 only for the relevant firms. The results in Table 9 are almost identical to those in Table 8. Replicating Tables 4 to 6, using oil and gas reserves, also produces very similar results (available on request). We conduct further robustness tests on our baseline results in the next section.

[Insert Table 9 about here]

*4.3. Other sensitivity tests*

We conduct several sensitivity tests and report the results in the Appendix. So far, we focused on firms that disclose their fossil fuel reserves at the country level. However, this automatically excludes some of the well-known fossil fuel firms (e.g., Shell, ExxonMobil), which typically operate worldwide and only disclose their aggregate fossil fuel reserves at a regional level. We conduct a sensitivity test to include these firms in our sample by splitting the regional reserves equally to each country of the region.[11] In general, our findings are in line with our baseline results (results available on request), indicating a small increase in the cost of loans for fossil fuel

[11] For instance, Royal Dutch Shell Plc discloses its 2014 proved reserves at a continental level, for Europe, Asia, Oceania, Africa, USA, Canada, and South America. In Europe, Shell estimates total proved reserves of 2,728 million barrels of oil equivalents and further reports its upstream operations in Europe to take place in 10 countries (Albania, Denmark, Germany, Greenland, Ireland, Italy, Netherlands, Norway, the UK, and Ukraine). Therefore, for Shell we assign 272.8 million barrels of oil equivalents (dividing the total reserves in Europe by the number of European countries in which Shell operates) to each of the 10 European countries in which it operates. Table A.3b reports the additional firms used in the extended data set. Firms that disclose fossil fuel reserves by region own reserves in up to 36 countries. *Proved Reserves over Total Assets* are not available for any of the additional firms; thus, there is no change over the results in Table 8.

firms relative to other firms in the post-2015 period. Moreover, in our main analysis, we use proved *reserves* and exclude "probable oil and gas reserves." Probable reserves are "those additional reserves that are less certain to be recovered than proved reserves but which, together with proved reserves, are as likely as not to be recovered" (US Security and Exchange Commission-SEC). Once more, our inferences are very similar to that of the baseline results (results available on request).

We also examine whether our findings are in fact due to general political and policy uncertainty in the countries examined, and not due to climate policy uncertainty in particular. We measure political instability using the State Fragility Index (SFI) from the Center for Systemic Peace, which measures countries' effectiveness and legitimacy in managing conflicts and their ability to implement public policies. The SFI varies between 0 (no fragility) to 25 (extreme fragility). Table A.6 reports the results as in Table 8, introducing triple interactions with the SFI in the fashion of (and in addition to) the triple interactions with the CCPI. The results document an insignificant triple interaction with the SFI and, if anything, make the triple interaction term involving the CCPI economically more potent.

Finally, we use an alternative measure of public attention/awareness of the risk of stranded fossil fuel reserves (compared to simply using the pre-post-2015 variation). Specifically, we use a Google-search of the term "carbon bubble" to infer public awareness on this issue. We also experiment with the terms "stranded carbon" and "unburnable carbon" but these are used more infrequently. Via Google Trends,[12] Google provides the Search Volume Index (SVI) of search terms and divides the search frequency data by the total search in the region and time period. The resulting time series is scaled on a range of 0 to 100 by the search term's popularity compared to all other searches. For our analysis, we match our data with the

[12] http://www.google.com/trends.

monthly time series from 2007 to 2016 of the Search Volume Index corresponding to the keywords. Figure A.2 shows the evolution of the resulting index over time.

We find statistically significant results on the triple interaction between the SVI of the term carbon bubble, the CCPI, and *Proved Reserves over Total Assets* (results in Table A.7). The positive triple interaction term is intuitive, indicating an increase in the cost of credit for fossil fuel firms with higher CCPI and public awareness of the carbon bubble issue. Taking the derivative of column (4) with respect to *Attention* and holding *CCPI* and *Proved Reserves over Total Assets* at their mean levels, we find that a unitary increase in attention increases AISD by approximately 1.2 basis points. Thus, the response is economically small.

*4.4. A role for loan maturity?*

In this section, we consider the role of loan maturity in both the relation between climate policy exposure and loan pricing and as an outcome variable of climate policy exposure. Our premise is that loans with a relatively long maturity will bear higher environmental policy risk for the banks, because of the underlying uncertainty on relevant policy innovations in the more distant future. The mean maturity in the full sample is 48.4 months and for the fossil fuel firms 43.8 months.

We first examine loan-pricing equations, where we use only loans with maturity longer than four years. We choose four years as a cutoff to focus on loans with a maturity longer than the usual tenure of legislative bodies around the world and thus more prone to political uncertainty.[13] Table A.8 (Appendix) reports specifications equivalent to those in Table 4. Our findings show that, similarly to the loans with a mean maturity, loans with longer maturity are not assigned higher prices due to environmental policy risk. The results are quite similar when

[13] We also examine the same specifications using loans with maturity longer than five years, without observing substantial differences.

we use *Proved Reserves over Total Assets* instead of the *FossilFuel* dummy (Table A.9). When repeating the analysis for the rest of our baseline results (e.g., for the C3I), we again draw very similar inferences. These findings further support that, at least before 2015, banks did not incorporate climate policy risk in their loan pricing decisions.[14]

Second, we examine loan maturity equations. We hypothesize that banks might react to climate policy risk, not by increasing loan spreads and facility fees, but by reducing loan maturity. To this end, we construct a binary variable, named *Short Maturity*, which equals one if *Maturity* ≤ four years (48 months) and zero otherwise.[15] As we mainly identify differential pricing of bank loans in the post-2015 period (compared to the pre-2015 period) based on the ratio of fossil-fuel reserves over total assets, we resort to specifications equivalent to Table 8, but with *Short Maturity* as dependent variable. We estimate the model using a linear probability model, which we favor over a probit model because of the inclusion of multiple fixed effects.[16]

Table 10 reports the results. The triple interaction term between *Reserves over Assets*, *Post 2015*, and *CCPI* is statistically insignificant across all specifications. Overall, we do not identify a strong role for loan maturity in lending to fossil fuel firms.

[Insert Table 10 about here]

*4.5. Climate risk awareness and the effect of fossil fuel firm's capital structure*

A hypothesis that relates to empirical findings from the tobacco industry (e.g., part of the analysis of Hong and Kacperczyk, 2009) suggests that if investors start taking the risk of stranded fossil fuel reserves into account or even avoiding investments in the fossil fuel sector,

[14] Unfortunately, we need to wait at least two years to conduct the analysis on the loans with long maturity for the pre-post 2015 periods.
[15] Simply using *Maturity* as the dependent variable produces very similar inferences.
[16] Logit models can accommodate fixed effects. However, with several types of fixed effects, even logit models face convergence difficulties.

fossil fuel firms need to switch to other financing sources. Fossil fuel firms will then need to increase their credit volume to make up for the "lost" access to equity finance. The effect should be more pronounced for fossil fuel firms that are highly exposed to climate policy risk. To test this hypothesis, we replicate the results of Table 4, using loan amount as the dependent variable. We report the results in Table 11 and find that the interaction term between FossilFuel and the CCPI is positive and significant at the 1% level across all specifications. Based on specification (4), a one standard deviation increase in the CCPI, increases the loan amount of fossil fuel firms by 0.00945 (1.05×0.009), which is economically a very small effect. Thus, it will take considerable increases in the CCPI to see any economically significant effects on the loan amount of fossil fuel firms.

[Insert Table 11 about here]

*4.6. Green banks vs. non-green banks*

In principle, "environmentally-friendly" or "green banks" (i.e., those aligning their business strategy with environmental/climate principles) should also demand a larger compensation for the risk of stranded fossil fuels. We use bank membership in the United Nations Environment Programme Finance Initiative as a proxy for banks' attitude toward environmental and climate change issues. This is a global partnership between United Nations and the financial sector, aiming to understand the effect of environmental and social considerations on financial performance. Over 200 members (banks, insurers, and fund managers) have joined the initiative.[17] We define a dummy variable (named *Participation Green Principles*), taking the value one from the year onward in which a bank signed the initiative, and zero otherwise.[18]

[17] The list of participating banks is available at http://www.unepfi.org/members/banking/ (Accessed April 2018).
[18] We also experiment with banks that have signed the Equators Principles framework, the results being similar.

In the specifications of Table 12, we examine the role of banks' greenness using a triple interaction between FossilFuel, the CCPI, and *Participation Green Principles*.[19] We expect that this term is positive: green banks should charge higher loan prices to fossil fuel firms that face higher environmental policy risk. The estimates of the first three specifications confirm this hypothesis, but adding banks' country fixed effects increases the standard error (without significantly affecting the coefficient estimate). The marginal effect of AISD with respect to *Participation Green Principles*, suggests that a one standard deviation increase in that variable will increase AISD by approximately 36 basis points.

[Insert Table 12 about here]

## 5. Conclusions

We provide the first evidence for the potential existence of a carbon bubble in the corporate loan market. Specifically, we study whether banks price-in the risk faced by fossil fuel firms that their fossil fuel reserves will become stranded. In turn, if these reserves are stranded, the fossil fuel firms will face considerable losses. We draw implications from hand-collected firm-year data on the fossil fuel reserves of firms across countries, country-year indices of environmental policy stringency (indicating higher climate policy risk), and global syndicated loan data. As relevant environmental policy initiatives are recent, our analysis covers the period 2007-2016.

Our baseline identification method compares the loan pricing of fossil fuel firms to non-fossil fuel firms and the loan pricing among fossil fuel firms based on their climate policy exposure. We strengthen the validity of this model via the fielding of many control variables and fixed effects (e.g., loan type and purpose, bank*year, and firms' country fixed effects). We identify further differences in loan pricing, by comparing, in the pre- and post-2015 periods, the

[19] Due to data limitations, we cannot redo this exercise using Proved Reserves.

terms of lending of fossil fuel to non-fossil fuel firms based on their climate policy exposure. The year 2015 signals a turning point because of the Paris Agreement and the intensified discussion of a carbon bubble.

Our results from the full 2007-2016 sample are consistent with a carbon bubble in the corporate loan market: we find no evidence that banks charge significantly higher loan spreads to fossil fuel firms. We find some evidence for higher loan fees to fossil fuel firms, but even these results are economically small and not robust across different specifications. However, when looking into the post-2015 period, we find the first evidence that banks increased their loan spreads to fossil fuel firms that are significantly exposed to climate policy risk. This is especially true when we do not simply compare fossil-fuel firms to non-fossil-fuel firms, but when we compare firms based on the value (relative to firms' size) of proved reserves. We find that a mere 1% point increase in proved reserves implies a 6.9 basis points increase in loan spreads, or USD 0.6 million. For a one standard deviation increase (equal to 0.47) in our measure of proved reserves, the increase in spreads is naturally even higher. We also document a direct negative effect of climate policy exposure on the maturity of loans to fossil fuel firms in the post-2015 period.

In sum, we provide the first empirical evidence for the financial risk of fossil fuel firms vis-à-vis other firms and highlights the importance of a smooth transition to a greener production for the financial markets. Future studies should examine whether fossil-fuel firms have indeed initiated this transition and how markets in general and banks in particular perceive it. Further, an interesting extension of our analysis is to look into the risks and associated loan pricing of green firms. We leave these ideas for future research.

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**Table 1**
**Variable definitions and sources**

| Variable | Description | Source |
|---|---|---|
| A. *Dependent variables in main specifications* | | |
| AISD | All-in-spread-drawn, defined as the sum of the spread over LIBOR plus the facility fee. | Dealscan and Thomson Reuters |
| AISU | All-in-spread-undrawn, defined as the sum of the facility fee and the commitment fee. | idem |
| Short Maturity | Binary variable which equals one if loan maturity ≤ 2 years and zero otherwise | idem |
| B. *Explanatory Variables: Loan characteristics* | | |
| Loan Amount | Log of the loan facility amount in dollars. | idem |
| Maturity | Log of loan duration in months. | idem |
| Collateral | Dummy equal to one if the loan is secured with collateral, zero otherwise. | idem |
| Number of Lenders | The number of banks involved in the syndicated loan. | idem |
| Performance Provisions | Dummy equal to one if the loan has performance pricing provisions, zero otherwise. | idem |
| General Covenants | The number of covenants in the loan contract. | idem |
| Loan Type | A series of dummy variables indicating loan type (e.g., term loans, revolvers, etc.). | idem |
| Loan Purpose | A series of dummy variables indicating loan purpose (e.g., corporate purpose, debt repay, etc.). | idem |
| C. *Explanatory variables: Borrower characteristics* | | |
| Firm Size | Log of total firm assets. | Compustat |
| Market to Book | The ratio of the market value of assets to the book value of assets. | idem |
| Tangibility | The ratio of tangible assets to total assets (multiplied by 100). | idem |
| Leverage | The ratio of total debt to total assets (multiplied by 100). | idem |
| Profitability | The return on equity. | idem |
| FossilFuel | Dummy equal to one if the firm operates in the fossil fuel sector (sic-code 1200-1400). | idem |
| D. *Explanatory variables: Borrower's country characteristics* | | |
| GDP per Capita | GDP per capita in current prices. | WDI |
| GDP Growth | Annual GDP growth rate. | WDI |
| E. *Fossil fuel firm's reserves data* | | |
| Fossil Fuel Reserves | Fossil fuel firms' relative amount of oil, gas and coal reserves by countries. | Annual reports and own calculations |
| Proved Reserves (USD) | Standardized measure of discounted future net cash flows related to proved oil and gas reserves (in million USD). | idem |
| Climate Policy Exposure | The climate policy exposure of fossil fuel firms determined by weighting the countries' climate policy index by the relative amount of a firm's fossil fuel reserves of each firm in each year in that country (see equation 1). As climate policy indices we use the C3I and CCPI. | Annual reports and climate policy indices |
| Political Instability Exposure | The political instability exposure of fossil fuel firms determined by weighting the countries' political instability index by the relative amount of a firm's fossil fuel reserves of each firm in each year in that country (similar to equation 1). As political instability index we use the SFI. | Annual reports and political instability indices |
| F. *Explanatory variables: Lender characteristics* | | |
| Participation Green Principles | Dummy equal to one from the year onwards in which the lender signed the green principles of the United Nations Environment Programme Finance Initiative. | Principle's webpage |

**Table 2a**
**Summary statistics – whole sample**

| | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| AISD | 72,742 | 280.66 | 187.35 | -370 | 5,000 |
| AISU | 18,456 | 37.24 | 30.35 | 0.25 | 625 |
| Short Maturity | 72,742 | 0.13 | 0.34 | 0 | 1 |
| Loan Amount | 72,742 | 18.53 | 1.55 | 10.35 | 25.35 |
| Maturity | 72,742 | 3.88 | 0.64 | 0 | 6.59 |
| Collateral | 72,742 | 0.00 | 0.07 | 0 | 1 |
| Number of Lenders | 72,742 | 6.55 | 6.37 | 1 | 141 |
| Performance Provisions | 72,742 | 0.12 | 0.32 | 0 | 1 |
| General Covenants | 72,742 | 0.45 | 0.99 | 0 | 6 |
| Firm Size | 23,705 | 8.72 | 2.39 | -0.25 | 20.50 |
| Market to Book | 14,896 | 14.44 | 676.09 | 0.23 | 40,663.91 |
| Leverage | 23,441 | 33.68 | 23.28 | 0 | 595.49 |
| Tangibility | 21,003 | 1 | 6 | 0 | 642 |
| GDP per Capita | 68,632 | 46,548 | 14,599 | 210 | 170,157 |
| GDP Growth | 68,615 | 2.02 | 2.31 | -21.54 | 26.28 |
| Participation Green Principles (EP) | 72,742 | 0.117 | 0.321 | 0 | 1 |
| Participation Green Principles (UNEPFI) | 72,742 | 0.359 | 0.480 | 0 | 1 |

**Table 2b**
**Summary statistics – subsample: fossil fuel sector**

| | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| AISD | 1,942 | 287.70 | 194.07 | 1 | 1,330 |
| AISU | 706 | 47.68 | 35.83 | 2 | 500 |
| Short Maturity | 1,942 | 0.14 | 0.35 | 0 | 1 |
| Loan Amount | 1,942 | 19.37 | 1.34 | 14.20 | 23.27 |
| Maturity | 1,942 | 3.78 | 0.60 | 0 | 5.65 |
| Collateral | 1,942 | 0.15 | 0.36 | 0 | 1 |
| Number of Lenders | 1,942 | 8.27 | 7.38 | 1 | 60 |
| Performance Provisions | 1,942 | 0.17 | 0.38 | 0 | 1 |
| General Covenants | 1,942 | 0.56 | 1.01 | 0.00 | 4.00 |
| Firm Size | 962 | 8.44 | 2.64 | 2.22 | 17.74 |
| Market to Book | 786 | 244 | 2935 | 0 | 40,664 |
| Leverage | 961 | 32 | 20 | 0 | 149 |
| Tangibility | 932 | 2 | 2 | 0 | 30 |
| GDP per Capita | 1,938 | 43,911 | 17,876 | 856 | 102,910 |
| GDP Growth | 1,936 | 2.15 | 2.53 | -7.82 | 25.05 |
| Participation Green Principles (UNEPFI) | 1,942 | 0.526 | 0.499 | 0 | 1 |
| Climate Policy Exposure (C3I) | 813 | 44.22 | 7.99 | 31.30 | 64.77 |
| Climate Policy Exposure (CCPI) | 769 | 54.68 | 1.05 | 46.56 | 60.19 |
| Total Fossil Fuel Reserves (MMBOE) | 803 | 1,965.326 | 5,755.305 | 0.002 | 46,400 |
| Proved Reserves (million USD) | 623 | 4,679.24 | 12,240.5 | 5.33 | 137,896 |
| Proved Reserves over Total Assets | 614 | 0.6449 | 0.4746 | 0.0011 | 5.0844 |
| Political Instability Exposure (SFI) | 875 | 3.215 | 2.4696 | 0 | 16.2614 |

## Table 3
## Climate policy exposure (C3I) and loan spreads: Baseline results

The table reports coefficients and t statistics in parentheses. The dependent variable is *AISD* and the climate policy exposure is measured by the C3I. All variables are as defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) contains only loan characteristics, column (2) only firm and macro-level controls. Specifications (3) and (4) include loan, firm and macro controls. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| FossilFuel | **27.371*** ** | 17.006 | 14.592 | 15.741 |
| | (3.351) | (1.479) | (1.308) | (1.250) |
| FossilFuel*Climate Policy Exposure (C3I) | 0.057 | 0.219 | 0.351 | 0.325 |
| | (0.253) | (0.836) | (1.195) | (1.027) |
| Loan Amount | **-22.626*** ** | | **-14.153*** ** | **-14.224*** ** |
| | (-14.739) | | (-7.472) | (-7.555) |
| Maturity | **18.574*** ** | | 0.678 | 0.266 |
| | (5.440) | | (0.109) | (0.042) |
| Collateral | **25.722** ** | | 9.551 | 8.837 |
| | (2.026) | | (0.833) | (0.778) |
| Number of Lenders | **-1.329*** ** | | -0.191 | -0.167 |
| | (-3.111) | | (-0.607) | (-0.541) |
| Performance | **-38.225*** ** | | **-21.110*** ** | **-21.340*** ** |
| | (-12.662) | | (-6.754) | (-6.916) |
| Number of Covenants | 1.983 | | **5.211*** ** | **5.082*** ** |
| | (1.353) | | (2.980) | (3.029) |
| Firm Size | | **-24.423*** ** | **-14.917*** ** | **-14.946*** ** |
| | | (-18.885) | (-9.607) | (-9.959) |
| Market to Book | | **-19.754*** ** | **-17.167*** ** | **-16.996*** ** |
| | | (-10.081) | (-8.368) | (-8.317) |
| Asset Tangibility | | **-0.095*** ** | **-0.079** ** | **-0.079** ** |
| | | (-3.085) | (-2.521) | (-2.512) |
| Leverage | | **0.893*** ** | **0.879*** ** | **0.882*** ** |
| | | (9.319) | (9.676) | (9.791) |
| GDP per Capita | | -0.001 | -0.000 | 0.001 |
| | | (-0.825) | (-0.285) | (0.658) |
| GDP Growth | | -4.447 | -3.904 | -2.997 |
| | | (-1.500) | (-1.279) | (-0.568) |
| Observations | 37,249 | 8,337 | 8,259 | 8,252 |
| R-Squared | 0.584 | 0.591 | 0.603 | 0.605 |
| Adjusted R-Squared | 0.565 | 0.560 | 0.572 | 0.571 |
| Bank*Year Effects | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes |
| Bank's Country Effects | No | No | No | Yes |
| Time Effects | No | No | No | Yes |
| Firm's Country Effects | No | No | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

## Table 4
## Climate policy exposure (CCPI) and loan spreads: Baseline results

The table reports coefficients and t statistics in parentheses. The dependent variable is *AISD* and the climate policy exposure is measured by the CCPI. All variables are as defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) contains only loan characteristics, column (2) only firm and macro-level controls. Specifications (3) and (4) include loan, firm and macro controls. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| FossilFuel | **34.051*** ** | **27.554** ** | **26.171** ** | **26.543*** |
| | (4.482) | (2.090) | (2.017) | (1.872) |
| FossilFuel*Climate Policy Exposure (CCPI) | 0.053 | 0.125 | 0.304 | 0.277 |
| | (0.206) | (0.337) | (0.784) | (0.679) |
| Loan Amount | **-22.875*** ** | | **-13.699*** ** | **-13.648*** ** |
| | (-16.038) | | (-8.923) | (-9.164) |
| Maturity | **17.065*** ** | | 1.493 | 1.228 |
| | (5.026) | | (0.240) | (0.195) |
| Collateral | 19.266 | | 3.756 | 3.395 |
| | (1.472) | | (0.333) | (0.303) |
| Number of Lenders | **-1.333*** ** | | -0.020 | -0.016 |
| | (-3.356) | | (-0.063) | (-0.053) |
| Performance | **-36.910*** ** | | **-21.129*** ** | **-21.318*** ** |
| | (-10.914) | | (-7.738) | (-7.751) |
| Number of Covenants | 1.338 | | **4.410*** ** | **4.278*** ** |
| | (0.898) | | (2.799) | (2.837) |
| Firm Size | | **-24.409*** ** | **-15.762*** ** | **-15.718*** ** |
| | | (-20.087) | (-12.941) | (-13.076) |
| Market to Book | | **-19.886*** ** | **-17.407*** ** | **-17.449*** ** |
| | | (-11.659) | (-9.928) | (-9.824) |
| Asset Tangibility | | **-0.087*** ** | **-0.077** ** | **-0.077** ** |
| | | (-2.884) | (-2.544) | (-2.532) |
| Leverage | | **0.882*** ** | **0.869*** ** | **0.870*** ** |
| | | (10.426) | (10.847) | (11.083) |
| GDP per Capita | | -0.001 | -0.001 | -0.001 |
| | | (-1.154) | (-0.884) | (-1.165) |
| GDP Growth | | -4.143 | -3.843 | -4.249 |
| | | (-1.311) | (-1.153) | (-1.138) |
| Observations | 45,106 | 9,739 | 9,650 | 9,645 |
| R-Squared | 0.590 | 0.590 | 0.601 | 0.603 |
| Adjusted R-Squared | 0.571 | 0.558 | 0.569 | 0.569 |
| Bank*Year Effects | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes |
| Bank's Country Effects | No | No | No | Yes |
| Time Effects | No | No | No | Yes |
| Firm's Country Effects | No | No | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

## Table 5
## Climate policy exposure (C3I) and loan spreads: Recent years

The table reports coefficients and t statistics in parentheses. The dependent variable is *AISD* and the climate policy exposure is measured by the C3I. All variables are as defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) and (2) compares pre and post-2011 periods. Column (3) and (4) compares pre and post-2012 periods. Column (5) and (6) compares pre and post-2013 periods. All specifications contain loan, firm and macro-level controls, while columns (2), (4) and (6) additionally include year, firm's country, and bank's country effects. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| FossilFuel | 10.352 | 11.357 | 9.331 | 10.540 | 13.132 | 13.831 |
| | (0.841) | (0.843) | (0.862) | (0.873) | (1.078) | (1.020) |
| FossilFuel*Climate Policy Exposure (C3I) | 0.153 | 0.140 | 0.207 | 0.191 | 0.228 | 0.212 |
| | (0.622) | (0.536) | (0.841) | (0.728) | (0.794) | (0.693) |
| FossilFuel*Post2011 | 13.337 | 13.987 | | | | |
| | (0.575) | (0.598) | | | | |
| FossilFuel*Post2011*Climate Policy Exposure (C3I) | 0.387 | 0.355 | | | | |
| | (0.950) | (0.873) | | | | |
| FossilFuel*Post2012 | | | 24.602 | 24.765 | | |
| | | | (0.859) | (0.833) | | |
| FossilFuel*Post2012*Climate Policy Exposure (C3I) | | | 0.343 | 0.306 | | |
| | | | (0.688) | (0.603) | | |
| FossilFuel*Post2013 | | | | | 14.109 | 18.961 |
| | | | | | (0.704) | (0.870) |
| FossilFuel*Post2013*Climate Policy Exposure (C3I) | | | | | 0.719 | 0.621 |
| | | | | | (1.452) | (1.217) |
| Loan Amount | **-14.128*** ** | **-14.208*** ** | **-14.144*** ** | **-14.226*** ** | **-14.122*** ** | **-14.202*** ** |
| | (-7.406) | (-7.487) | (-7.406) | (-7.493) | (-7.436) | (-7.515) |
| Maturity | 0.664 | 0.265 | 0.730 | 0.332 | 0.634 | 0.227 |
| | (0.106) | (0.042) | (0.116) | (0.052) | (0.101) | (0.036) |
| Collateral | **18.790*** | 17.752 | 17.751 | 16.671 | 14.998 | 14.244 |
| | (1.708) | (1.640) | (1.483) | (1.408) | (1.282) | (1.237) |
| Number of Lenders | -0.186 | -0.162 | -0.200 | -0.176 | -0.197 | -0.172 |
| | (-0.591) | (-0.526) | (-0.632) | (-0.567) | (-0.627) | (-0.560) |
| Performance | **-20.917*** ** | **-21.153*** ** | **-21.063*** ** | **-21.299*** ** | **-21.158*** ** | **-21.387*** ** |
| | (-6.765) | (-6.921) | (-6.763) | (-6.931) | (-6.655) | (-6.818) |
| Number of Covenants | **5.136*** ** | **5.014*** ** | **5.144*** ** | **5.026*** ** | **5.122*** ** | **5.001*** ** |
| | (2.918) | (2.962) | (2.952) | (2.996) | (2.929) | (2.970) |
| Firm Size | **-14.954*** ** | **-14.966*** ** | **-14.900*** ** | **-14.911*** ** | **-14.937*** ** | **-14.963*** ** |
| | (-9.561) | (-9.856) | (-9.500) | (-9.804) | (-9.529) | (-9.861) |
| Market to Book | **-17.149*** ** | **-16.974*** ** | **-17.093*** ** | **-16.917*** ** | **-17.092*** ** | **-16.927*** ** |
| | (-8.302) | (-8.251) | (-8.296) | (-8.260) | (-8.342) | (-8.295) |
| Asset Tangibility | **-0.080** ** | **-0.079** ** | **-0.077** ** | **-0.076** ** | **-0.079** ** | **-0.078** ** |
| | (-2.553) | (-2.537) | (-2.463) | (-2.450) | (-2.565) | (-2.552) |
| Leverage | **0.873*** ** | **0.876*** ** | **0.872*** ** | **0.876*** ** | **0.876*** ** | **0.879*** ** |
| | (9.537) | (9.673) | (9.522) | (9.646) | (9.605) | (9.717) |
| GDP per Capita | -0.000 | 0.001 | -0.000 | 0.001 | -0.000 | 0.001 |
| | (-0.300) | (0.603) | (-0.293) | (0.607) | (-0.291) | (0.633) |
| GDP Growth | -3.987 | -2.757 | -4.067 | -2.814 | -3.947 | -3.166 |
| | (-1.306) | (-0.519) | (-1.359) | (-0.537) | (-1.290) | (-0.597) |
| Observations | 8,259 | 8,252 | 8,259 | 8,252 | 8,259 | 8,252 |
| R-Squared | 0.603 | 0.605 | 0.604 | 0.605 | 0.603 | 0.605 |
| Adjusted R-Squared | 0.572 | 0.571 | 0.572 | 0.572 | 0.572 | 0.572 |
| Bank*Year Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year, Firm's Country, and Bank's Country Effects | No | Yes | No | Yes | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

## Table 6
## Climate policy exposure (CCPI) and loan spreads: Recent years

The table reports coefficients and t statistics in parentheses. The dependent variable is *AISD* and the climate policy exposure is measured by the CCPI. All variables are as defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) and (2) compares pre and post-2011 periods. Column (3) and (4) compares pre and post-2013 periods. Column (5) and (6) compares pre and post-2015 periods. All specifications contain loan, firm and macro-level controls, while columns (2), (4) and (6) additionally include year, firm's country, and bank's country effects. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| FossilFuel | 15.700 | 16.022 | 15.867 | 16.093 | **26.839**** | **27.206*** |
| | (1.344) | (1.205) | (1.293) | (1.147) | (2.031) | (1.860) |
| FossilFuel*Climate Policy Exposure (CCPI) | -0.009 | -0.020 | 0.166 | 0.137 | 0.181 | 0.150 |
| | (-0.028) | (-0.060) | (0.465) | (0.355) | (0.451) | (0.352) |
| FossilFuel*Post2011 | 31.870 | 32.455 | | | | |
| | (1.310) | (1.325) | | | | |
| FossilFuel*Post2011*Climate Policy Exposure (CCPI) | 0.257 | 0.222 | | | | |
| | (0.475) | (0.406) | | | | |
| FossilFuel*Post2013 | | | 55.194 | 56.455 | | |
| | | | (1.389) | (1.404) | | |
| FossilFuel*Post2013*Climate Policy Exposure (CCPI) | | | 0.030 | 0.022 | | |
| | | | (0.035) | (0.026) | | |
| FossilFuel*Post2015 | | | | | 5.214 | 7.253 |
| | | | | | (0.170) | (0.233) |
| FossilFuel*Post2015*Climate Policy Exposure (CCPI) | | | | | **1.917*** | **1.958*** |
| | | | | | (1.831) | (1.917) |
| Loan Amount | **-13.619***** | **-13.581***** | **-13.636***** | **-13.599***** | **-13.691***** | **-13.641***** |
| | (-8.778) | (-9.007) | (-8.862) | (-9.105) | (-8.881) | (-9.120) |
| Maturity | 1.419 | 1.162 | 1.522 | 1.259 | 1.647 | 1.397 |
| | (0.227) | (0.184) | (0.242) | (0.198) | (0.265) | (0.223) |
| Collateral | **19.091*** | **18.348*** | 15.672 | 15.515 | 7.645 | 7.435 |
| | (1.782) | (1.728) | (1.389) | (1.389) | (0.699) | (0.688) |
| Number of Lenders | -0.009 | -0.006 | -0.019 | -0.015 | -0.016 | -0.013 |
| | (-0.029) | (-0.019) | (-0.062) | (-0.049) | (-0.051) | (-0.041) |
| Performance | **-20.957***** | **-21.143***** | **-21.177***** | **-21.359***** | **-21.240***** | **-21.431***** |
| | (-7.799) | (-7.801) | (-7.720) | (-7.730) | (-7.854) | (-7.865) |
| Number of Covenants | **4.314***** | **4.192***** | **4.327***** | **4.210***** | **4.395***** | **4.259***** |
| | (2.722) | (2.763) | (2.739) | (2.781) | (2.804) | (2.840) |
| Firm Size | **-15.842***** | **-15.781***** | **-15.833***** | **-15.778***** | **-15.750***** | **-15.702***** |
| | (-12.931) | (-13.031) | (-12.916) | (-13.037) | (-12.993) | (-13.127) |
| Market to Book | **-17.318***** | **-17.360***** | **-17.218***** | **-17.252***** | **-17.368***** | **-17.412***** |
| | (-9.850) | (-9.726) | (-9.821) | (-9.714) | (-9.887) | (-9.797) |
| Asset Tangibility | **-0.076**** | **-0.076**** | **-0.074**** | **-0.074**** | **-0.076**** | **-0.076**** |
| | (-2.502) | (-2.489) | (-2.482) | (-2.471) | (-2.493) | (-2.483) |
| Leverage | **0.861***** | **0.862***** | **0.863***** | **0.864***** | **0.866***** | **0.867***** |
| | (10.716) | (10.972) | (10.795) | (11.032) | (10.922) | (11.180) |
| GDP per Capita | -0.001 | -0.002 | -0.001 | -0.001 | -0.001 | -0.001 |
| | (-0.908) | (-1.179) | (-0.892) | (-1.145) | (-0.875) | (-1.152) |
| GDP Growth | -3.780 | -4.123 | -3.820 | -4.150 | -3.770 | -4.235 |
| | (-1.133) | (-1.101) | (-1.134) | (-1.092) | (-1.143) | (-1.140) |
| Observations | 9,650 | 9,645 | 9,650 | 9,645 | 9,650 | 9,645 |
| R-Squared | 0.601 | 0.604 | 0.602 | 0.604 | 0.601 | 0.604 |
| Adjusted R-Squared | 0.570 | 0.570 | 0.570 | 0.571 | 0.570 | 0.570 |
| Bank*Year Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year, Firm's Country, and Bank's Country Effects | No | Yes | No | Yes | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

## Table 7
## Climate policy exposure (CCPI) and AISU

The table reports coefficients and t statistics in parentheses. The dependent variable is *AISU* and the climate policy exposure is measured by the CCPI. All variables are as defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) contains only loan characteristics, column (2) only firm and macro-level controls. Specifications (3) and (4) include loan, firm and macro controls. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| FossilFuel | **6.489*** ** | **4.448*** | **4.218*** | **4.902**** |
| | (3.353) | (1.899) | (1.789) | (2.140) |
| FossilFuel*Climate Policy Exposure (CCPI) | 0.063 | 0.046 | 0.076 | 0.061 |
| | (1.167) | (0.729) | (1.239) | (1.033) |
| Loan Amount | **-3.678*** ** | | **-1.739*** ** | **-1.702*** ** |
| | (-9.146) | | (-6.268) | (-6.181) |
| Maturity | -0.878 | | -1.957 | -2.121 |
| | (-1.329) | | (-1.017) | (-1.118) |
| Collateral | 0.323 | | -0.553 | -0.835 |
| | (0.164) | | (-0.249) | (-0.365) |
| Number of Lenders | 0.031 | | 0.082 | 0.080 |
| | (0.497) | | (1.513) | (1.473) |
| Performance | **-3.778*** ** | | **-1.089*** | **-0.969*** |
| | (-8.118) | | (-1.936) | (-1.693) |
| Number of Covenants | **0.831*** ** | | **0.890*** ** | **0.853*** ** |
| | (3.022) | | (3.117) | (2.913) |
| Firm Size | | **-3.515*** ** | **-2.597*** ** | **-2.613*** ** |
| | | (-13.396) | (-5.931) | (-6.019) |
| Market to Book | | **-3.043*** ** | **-2.792*** ** | **-2.831*** ** |
| | | (-8.366) | (-8.294) | (-8.557) |
| Asset Tangibility | | -0.007 | -0.004 | -0.005 |
| | | (-1.195) | (-0.751) | (-0.815) |
| Leverage | | **0.166*** ** | **0.163*** ** | **0.163*** ** |
| | | (10.768) | (10.536) | (10.319) |
| GDP per Capita | | **-0.000*** | -0.000 | -0.000 |
| | | (-1.840) | (-1.372) | (-1.262) |
| GDP Growth | | 0.035 | 0.066 | -0.812 |
| | | (0.067) | (0.127) | (-1.341) |
| Observations | 14,650 | 5,610 | 5,587 | 5,582 |
| R-Squared | 0.473 | 0.521 | 0.529 | 0.532 |
| Adjusted R-Squared | 0.441 | 0.477 | 0.485 | 0.485 |
| Bank*Year Effects | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes |
| Bank's Country Effects | No | No | No | Yes |
| Time Effects | No | No | No | Yes |
| Firm's Country Effects | No | No | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

## Table 8
## Climate policy exposure (CCPI) and proved reserves over total assets

The table reports coefficients and t statistics in parentheses. The dependent variable is *AISD* and the climate policy exposure is measured by the CCPI. All variables are as defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) contains only loan characteristics, column (2) only firm and macro-level controls. Specifications (3) and (4) include loan, firm and macro controls. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Proved Reserves over Total Assets | -7.580 | -30.382 | -48.994 | -44.145 |
| | (-0.178) | (-0.759) | (-1.471) | (-1.202) |
| Climate Policy Exposure (CCPI) | **0.701*** | **0.700*** | **0.706*** | **0.713*** |
| | (1.945) | (1.898) | (1.894) | (1.846) |
| Proved Reserves over Total Assets *Climate Policy Exposure (CCPI) | 0.087 | 0.572 | 1.046 | 0.914 |
| | (0.067) | (0.471) | (1.009) | (0.794) |
| Proved Reserves over Total Assets*Post2015 | **-933.287***** | **-800.644***** | **-726.637***** | **-759.065***** |
| | (-3.841) | (-10.293) | (-8.284) | (-14.588) |
| Post2015*Climate Policy Exposure (CCPI) | **-1.886***** | **-2.445***** | **-2.333***** | **-2.343***** |
| | (-3.430) | (-3.350) | (-3.786) | (-3.873) |
| Proved Reserves over Total Assets*Post2015*Climate Policy Exposure (CCPI) | **27.876***** | **26.863***** | **25.501***** | **26.364***** |
| | (4.138) | (9.871) | (9.412) | (15.110) |
| Loan Amount | **-22.794***** | | **-13.216***** | **-13.201***** |
| | (-16.317) | | (-8.692) | (-8.918) |
| Maturity | **17.043***** | | 0.154 | -0.235 |
| | (5.001) | | (0.024) | (-0.037) |
| Collateral | **31.654**** | | **20.201*** | **18.960*** |
| | (2.251) | | (1.797) | (1.680) |
| Number of Lenders | **-1.311***** | | -0.013 | -0.004 |
| | (-3.229) | | (-0.044) | (-0.013) |
| Performance | **-36.157***** | | **-20.570***** | **-20.643***** |
| | (-10.881) | | (-8.062) | (-8.111) |
| Number of Covenants | 1.153 | | **4.044***** | **3.898***** |
| | (0.774) | | (2.797) | (2.751) |
| Firm Size | | **-24.675***** | **-16.320***** | **-16.340***** |
| | | (-19.654) | (-12.906) | (-12.964) |
| Market to Book | | **-19.584***** | **-17.162***** | **-17.192***** |
| | | (-10.740) | (-9.085) | (-9.048) |
| Asset Tangibility | | **-0.087***** | **-0.079**** | **-0.078**** |
| | | (-2.722) | (-2.424) | (-2.368) |
| Leverage | | **0.898***** | **0.881***** | **0.886***** |
| | | (10.276) | (10.730) | (10.942) |
| GDP per Capita | | -0.001 | -0.000 | -0.002 |
| | | (-0.859) | (-0.563) | (-1.094) |
| GDP Growth | | -4.446 | -4.052 | -4.269 |
| | | (-1.274) | (-1.126) | (-1.195) |
| Observations | 44,362 | 9,492 | 9,407 | 9,402 |
| R-Squared | 0.589 | 0.592 | 0.603 | 0.605 |
| Adjusted R-Squared | 0.569 | 0.560 | 0.571 | 0.571 |
| Bank*Year Effects | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes |
| Bank's Country Effects | No | No | No | Yes |
| Time Effects | No | No | No | Yes |
| Firm's Country Effects | No | No | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

## Table 9

## Climate policy exposure (CCPI) and proved reserves over total assets - Only oil and gas firms

The table reports coefficients and t statistics in parentheses. The dependent variable is *AISD* and the climate policy exposure is measured by the CCPI. All variables are as defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) contains only loan characteristics, column (2) only firm and macro-level controls. Specifications (3) and (4) include loan, firm and macro controls. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Proved Reserves over Total Assets | -7.801 | -36.341 | -49.890 | -45.082 |
| | (-0.183) | (-0.902) | (-1.480) | (-1.213) |
| Climate Policy Exposure (CCPI) | **0.651*** | 0.574 | **0.620*** | 0.627 |
| | (1.794) | (1.631) | (1.693) | (1.649) |
| Proved Reserves over Total Assets *Climate Policy Exposure (CCPI) | 0.161 | 0.852 | 1.195 | 1.065 |
| | (0.123) | (0.699) | (1.123) | (0.904) |
| Proved Reserves over Total Assets*Post2015 | **-932.856***** | **-793.983***** | **-724.917***** | **-757.404***** |
| | (-3.839) | (-10.216) | (-8.298) | (-14.575) |
| Post2015*Climate Policy Exposure (CCPI) | **-1.836***** | **-2.320***** | **-2.249***** | **-2.258***** |
| | (-3.320) | (-3.208) | (-3.671) | (-3.756) |
| Proved Reserves over Total Assets*Post2015*Climate Policy Exposure (CCPI) | **27.798***** | **26.568***** | **25.336***** | **26.199***** |
| | (4.126) | (9.786) | (9.392) | (15.067) |
| Loan Amount | **-22.799***** | | **-13.217***** | **-13.203***** |
| | (-16.306) | | (-8.690) | (-8.916) |
| Maturity | **17.044***** | | 0.169 | -0.220 |
| | (5.003) | | (0.027) | (-0.035) |
| Collateral | **30.305**** | | 16.616 | 15.358 |
| | (2.112) | | (1.531) | (1.409) |
| Number of Lenders | **-1.314***** | | -0.015 | -0.006 |
| | (-3.233) | | (-0.050) | (-0.019) |
| Performance | **-36.133***** | | **-20.459***** | **-20.529***** |
| | (-10.879) | | (-8.020) | (-8.062) |
| Number of Covenants | 1.160 | | **4.088***** | **3.942***** |
| | (0.779) | | (2.832) | (2.788) |
| Firm Size | | **-24.734***** | **-16.374***** | **-16.395***** |
| | | (-19.656) | (-12.916) | (-12.937) |
| Market to Book | | **-19.620***** | **-17.202***** | **-17.232***** |
| | | (-10.754) | (-9.112) | (-9.075) |
| Asset Tangibility | | **-0.087***** | **-0.079**** | **-0.078**** |
| | | (-2.705) | (-2.217) | (-2.186) |
| Leverage | | **0.897***** | **0.881***** | **0.886***** |
| | | (10.279) | (10.744) | (10.955) |
| GDP per Capita | | -0.001 | -0.000 | -0.002 |
| | | (-0.859) | (-0.563) | (-1.221) |
| GDP Growth | | -4.453 | -4.058 | -4.268 |
| | | (-1.274) | (-1.126) | (-1.194) |
| Observations | 44,358 | 9,488 | 9,403 | 9,398 |
| R-Squared | 0.589 | 0.593 | 0.603 | 0.606 |
| Adjusted R-Squared | 0.569 | 0.560 | 0.571 | 0.571 |
| Bank*Year Effects | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes |
| Bank's Country Effects | No | No | No | Yes |
| Time Effects | No | No | No | Yes |
| Firm's Country Effects | No | No | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

## Table 10
## Climate policy exposure (CCPI) and loan maturity

The table reports coefficients and t statistics in parentheses from the estimation of a linear probability model. Dependent variable is the binary response variable *Short Maturity*, which equals one if loan maturity ≤ four years and zero otherwise. The climate policy exposure is measured by the CCPI. All variables are defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) contains only loan characteristics, column (2) only firm and macro-level controls. Specifications (3) and (4) include loan, firm and macro controls. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Proved Reserves over Total Assets | 0.461 | **0.472*** | 0.366 | 0.333 |
| | (1.502) | (1.760) | (1.232) | (1.099) |
| Climate Policy Exposure (CCPI) | 0.002 | **0.004***** | **0.004**** | **0.004**** |
| | (1.072) | (2.653) | (2.365) | (2.369) |
| Proved Reserves over Total Assets*Climate Policy Exposure (CCPI) | -0.012 | **-0.013*** | -0.010 | -0.009 |
| | (-1.463) | (-1.734) | (-1.226) | (-1.090) |
| Proved Reserves over Total Assets*Post2015 | 0.601 | -0.146 | 0.191 | 0.129 |
| | (0.616) | (-0.225) | (0.334) | (0.257) |
| Post2015*Climate Policy Exposure (CCPI) | 0.002 | 0.003 | 0.003 | 0.004 |
| | (0.464) | (0.547) | (0.643) | (0.661) |
| Proved Reserves over Total Assets*Post2015*Climate Policy Exposure (CCPI) | -0.002 | 0.013 | 0.005 | 0.006 |
| | (-0.081) | (0.541) | (0.231) | (0.350) |
| Loan Amount | **-0.013**** | | **-0.053***** | **-0.054***** |
| | (-2.472) | | (-7.624) | (-7.558) |
| AISD | **-0.000***** | | **0.000**** | **0.000**** |
| | (-2.956) | | (2.063) | (1.983) |
| Collateral | **0.167***** | | **0.120**** | **0.124**** |
| | (3.862) | | (2.455) | (2.464) |
| Number of Lenders | **-0.006***** | | **-0.005***** | **-0.005***** |
| | (-5.250) | | (-5.572) | (-5.498) |
| Performance | **-0.042***** | | -0.015 | -0.015 |
| | (-4.955) | | (-1.531) | (-1.487) |
| Number of Covenants | **-0.007*** | | -0.004 | -0.003 |
| | (-1.664) | | (-0.738) | (-0.553) |
| Firm Size | | -0.009 | **0.043***** | **0.044***** |
| | | (-1.408) | (6.476) | (6.541) |
| Market to Book | | **-0.015**** | 0.004 | 0.005 |
| | | (-2.000) | (0.579) | (0.610) |
| Asset Tangibility | | **-0.000***** | **-0.000*** | **-0.000*** |
| | | (-3.482) | (-1.721) | (-1.816) |
| Leverage | | 0.000 | 0.000 | 0.000 |
| | | (1.308) | (1.113) | (1.115) |
| GDP per Capita | | -0.000 | 0.000 | 0.000 |
| | | (-1.197) | (0.555) | (1.581) |
| GDP Growth | | 0.007 | 0.006 | -0.007 |
| | | (0.750) | (0.532) | (-0.614) |
| Observations | 45164 | 13287 | 9492 | 9487 |
| R-Squared | 0.344 | 0.409 | 0.425 | 0.427 |
| Adjusted R-Squared | 0.314 | 0.365 | 0.379 | 0.378 |
| Bank*Year Effects | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes |
| Bank's Country Effects | No | No | No | Yes |
| Time Effects | No | No | No | Yes |
| Firm's Country Effects | No | No | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

## Table 11
## Climate policy exposure (CCPI) and loan amount

The table reports coefficients and t statistics in parentheses. The dependent variable is *Loan Amount* and the climate policy exposure is measured by the CCPI. All variables are as defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) contains only loan characteristics, column (2) only firm and macro-level controls. Specifications (3) and (4) include loan, firm and macro controls. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| FossilFuel | **0.199*** ** | -0.108 | 0.075 | 0.084 |
| | (4.118) | (-1.086) | (0.811) | (0.976) |
| FossilFuel*Climate Policy Exposure (CCPI) | **0.012*** ** | **0.017*** ** | **0.009*** ** | **0.009*** ** |
| | (6.774) | (6.066) | (3.630) | (3.551) |
| AISD | **-0.002*** ** | | **-0.001*** ** | **-0.001*** ** |
| | (-11.385) | | (-7.132) | (-7.102) |
| Maturity | **0.189*** ** | | **0.341*** ** | **0.348*** ** |
| | (6.864) | | (7.379) | (7.261) |
| Collateral | 0.140 | | **0.321*** ** | **0.319*** ** |
| | (1.566) | | (3.398) | (3.434) |
| Number of Lenders | **0.101*** ** | | **0.037*** ** | **0.036*** ** |
| | (12.102) | | (5.990) | (5.935) |
| Performance | **0.205*** ** | | **0.063** ** | **0.058*** |
| | (4.581) | | (2.058) | (1.911) |
| Number of Covenants | 0.000 | | **-0.018*** | -0.017 |
| | (0.017) | | (-1.666) | (-1.573) |
| Firm Size | | **0.505*** ** | **0.431*** ** | **0.438*** ** |
| | | (26.628) | (29.455) | (29.385) |
| Market to Book | | **0.146*** ** | **0.092*** ** | **0.096*** ** |
| | | (7.655) | (6.754) | (7.556) |
| Asset Tangibility | | 0.000 | 0.000 | 0.000 |
| | | (0.680) | (1.024) | (0.899) |
| Leverage | | -0.000 | 0.001 | 0.001 |
| | | (-0.172) | (0.809) | (0.931) |
| GDP per Capita | | **0.000*** ** | **0.000*** ** | **0.000*** |
| | | (5.843) | (3.884) | (1.661) |
| GDP Growth | | **0.081** ** | 0.023 | 0.015 |
| | | (2.423) | (1.143) | (0.930) |
| Observations | 45,106 | 13,644 | 9,650 | 9,645 |
| R-Squared | 0.534 | 0.624 | 0.656 | 0.660 |
| Adjusted R-Squared | 0.512 | 0.596 | 0.629 | 0.631 |
| Bank*Year Effects | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes |
| Bank's Country Effects | No | No | No | Yes |
| Time Effects | No | No | No | Yes |
| Firm's Country Effects | No | No | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

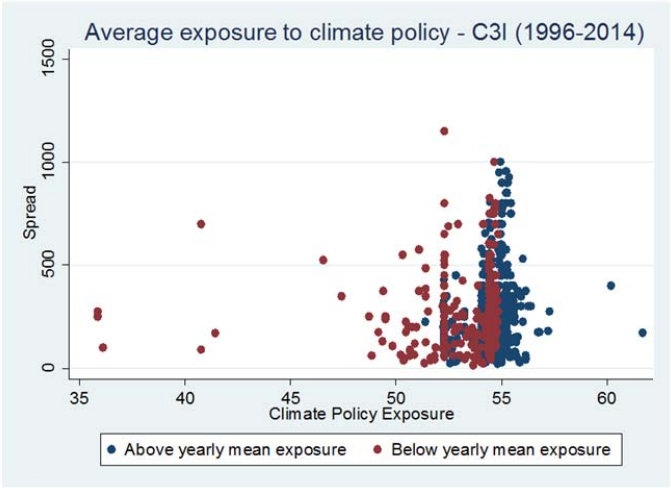
## Table 12
## The role of banks' "greenness"

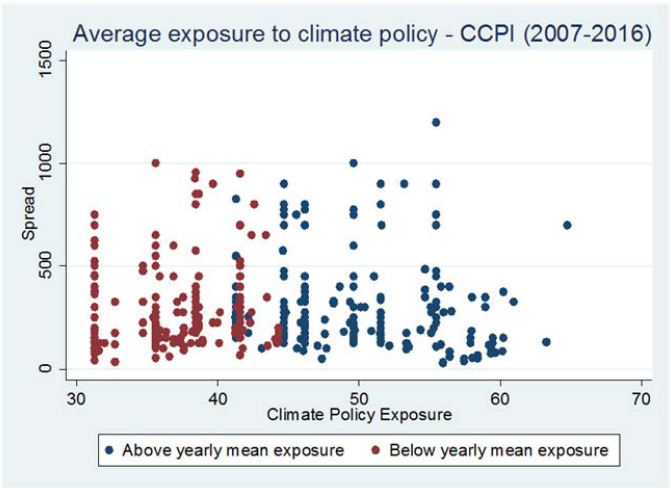
The table reports coefficients and t statistics in parentheses. The dependent variable is *AISD* and the climate policy exposure is measured by the CCPI. The "greenness" of banks is measured with a dummy defined by banks' membership (or not) in the United Nations Environment Programme Finance Initiative. All variables are as defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) contains only loan characteristics, column (2) only firm and macro-level controls. Specifications (3) and (4) include loan, firm and macro controls. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01).

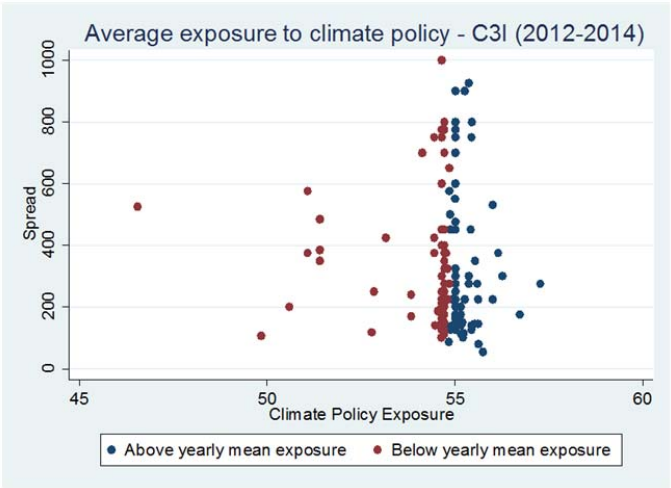
| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| FossilFuel | **42.164*** ** | **39.581*** ** | **38.335*** ** | **38.767*** ** |
| | (4.551) | (2.816) | (2.742) | (2.745) |
| FossilFuel*Climate Policy Exposure (CCPI)*Participation Green Principles (UNEP FI) | **1.543*** ** | **2.192*** | **2.143*** | 2.230 |
| | (2.692) | (1.797) | (1.759) | (1.595) |
| FossilFuel*Climate Policy Exposure (CCPI) | -0.324 | -0.399 | -0.207 | -0.233 |
| | (-1.493) | (-1.221) | (-0.630) | (-0.683) |
| FossilFuel*Participation Green Principles (UNEP FI) | **-36.069**** | -44.689 | -44.383 | -48.932 |
| | (-2.157) | (-1.270) | (-1.288) | (-1.127) |
| Loan Amount | **-22.861*** ** | | **-13.649*** ** | **-13.617*** ** |
| | (-16.093) | | (-8.914) | (-9.206) |
| Maturity | **17.084*** ** | | 1.806 | 1.502 |
| | (5.027) | | (0.291) | (0.240) |
| Collateral | 18.877 | | 2.683 | 2.414 |
| | (1.485) | | (0.235) | (0.213) |
| Number of Lenders | **-1.328*** ** | | -0.017 | -0.010 |
| | (-3.354) | | (-0.053) | (-0.033) |
| Performance | **-36.830*** ** | | **-21.188*** ** | **-21.374*** ** |
| | (-10.923) | | (-7.761) | (-7.780) |
| Number of Covenants | 1.311 | | **4.399*** ** | **4.270*** ** |
| | (0.883) | | (2.787) | (2.834) |
| Firm Size | | **-24.274*** ** | **-15.663*** ** | **-15.635*** ** |
| | | (-20.378) | (-12.678) | (-12.866) |
| Market to Book | | **-19.823*** ** | **-17.354*** ** | **-17.377*** ** |
| | | (-11.646) | (-9.904) | (-9.803) |
| Asset Tangibility | | **-0.089*** ** | **-0.079**** | **-0.078**** |
| | | (-2.939) | (-2.598) | (-2.582) |
| Leverage | | **0.885*** ** | **0.872*** ** | **0.874*** ** |
| | | (10.319) | (10.752) | (11.033) |
| GDP per Capita | | -0.001 | -0.001 | -0.002 |
| | | (-1.168) | (-0.897) | (-1.336) |
| GDP Growth | | -4.298 | -3.994 | -4.061 |
| | | (-1.334) | (-1.177) | (-1.120) |
| Observations | 45,106 | 9,739 | 9,650 | 9,645 |
| R-Squared | 0.590 | 0.591 | 0.602 | 0.604 |
| Adjusted R-Squared | 0.571 | 0.559 | 0.570 | 0.571 |
| Bank*Year Effects | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes |
| Bank's Country Effects | No | No | No | Yes |
| Time Effects | No | No | No | Yes |
| Firm's Country Effects | No | No | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

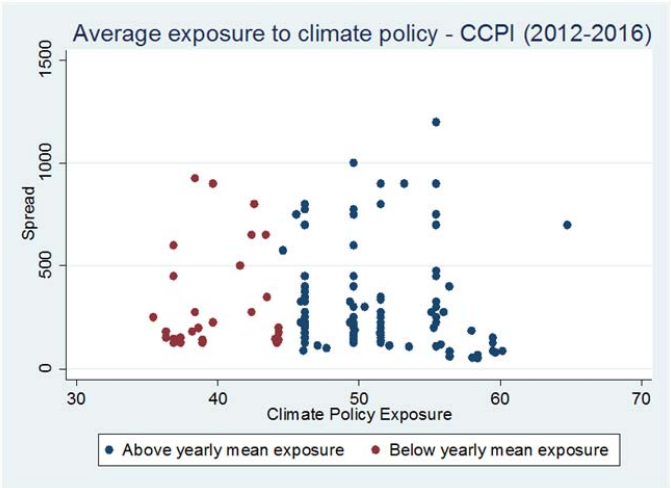
**Figure 1**
**Weighted exposure to climate policy and AISD**

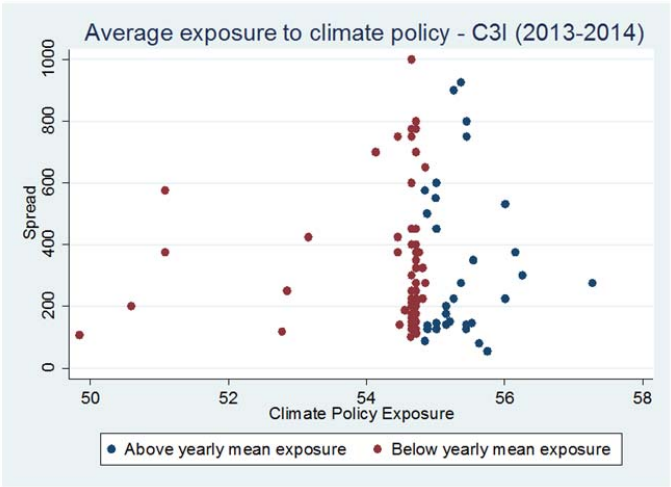
The figure illustrates the relation of the firms' total cost of the loan facilities (*AISD*) and the climate policy exposure of fossil fuel firms, *Climate policy exposure*, for different time periods. The left column contains the *Climate policy exposure* measured by the C3I; the right column contains the exposure measured by the CCPI. The blue dots indicate average exposure above the annual mean exposure, the red dots represent below mean average exposure.



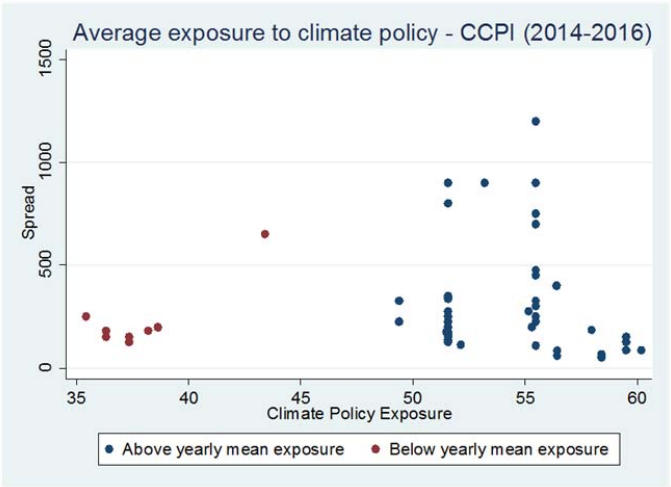
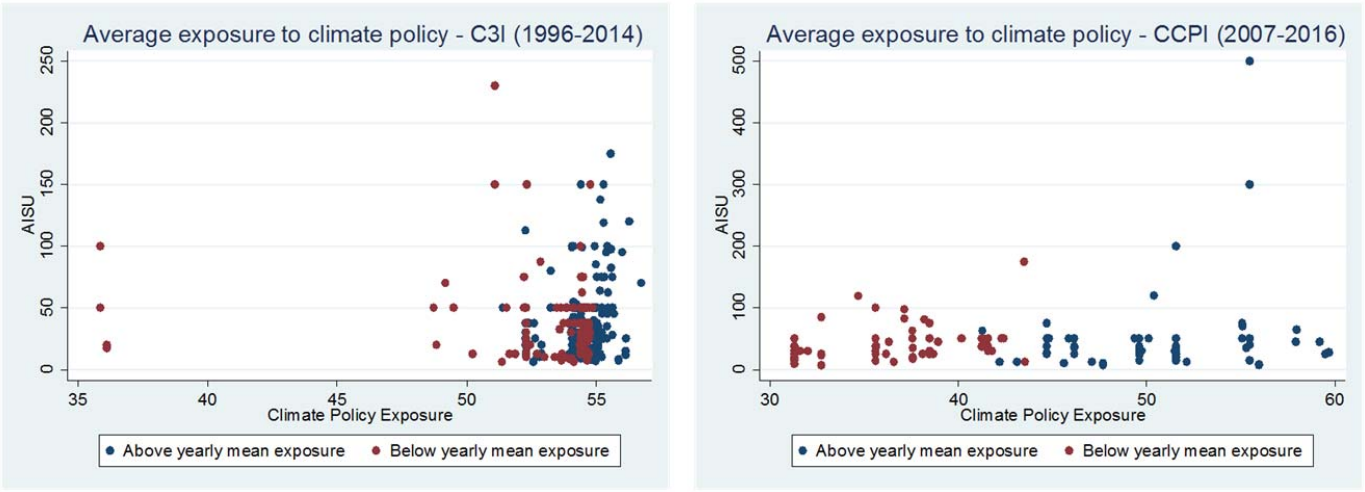



**Figure 2**
**Weighted exposure to climate policy and the all-in-spread undrawn**

The figure illustrates the relation of the firms' total costs for each dollar available under a commitment (*AISU*) and the climate policy exposure of fossil fuel firms, *Climate policy exposure*, measured by the C3I (left hand side) and the CCPI (right hand side). The blue dots indicate average exposure above the annual mean exposure, the red dots represent below mean average exposure.



# Appendix

This Appendix includes additional summary statistics and figures illustrating the climate policy indices. Further, it provides additional sensitivity tests for the findings reported in the main text.

## Table A.1
## Summary statistics –relative fossil fuel reserves by country

Summary statistics of firm's relative oil, gas and/or coal reserves in the period 2007-2016 by country. In our sample firms own oil, gas, and coal reserves in 59 countries.

| | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| Number of countries in which firms own oil, gas and/or coal reserves | 1,445 | 1.39 | 1.02 | 1 | 13 |
| *Country*: | | | | | |
| Algeria | 6 | 0.28 | 0.42 | 0.01 | 0.82 |
| Angola | 5 | 0.01 | 0.00 | 0.01 | 0.01 |
| Argentina | 17 | 0.23 | 0.37 | 0.03 | 1.00 |
| Australia | 77 | 0.49 | 0.43 | 0.00 | 1 |
| Azerbaijan | 3 | 0.04 | 0 | 0.04 | 0.04 |
| Bangladesh | 6 | 0.17 | 0.02 | 0.15 | 0.22 |
| Brazil | 2 | 0.07 | 0.08 | 0.02 | 0.13 |
| Bulgaria | 5 | 0.07 | 0.06 | 0.00 | 0.14 |
| Canada | 500 | 0.82 | 0.29 | 0.02 | 1 |
| China | 16 | 0.31 | 0.43 | 0.00 | 1 |
| Colombia | 46 | 0.66 | 0.37 | 0.00 | 1 |
| Congo, Rep. | 1 | 0.00 | . | 0.00 | 0.00 |
| Côte d'Ivoire | 2 | 0.06 | 0 | 0.06 | 0.06 |
| Croatia | 5 | 0.85 | 0.01 | 0.85 | 0.86 |
| Czech Republic | 2 | 0.53 | 0.03 | 0.51 | 0.55 |
| Denmark | 1 | 0.00 | . | 0.00 | 0.00 |
| Ecuador | 2 | 0.06 | 0.05 | 0.03 | 0.09 |
| Egypt, Arab Rep. | 32 | 0.16 | 0.21 | 0.00 | 0.76 |
| Equatorial Guinea | 3 | 0.11 | 0.01 | 0.09 | 0.11 |
| France | 15 | 0.30 | 0.04 | 0.25 | 0.38 |
| Gabon | 11 | 0.63 | 0.43 | 0.01 | 1 |
| Germany | 2 | 0.04 | 0.01 | 0.03 | 0.04 |
| India | 38 | 0.88 | 0.19 | 0.54 | 1 |
| Indonesia | 52 | 0.63 | 0.40 | 0.02 | 1 |
| Iraq | 1 | 0.06 | . | 0.06 | 0.06 |
| Ireland | 13 | 0.16 | 0.02 | 0.13 | 0.17 |
| Israel | 8 | 0.74 | 0.36 | 0.27 | 1 |
| Italy | 7 | 0.16 | 0.18 | 0.02 | 0.39 |
| Kazakhstan | 5 | 0.42 | 0.53 | 0.03 | 1 |
| Libya | 4 | 0.01 | 0.01 | 0.00 | 0.02 |
| Malaysia | 12 | 0.14 | 0.17 | 0.02 | 0.55 |
| Mauritania | 7 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mexico | 20 | 1 | 0 | 1 | 1 |
| Mongolia | 5 | 1 | 0 | 1 | 1 |
| Morocco | 2 | 0.30 | 0 | 0.30 | 0.30 |
| Myanmar | 3 | 0.06 | 0 | 0.06 | 0.06 |
| Netherlands | 18 | 0.10 | 0.15 | 0.01 | 0.70 |
| New Zealand | 13 | 0.07 | 0.06 | 0.05 | 0.26 |
| Nigeria | 5 | 0.79 | 0.19 | 0.62 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| Norway | 43 | 0.43 | 0.41 | 0.00 | 1 |
| Oman | 1 | 1 | . | 1 | 1 |
| Pakistan | 7 | 0.10 | 0.01 | 0.09 | 0.12 |
| Papua New Guinea | 7 | 0.65 | 0.45 | 0.00 | 1 |
| Peru | 9 | 0.37 | 0.47 | 0.01 | 1 |
| Poland | 4 | 0.70 | 0.26 | 0.45 | 0.94 |
| Romania | 3 | 0.97 | 0.00 | 0.96 | 0.97 |
| Russian Federation | 41 | 0.97 | 0.10 | 0.64 | 1 |
| South Africa | 2 | 0.00 | 0.01 | 0.00 | 0.01 |
| Sudan | 4 | 0.07 | 0.06 | 0.04 | 0.16 |
| Syrian Arab Republic | 9 | 0.12 | 0.03 | 0.03 | 0.14 |
| Thailand | 6 | 0.63 | 0.21 | 0.44 | 1 |
| Trinidad and Tobago | 9 | 0.30 | 0.26 | 0.03 | 0.96 |
| Tunisia | 7 | 0.20 | 0.15 | 0.00 | 0.37 |
| Turkey | 3 | 0.35 | 0.56 | 0.03 | 1.00 |
| United Kingdom | 65 | 0.39 | 0.37 | 0.00 | 1 |
| United States | 793 | 0.88 | 0.26 | 0.00 | 1 |
| Venezuela, RB | 4 | 0.76 | 0.48 | 0.04 | 1 |
| Vietnam | 16 | 0.08 | 0.06 | 0.00 | 0.14 |
| Yemen, Rep. | 2 | 0.62 | 0.53 | 0.24 | 1 |

**Table A.2**
**Country of headquarters of fossil fuel firms**
The table reports the frequency of headquarters of fossil fuel firms which own oil, gas, and/or coal reserves in the period 2007-2016.

| Country | Frequency | Percent |
|---|---|---|
| Argentina | 3 | 0.36 |
| Australia | 21 | 2.49 |
| Bermuda | 10 | 1.19 |
| Canada | 79 | 9.37 |
| China | 1 | 0.12 |
| Gabon | 3 | 0.36 |
| India | 11 | 1.3 |
| Indonesia | 15 | 1.78 |
| Israel | 4 | 0.47 |
| Mexico | 15 | 1.78 |
| Mongolia | 2 | 0.24 |
| Nigeria | 1 | 0.12 |
| Norway | 7 | 0.83 |
| Papua New Guinea | 1 | 0.12 |
| Romania | 3 | 0.36 |
| Russia | 25 | 2.97 |
| Singapore | 4 | 0.47 |
| Sweden | 1 | 0.12 |
| USA | 619 | 73.43 |
| United Kingdom | 14 | 1.66 |
| Venezuela | 3 | 0.36 |
| Yemen | 1 | 0.12 |
| Total | 843 | 100 |

**Table A.3a**
**Fossil fuel firms that own oil, gas, and/or coal reserves (disclosed by country)**

| | | | |
|---|---|---|---|
| Abraxas Petroleum Co | Diamondback Energy Inc | Mainland Resources Inc | Ram Energy Inc |
| Addax Petroleum Corp | Doral Energy Corp | Mariner Energy | Rancher Energy Corp |
| Alliance Resource Partners LP | Double Eagle Petroleum Co | Massey Energy Co | Range Resources Corp |
| Alpha Natural Resources LLC | Dune Energy Inc | Max Petroleum Plc | Reliance Industries Ltd |
| Anderson Energy Ltd | EOG Resources Inc | Merit Energy | ReoStar Energy Corp |
| Antares Energy Ltd | EPL Oil & Gas Inc | Midstates Petroleum Co LLC | Resaca Exploitation Inc |
| Antero Resources Corp | EV Energy Partners LP | Mongolian Mining Corp | Resolute Energy Corp |
| Apache Corp | EV Properties LP | Murphy Oil Corp | Rex Energy Corp |
| Approach Resources Inc | Eagle Exploration Operating LLC | National Fuel Gas Co | Rice Energy Inc |
| Arc Resources | Eagle Rock Energy Partners LP | Natural Resource Partners LP | Rosetta Resources Inc |
| Arch Coal Inc | Earthstone Energy Inc | New Source Energy Partners LP | Rosneft Oil Co OJSC |
| Arena Resources Inc | Edge Petroleum Corp | Newfield Exploration Co | RusPetro Plc |
| Atlas Resource Partners LP | Emerald Oil Inc | Niko Resources Ltd | SM Energy Co |
| Aurora Oil & Gas Corp | Encana | North American Coal | SNP Petrom SA |
| Avner Oil Exploration Ltd | Encore Acquisition Co | Northern Oil & Gas Inc | Salamander Energy Plc |
| BPZ Resources Inc | Encore Energy Partners LP | Norwegian Energy Co ASA | Sanchez Energy Corp |
| Baseline Oil & Gas Corp | Endeavour International Corp | Novatek OAO | SandRidge Energy Inc |
| Beach Energy Ltd | Energy XXI Ltd. | OMV PETROM SA | Saratoga Resources Inc |
| Belden & Blake Corp | Enerplus Corp | OPTI Canada Inc | Shoreline Energy LLC |
| Berry Petroleum Co | Exco Resources Inc | Oasis Petroleum North America LLC | Southern Pacific ResourceCorp |
| Bill Barrett Corp | Exillon Energy Plc | Oil India Ltd | Southwestern Energy Co |
| BlackPearl Resources Inc | Exploration Company of Delaware | Oil Search Ltd | St Mary Land & Exploration Co |
| Bois D'Arc Energy LLC | FX Energy Inc | Origin Energy Ltd | Stone Energy Corp |
| Bonterra Energy Ltd | Fairborne Energy Ltd | PT Bayan Resources | Storm Cat Energy Corp |
| Breitburn Energy Partners | Foresight Energy | PT Berau Coal Energy | Straits Asia Resources Ltd |
| Brigham Exploration Co | Forest Oil Corp | PT Bumi Resources Tbk | Stratic Energy Corp |
| Cabot Oil & Gas Corp | GMX Resources Inc | PT Harum Energy | SunCoke Energy |
| California Resources Corp | GasCo Energy Inc | Pacific Rubiales Energy Corp | Suncor Energy Inc |
| Callon Petroleum Co | Gastar Exploration USA Inc | Parallel Petroleum Corp | Suncor Energy Ventures Holding |
| Cano Petroleum Inc | Gazpromneft OAO | Patriot Coal Corp | Superior Energy Services Inc |
| Carrizo Oil & Gas Inc | GeoResources Inc | Peabody Energy Corp | Swift Energy Co |
| Cenovus Energy Inc | Geomet Inc | Pengrowth Energy Corp | TXCO Resources Inc |
| Chaparral Energy Inc | Goodrich Petroleum Co | Penn Virginia Corp | Talisman Energy Inc |
| Chesapeake Energy | Gran Tierra Energy Inc | Penn Virginia Resource Partners LP | Terra Energy Corp |
| Chinook Energy Inc | Gulfport Energy Corp. | PetroLatina Energy Plc | Tethys Oil AB |
| Cimarex Energy Co | Halcon Resources LLC | PetroQuest Energy Inc | Teton Energy Corp |
| Clayton Williams Energy Inc | Hidili Industry International Develop.. | PetroQuest Energy LLC | Texas American Resources |
| Cloud Peak Energy Resources | HighMount Exploration & Production | Petroceltic International Plc. | Total Gabon SA |
| Compton Petroleum Corp | Highpine Oil & Gas Ltd | Petrohawk Energy Corp | Triangle USA Petroleum Corp. |
| Comstock Resources Inc | Husky Energy Inc | Petroleos Mexicanos (Pemex) | Unit Corp |
| Concho Resources Inc | InterOil Corp | Petroleos de Venezuela SA | Vaalco Energy |
| Connacher Oil & Gas | International Coal Group | Petroleum Development Corp | anguard Natural Resources LLC |
| Consol Energy Inc | Isramco | Petsec Energy Inc | Venoco Inc |
| Constellation Energy Partners | Iteration Energy | Pinnacle Gas Resources Inc | Viper Energy Partners LP |
| Contango Oil & Gas Co | Ithaca Energy (UK) Ltd | Pioneer Natural Resources Co | Voyager Oil & Gas Inc |
| Continental Resources | James River Coal Co | Pioneer Southwest Energy Partners LP | W&T Offshore |
| Crew Energy Inc | Kodiak Oil & Gas Corp | Plains Exploration & Production Co LP | WPX Energy |
| Crimson Exploration Inc | Laredo Petroleum | Premier Oil Plc | Walter Energy Inc |
| Cubic Energy Inc | Legacy Reserves LP | PrimeEnergy Corp | Warren Resources Inc |
| Delek Group Ltd | Linn Energy LLC | QEP Resources Inc | Westmoreland Coal Co |
| Delta Petroleum | Lone Pine Resources Inc | QR Energy | Whitehaven Coal Ltd |
| Denbury Resources Inc | Lucas Energy Inc | Quest Resource Corp | Whiting Petroleum Corp |
| Det Norske Oljeselskap ASA | MEG Energy Corp | Questar Market Resources Inc | XTO Energy Inc |
| Devon Energy Corp | Magnum Hunter Resources Corp | Quicksilver Resources Inc | YPF SA |

**Table A.3b**
**Fossil fuel firms that own oil, gas, and/or coal reserves not disclosed by country**

| | |
|---|---|
| Addax Petroleum Corp | Marathon Oil Corp |
| Anadarko Petroleum Corp | Max Petroleum Plc |
| Arc Resources | Nexen Inc |
| BG Group Plc | Noble Energy Inc |
| Baseline Oil & Gas Corp | OPTI Canada Inc |
| Beach Energy Ltd | Occidental Petroleum |
| CNOOC Ltd | Oil Search Ltd |
| Canadian Natural Resources | Pengrowth Energy Corp |
| Chinook Energy Inc | Rancher Energy Corp |
| Cloud Peak Energy Resources LLC | Reliance Industries Ltd |
| ConocoPhillips | Royal Dutch Shell Plc |
| Cubic Energy Inc | Saratoga Resources Inc |
| Delek Group Ltd | Stratic Energy Corp |
| Devon Energy Corp | Superior Energy Services Inc |
| EOG Resources Inc | Tethys Oil AB |
| EV Energy Partners LP | Teton Energy Corp |
| Exxon Mobil Corp | Vaalco Energy |
| INA-Industrija Nafte dd | Whitehaven Coal Ltd |

**Table A.4**

**Summary statistics – Climate Change Cooperation Index (C3I) by country**

Summary statistics for countries in which the samples' firms have oil, gas and/or coal reserves for the period 2007-2014.

| Country | Observations | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| Algeria | 19 | 53.29 | 3.81 | 42.15 | 60.47 |
| Angola | 15 | 51.25 | 4.34 | 39.55 | 59.92 |
| Argentina | 19 | 53.74 | 1.94 | 49.11 | 56.09 |
| Australia | 19 | 54.51 | 0.75 | 52.53 | 55.55 |
| Azerbaijan | 19 | 55.29 | 6.78 | 44.22 | 70.01 |
| Bangladesh | 19 | 52.00 | 1.28 | 50.16 | 54.88 |
| Bolivia | 19 | 53.45 | 3.77 | 46.98 | 62.94 |
| Brazil | 19 | 53.93 | 1.43 | 51.91 | 55.95 |
| Bulgaria | 19 | 55.08 | 3.65 | 46.35 | 62.75 |
| Canada | 19 | 54.68 | 0.81 | 52.65 | 55.62 |
| Côte d'Ivoire | 19 | 52.53 | 1.72 | 49.28 | 55.44 |
| China | 19 | 51.49 | 3.46 | 44.64 | 55.63 |
| Colombia | 19 | 54.89 | 1.40 | 52.31 | 58.25 |
| Congo, Rep. | 18 | 52.56 | 5.03 | 47.55 | 71.69 |
| Croatia | 19 | 51.66 | 2.28 | 46.20 | 54.52 |
| Czech Republic | 19 | 55.01 | 1.67 | 49.81 | 58.56 |
| Denmark | 19 | 55.65 | 1.41 | 52.49 | 57.36 |
| Vietnam | 19 | 51.15 | 2.78 | 44.55 | 56.23 |
| Ecuador | 19 | 53.86 | 2.02 | 49.41 | 58.00 |
| Egypt, Arab Rep. | 19 | 51.82 | 2.54 | 46.35 | 56.46 |
| Equatorial Guinea | 14 | 43.86 | 14.08 | 2.52 | 53.66 |
| France | 19 | 55.76 | 0.81 | 53.38 | 56.94 |
| Gabon | 16 | 51.27 | 1.43 | 49.81 | 54.94 |
| Ghana | 19 | 52.79 | 2.13 | 48.74 | 55.47 |
| Germany | 19 | 55.25 | 0.80 | 52.19 | 55.98 |
| India | 19 | 51.57 | 1.84 | 49.37 | 56.41 |
| Indonesia | 19 | 52.91 | 5.20 | 47.43 | 71.96 |
| Ireland | 19 | 55.13 | 1.26 | 52.06 | 56.58 |
| Iraq | 5 | 48.11 | 2.00 | 44.71 | 49.95 |
| Israel | 19 | 53.10 | 1.26 | 50.43 | 54.92 |
| Italy | 19 | 54.08 | 2.01 | 50.08 | 56.32 |
| Japan | 19 | 55.00 | 1.29 | 50.44 | 56.08 |
| Kazakhstan | 19 | 53.11 | 9.99 | 35.87 | 81.23 |
| Libya | 13 | 48.66 | 4.57 | 46.10 | 63.58 |
| Mauritania | 19 | 51.82 | 0.82 | 50.02 | 53.73 |
| Malaysia | 19 | 53.90 | 2.65 | 47.39 | 59.33 |
| Mexico | 19 | 54.32 | 1.60 | 51.64 | 55.91 |
| Moldova | 19 | 56.99 | 13.85 | 46.00 | 100.00 |
| Mongolia | 19 | 53.15 | 13.05 | 29.05 | 93.06 |
| Morocco | 19 | 53.19 | 1.47 | 49.95 | 54.86 |
| Myanmar | 15 | 52.48 | 3.69 | 45.48 | 61.25 |

| | | | | | |
|---|---|---|---|---|---|
| New Zealand | 19 | 55.19 | 0.60 | 53.84 | 55.95 |
| Nigeria | 19 | 51.95 | 4.55 | 35.19 | 57.78 |
| Norway | 19 | 55.90 | 1.11 | 52.67 | 57.90 |
| Netherlands | 19 | 55.38 | 0.38 | 54.64 | 55.92 |
| Oman | 19 | 52.99 | 3.76 | 45.87 | 59.54 |
| Pakistan | 19 | 51.82 | 1.59 | 49.15 | 56.26 |
| Peru | 19 | 53.35 | 1.80 | 50.32 | 56.52 |
| Papua New Guinea | 19 | 52.53 | 2.80 | 45.79 | 57.47 |
| Poland | 19 | 54.88 | 1.33 | 52.54 | 57.95 |
| Romania | 19 | 54.80 | 3.29 | 48.21 | 61.38 |
| Russian Federation | 19 | 53.72 | 1.96 | 49.52 | 57.20 |
| South Africa | 18 | 52.87 | 2.78 | 46.61 | 57.51 |
| Sudan | 16 | 52.02 | 1.57 | 49.80 | 55.01 |
| Syrian Arab Republic | 12 | 50.36 | 8.43 | 34.76 | 63.46 |
| Tanzania | 19 | 51.44 | 1.28 | 48.46 | 55.16 |
| Thailand | 19 | 53.64 | 1.28 | 51.80 | 56.98 |
| Turkmenistan | 19 | 49.73 | 17.24 | 0.00 | 95.83 |
| Trinidad and Tobago | 19 | 51.49 | 5.70 | 40.35 | 65.18 |
| Tunisia | 19 | 53.50 | 1.54 | 50.47 | 55.82 |
| Turkey | 11 | 50.57 | 1.89 | 47.22 | 52.86 |
| United Kingdom | 19 | 55.46 | 0.54 | 54.02 | 56.30 |
| United States | 19 | 54.30 | 0.77 | 52.27 | 55.21 |
| Venezuela, RB | 18 | 52.58 | 4.18 | 43.45 | 61.69 |
| Yemen, Rep. | 19 | 50.25 | 3.10 | 42.00 | 55.50 |

**Table A.5**

**Summary statistics – Climate change policy index (CCPI) by country**

Summary statistics for countries in which the samples' firms have oil, gas and/or coal reserves for the period 2007-2016.

| Country | Observations | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| Algeria | 10 | 53.55 | 3.797569 | 46.8 | 59.36 |
| Argentina | 10 | 51.456 | 5.003395 | 45.56 | 59.4 |
| Australia | 10 | 39.354 | 3.392732 | 33.82 | 44.89 |
| Brazil | 10 | 59.329 | 4.530451 | 52.51 | 65.06 |
| Bulgaria | 10 | 51.997 | 4.807568 | 45.7 | 58.89 |
| Canada | 10 | 37.2 | 2.104323 | 32.72 | 39.96 |
| China | 10 | 48.41 | 3.766837 | 44.36 | 55.09 |
| Croatia | 10 | 52.406 | 3.964233 | 46.26 | 57.84 |
| Czech Republic | 10 | 52.585 | 3.281705 | 48.02 | 58.31 |
| Denmark | 10 | 64.03 | 7.791782 | 51.33 | 76.62 |
| Egypt | 10 | 56.401 | 2.571081 | 52.8 | 60.03 |
| France | 10 | 60.192 | 3.349971 | 54.65 | 65.97 |
| Germany | 10 | 60.326 | 3.431761 | 57.38 | 68.23 |
| India | 10 | 59.458 | 3.968601 | 53.56 | 64.96 |
| Indonesia | 10 | 57.144 | 2.324316 | 54.65 | 60.94 |
| Ireland | 10 | 56.977 | 4.786939 | 48.85 | 63.08 |
| Italy | 10 | 52.916 | 5.545405 | 43.99 | 59.84 |
| Japan | 10 | 46.407 | 3.512359 | 37.33 | 49.47 |
| Kazakhstan | 10 | 40.355 | 8.701166 | 32.28 | 55.28 |
| Malaysia | 10 | 46.988 | 2.801638 | 43.73 | 52.58 |
| Mexico | 10 | 58.988 | 1.989309 | 55.96 | 63.71 |
| Morocco | 10 | 59.801 | 2.641012 | 56.56 | 64.1 |
| Netherlands | 10 | 52.371 | 3.594874 | 44.45 | 56.33 |
| New Zealand | 10 | 51.976 | 2.523503 | 47.39 | 56.19 |
| Norway | 10 | 57.278 | 3.655424 | 50.4 | 62.41 |
| Poland | 10 | 50.67 | 3.807793 | 45.74 | 56.14 |
| Romania | 10 | 57.61 | 3.773157 | 51.14 | 62.67 |
| Russian Federation | 10 | 47.796 | 3.454376 | 42.59 | 53.36 |
| South Africa | 10 | 49.471 | 2.012513 | 46.1 | 52.96 |
| Thailand | 10 | 54.366 | 2.801497 | 49.41 | 59.02 |
| Turkey | 10 | 48.343 | 6.445522 | 39.83 | 60.99 |
| United Kingdom | 10 | 63.98 | 4.487766 | 59.17 | 70.81 |
| United States | 10 | 43.578 | 7.452962 | 31.3 | 55.48 |

## Table A.6
## Controlling for political instability exposure (SFI)

The table reports coefficients and t statistics in parentheses. The dependent variable is *AISD* and the political instability exposure is measured by the State Fragility Index (SFI). All variables are as defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) contains only loan characteristics, column (2) only firm and macro-level controls. Specifications (3) and (4) include loan, firm and macro controls. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Proved Reserves over Total Assets | -4.038 | -30.384 | -48.041 | -44.451 |
| | (-0.086) | (-0.757) | (-1.403) | (-1.276) |
| Political Instability Exposure (SFI) | 9.206 | -0.190 | 2.303 | -1.753 |
| | (0.618) | (-0.011) | (0.140) | (-0.095) |
| Climate Policy Exposure (CCPI) | 0.205 | 0.711 | 0.579 | 0.806 |
| | (0.222) | (0.743) | (0.627) | (0.759) |
| Proved Reserves over Total Assets*Post2015*Political Instability Exposure (SFI) | -85.479 | -93.896 | -85.800 | -89.691 |
| | (-0.959) | (-1.223) | (-1.200) | (-1.269) |
| Proved Reserves over Total Assets*Post2015*Climate Policy Exposure (CCPI) | **49.255**** | **53.854***** | **50.463***** | **52.590***** |
| | (2.258) | (4.700) | (4.378) | (5.166) |
| Proved Reserves over Total Assets*Political Instability Exposure (SFI) | -1.156 | -0.057 | -3.388 | -0.806 |
| | (-0.060) | (-0.002) | (-0.159) | (-0.036) |
| Proved Reserves over Total Assets*Post2015 | **-1848.428**** | **-1999.602***** | **-1838.607***** | **-1929.102***** |
| | (-2.184) | (-4.566) | (-4.167) | (-5.015) |
| Proved Reserves over Total Assets*Climate Policy Exposure (CCPI) | 0.023 | 0.576 | 1.212 | 0.975 |
| | (0.013) | (0.307) | (0.745) | (0.549) |
| Post2015*Political Instability Exposure (SFI) | **-33.064***** | **-42.520***** | **-40.631***** | **-40.663***** |
| | (-3.724) | (-3.551) | (-3.899) | (-3.958) |
| Loan Amount | **-22.798***** | | **-13.221***** | **-13.195***** |
| | (-16.294) | | (-8.656) | (-8.875) |
| Maturity | **17.008***** | | 0.132 | -0.222 |
| | (4.989) | | (0.021) | (-0.034) |
| Collateral | **31.182**** | | **20.163*** | **19.199*** |
| | (2.240) | | (1.806) | (1.716) |
| Number of Lenders | **-1.312***** | | -0.013 | -0.004 |
| | (-3.228) | | (-0.044) | (-0.013) |
| Performance | **-36.133***** | | **-20.539***** | **-20.624***** |
| | (-10.837) | | (-7.989) | (-8.023) |
| Number of Covenants | 1.139 | | **4.044***** | **3.901***** |
| | (0.763) | | (2.803) | (2.759) |
| Firm Size | | **-24.665***** | **-16.308***** | **-16.331***** |
| | | (-19.539) | (-12.904) | (-12.956) |
| Market to Book | | **-19.580***** | **-17.158***** | **-17.186***** |
| | | (-10.762) | (-9.099) | (-9.062) |
| Asset Tangibility | | **-0.087**** | **-0.079**** | **-0.078**** |
| | | (-2.572) | (-2.463) | (-2.422) |
| Leverage | | **0.898***** | **0.881***** | **0.886***** |
| | | (10.292) | (10.773) | (10.958) |
| GDP per Capita | | -0.001 | -0.000 | -0.002 |
| | | (-0.851) | (-0.519) | (-0.922) |
| GDP Growth | | -4.434 | -4.040 | -4.261 |
| | | (-1.274) | (-1.125) | (-1.194) |
| Observations | 44,362 | 9,492 | 9,407 | 9,402 |
| R-Squared | 0.589 | 0.592 | 0.603 | 0.605 |
| Adjusted R-Squared | 0.569 | 0.560 | 0.571 | 0.571 |
| Bank*Year Effects | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes |
| Bank's Country Effects | No | No | No | Yes |
| Time Effects | No | No | No | Yes |
| Firm's Country Effects | No | No | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

## Table A.7
## Controlling for increasing public attention to the Carbon Bubble issue

The table reports coefficients and t statistics in parentheses. The dependent variable is *AISD*, the climate policy exposure and public attention is measured by the CCP and the google search of "carbon bubble", respectively. All variables are as defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) contains only loan characteristics, column (2) only firm and macro-level controls. Specifications (3) and (4) include loan, firm and macro controls. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Proved Reserves over Total Assets | 62.160 | 32.595 | 13.510 | 16.013 |
| | (1.028) | (0.609) | (0.307) | (0.348) |
| Climate Policy Exposure (CCPI) | **0.853**** | **0.664*** | **0.688*** | **0.702*** |
| | (2.270) | (1.876) | (1.960) | (1.906) |
| Attention (Search "Carbon Bubble") | 0.049 | 0.045 | 0.050 | 0.054 |
| | (1.093) | (0.656) | (0.701) | (0.824) |
| Proved Reserves over Total Assets*Climate Policy Exposure (CCPI) | -1.799 | -1.079 | -0.614 | -0.690 |
| | (-0.971) | (-0.718) | (-0.491) | (-0.519) |
| Proved Reserves over Total Assets* Attention (Search "Carbon Bubble") | **-8.751***** | **-7.751**** | **-7.085**** | **-6.927**** |
| | (-3.126) | (-2.442) | (-2.241) | (-2.070) |
| Attention (Search "Carbon Bubble")*Climate Policy Exposure (CCPI) | -0.010 | -0.000 | -0.000 | -0.001 |
| | (-0.765) | (-0.037) | (-0.063) | (-0.093) |
| Proved Reserves over Total Assets*Attention (Search "Carbon Bubble")*Climate Policy Exposure (CCPI) | **0.205***** | **0.177**** | **0.164**** | **0.161**** |
| | (2.973) | (2.408) | (2.292) | (2.159) |
| Loan Amount | **-22.781***** | | **-13.161***** | **-13.153***** |
| | (-16.347) | | (-8.569) | (-8.803) |
| Maturity | **17.050***** | | 0.031 | -0.367 |
| | (4.989) | | (0.005) | (-0.057) |
| Collateral | **28.149**** | | **19.130*** | 17.818 |
| | (2.158) | | (1.688) | (1.577) |
| Number of Lenders | **-1.313***** | | -0.020 | -0.010 |
| | (-3.235) | | (-0.064) | (-0.034) |
| Performance | **-36.133***** | | **-20.612***** | **-20.671***** |
| | (-10.817) | | (-7.959) | (-8.012) |
| Number of Covenants | 1.121 | | **3.961***** | **3.827***** |
| | (0.757) | | (2.744) | (2.706) |
| Firm Size | | **-24.678***** | **-16.357***** | **-16.379***** |
| | | (-19.903) | (-12.952) | (-13.045) |
| Market to Book | | **-19.507***** | **-17.097***** | **-17.121***** |
| | | (-10.950) | (-9.214) | (-9.159) |
| Asset Tangibility | | **-0.085***** | **-0.078**** | **-0.076**** |
| | | (-2.682) | (-2.437) | (-2.398) |
| Leverage | | **0.899***** | **0.882***** | **0.887***** |
| | | (10.272) | (10.741) | (10.939) |
| GDP per Capita | | -0.001 | -0.000 | -0.002 |
| | | (-0.835) | (-0.566) | (-1.260) |
| GDP Growth | | -4.601 | -4.224 | -4.395 |
| | | (-1.308) | (-1.165) | (-1.225) |
| Observations | 44,362 | 9,492 | 9,407 | 9,402 |
| R-Squared | 0.589 | 0.592 | 0.602 | 0.605 |
| Adjusted R-Squared | 0.569 | 0.559 | 0.570 | 0.570 |
| Bank*Year Effects | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes |
| Bank's Country Effects | No | No | No | Yes |
| Time Effects | No | No | No | Yes |
| Firm's Country Effects | No | No | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

## Table A.8
## Loans with maturity longer than 4 years

The table reports coefficients and t statistics in parentheses. The dependent variable is *AISD* and the climate policy exposure is measured by the CCPI. All variables are as defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) contains only loan characteristics, column (2) only firm and macro-level controls. Specifications (3) and (4) include loan, firm and macro controls. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| FossilFuel | **37.012*** ** | **36.921** ** | **35.503** ** | **37.350** ** |
| | (4.186) | (2.361) | (2.343) | (2.283) |
| FossilFuel*Climate Policy Exposure (CCPI) | 0.096 | 0.216 | 0.310 | 0.263 |
| | (0.302) | (0.546) | (0.755) | (0.618) |
| Loan Amount | **-24.398*** ** | | **-13.957*** ** | **-13.841*** ** |
| | (-16.012) | | (-7.783) | (-7.414) |
| Maturity | **64.093*** ** | | **64.322** ** | **66.724** ** |
| | (3.798) | | (2.268) | (2.436) |
| Collateral | 28.329 | | 28.473 | 28.077 |
| | (1.628) | | (1.499) | (1.514) |
| Number of Lenders | **-1.434*** ** | | -0.183 | -0.150 |
| | (-3.191) | | (-0.589) | (-0.486) |
| Performance | **-33.746*** ** | | **-14.312*** ** | **-14.223*** ** |
| | (-8.031) | | (-5.267) | (-5.102) |
| Number of Covenants | -0.714 | | 2.659 | **2.659** * |
| | (-0.386) | | (1.609) | (1.656) |
| Firm Size | | **-22.631*** ** | **-13.944*** ** | **-14.306*** ** |
| | | (-14.273) | (-9.096) | (-8.898) |
| Market to Book | | **-17.508*** ** | **-14.772*** ** | **-15.080*** ** |
| | | (-8.557) | (-6.884) | (-6.545) |
| Asset Tangibility | | **-0.078** ** | **-0.080*** ** | **-0.081*** ** |
| | | (-2.608) | (-2.723) | (-2.715) |
| Leverage | | **0.885*** ** | **0.878*** ** | **0.879*** ** |
| | | (10.441) | (10.872) | (10.997) |
| GDP per Capita | | -0.000 | 0.000 | 0.001 |
| | | (-0.270) | (0.041) | (0.280) |
| GDP Growth | | -0.536 | -0.243 | -4.106 |
| | | (-0.280) | (-0.130) | (-1.632) |
| Observations | 27,866 | 6,355 | 6,269 | 6,264 |
| R-Squared | 0.626 | 0.652 | 0.662 | 0.664 |
| Adjusted R-Squared | 0.605 | 0.621 | 0.632 | 0.631 |
| Bank*Year Effects | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes |
| Bank's Country Effects | No | No | No | Yes |
| Time Effects | No | No | No | Yes |
| Firm's Country Effects | No | No | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

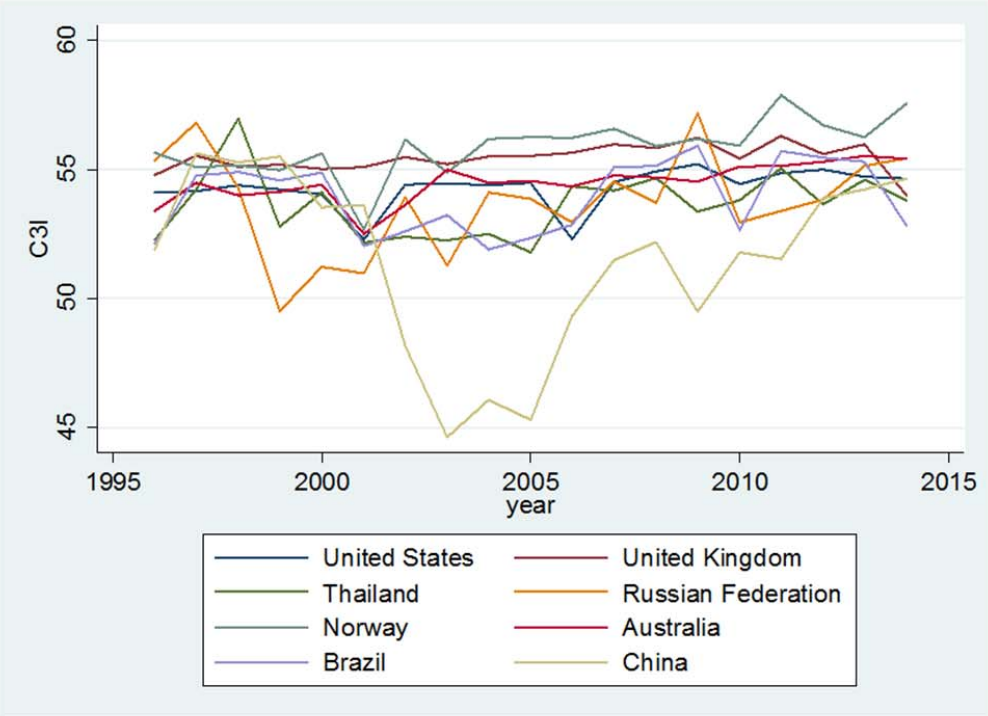
## Table A.9
## Loans with maturity longer than 4 years-Proved reserves over total assets

The table reports coefficients and t statistics in parentheses. The dependent variable is *AISD* and the climate policy exposure is measured by the C3I. All variables are as defined in Table 1. The lower part of the table denotes the type of fixed effects and clustering used in each specification. Column (1) contains only loan characteristics, column (2) only firm and macro-level controls. Specifications (3) and (4) include loan, firm and macro controls. For readability, omitted variables due to collinearity are left out. (* p<0.10, ** p<0.05, *** p<0.01)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Proved Reserves over Total Assets | 41.648 | 113.130 | 38.775 | 38.646 |
| | (0.807) | (1.560) | (0.776) | (0.762) |
| Climate Policy Exposure (CCPI) | **1.033**** | **1.044**** | **1.159**** | **1.170**** |
| | (2.548) | (2.148) | (2.252) | (2.300) |
| Proved Reserves over Total Assets*Climate Policy Exposure (CCPI) | -1.258 | -2.654 | -1.123 | -1.138 |
| | (-0.839) | (-1.431) | (-0.762) | (-0.766) |
| Loan Amount | **-24.333***** | | **-13.520***** | **-13.377***** |
| | (-16.351) | | (-7.042) | (-6.734) |
| Maturity | **65.748***** | | **68.210**** | **69.899**** |
| | (3.852) | | (2.408) | (2.503) |
| Collateral | **41.450**** | | **39.426**** | **39.002**** |
| | (2.413) | | (2.019) | (1.999) |
| Number of Lenders | **-1.399***** | | -0.183 | -0.141 |
| | (-3.029) | | (-0.583) | (-0.455) |
| Performance | **-33.188***** | | **-13.553***** | **-13.427***** |
| | (-7.960) | | (-5.301) | (-5.160) |
| Number of Covenants | -0.732 | | 2.515 | **2.499*** |
| | (-0.388) | | (1.621) | (1.657) |
| Firm Size | | **-22.568***** | **-14.105***** | **-14.551***** |
| | | (-13.950) | (-8.831) | (-8.570) |
| Market to Book | | **-17.179***** | **-14.422***** | **-14.674***** |
| | | (-7.572) | (-6.093) | (-5.960) |
| Asset Tangibility | | **-0.083**** | **-0.085***** | **-0.083**** |
| | | (-2.576) | (-2.677) | (-2.580) |
| Leverage | | **0.885***** | **0.876***** | **0.878***** |
| | | (10.101) | (10.299) | (10.297) |
| GDP per Capita | | 0.000 | 0.001 | 0.000 |
| | | (0.412) | (0.828) | (0.175) |
| GDP Growth | | -0.497 | -0.224 | -2.360 |
| | | (-0.244) | (-0.113) | (-1.395) |
| Observations | 27,445 | 6,212 | 6,130 | 6,125 |
| R-Squared | 0.628 | 0.656 | 0.666 | 0.668 |
| Adjusted R-Squared | 0.607 | 0.625 | 0.636 | 0.636 |
| Bank*Year Effects | Yes | Yes | Yes | Yes |
| Loan Type Effects | Yes | Yes | Yes | Yes |
| Loan Purpose Effects | Yes | Yes | Yes | Yes |
| Bank's Country Effects | No | No | No | Yes |
| Time Effects | No | No | No | Yes |
| Firm's Country Effects | No | No | No | Yes |
| Clustered Standard Errors | Bank, Firm | Bank, Firm | Bank, Firm | Bank, Firm |

**Figure A.1**
**The Climate Policy Indices over time**

The figure illustrates the evolution of the two climate policy indices, C3I and CCPI, over time for eight countries.



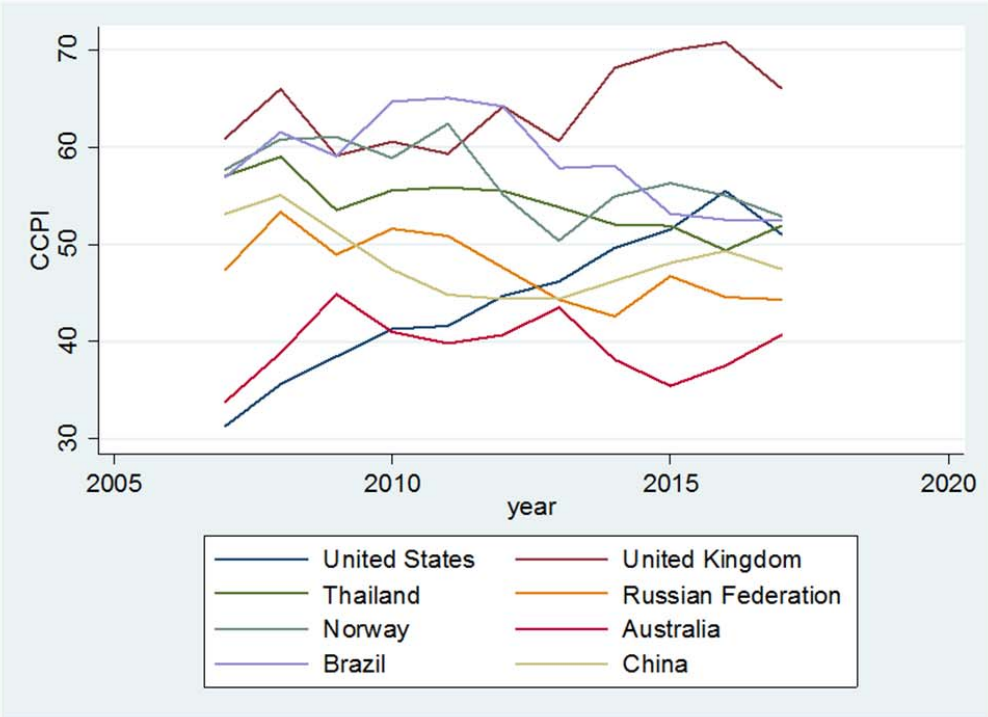



**Figure A. 2**
**The Google Search Volume Index over time**

The figure illustrates the evolution of the three search terms "Carbon Bubble" (Accessed 23 April, 2018)