Can Finance Save the World?
Measurement and Effects of Bank Coal Exit Policies*

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Abstract

We study whether exit policies by financial institutions are an effective tool to address climate change, using bank policies targeting the coal industry around the world as a laboratory. In contrast to theories predicting divestment to be ineffective because capital is highly substitutable, we find large effects of these policies. We first develop a comprehensive set of measures of policy strength, and document a large heterogeneity along this dimension. Using a shift-share instrument combining bank-level policy strength and timing with borrower-bank relationships, we document that bank exit policies affect both the financing and operation of coal assets. We observe negative effects of the policies on coal firm debt issuance, as well as on their outstanding debt and total assets. Substitution from exiting lenders to non-exiting ones, as well as to equity issuance, appears to be limited. Coal power plants owned by firms exposed to bank exit policies are more likely to be retired, translating into lower CO2 emissions. However, the current aggregate impact of such policies is limited by their distribution: banks with larger coal lending businesses adopt fewer and weaker exit policies.

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1 Introduction

In the public debate on how to address climate change, business initiatives are often presented as a crucial ingredient, with potentially easier implementation or larger effects than regulatory or individual actions. Among private actors, financial institutions are often pointed out as disproportionately important, given their central role in allocating capital across economic activities.

Facing unprecedented pressure from activists, investors, and even regulators, a broad set of financial institutions have begun to enact fossil fuel exit policies, also known as divestment policies.[1] In these policies, institutions such as endowments, asset managers, banks, and insurance companies pledge to limit, phase out, or stop altogether intermediating or investing capital in producers and heavy users of fossil fuels. Given the growing adoption of exit policies and public interest in business initiatives to combat climate change, it is important to understand whether such policies are achieving their goals. Do they affect the supply of capital to the fossil fuel industry? If so, to what extent does this affect operations of carbon-intensive activities and eventually reduce carbon emissions?

Theoretically, exit policies from major capital providers should reduce the supply of capital to targeted projects and firms, resulting in an increase in their cost of funding and/or a rationing of their access to capital. However, material effects can only be realized if substitution to other sources of capital is limited. Further, the extent to which reductions in capital supply have real effects depends on the output sensitivity to funding cost and quantity for the industry (Hartzmark and Shue, 2023). It is thus ultimately an empirical question whether these policies have significant financial and real impacts and in what settings.

In this paper, we aim to answer this important question by studying the impact of bank exit policies relating to the global coal industry. Coal is the most carbon-intensive

[1] The movement of divestment from fossil fuels can be traced to the 2006 "Ditch Dirty Development" student campaign in the UK. The movement gained traction around 2011-2012 among student organizations and non-profits in the US, UK and Australia targeting governments and endowments, including Fossil Free ANU, 350.org, and Divest Harvard.

fossil fuel and is the main target of bank exit policies. The coal industry also represents the ideal setting for exit policies by financial institutions to have an impact because it is highly capital intensive and mostly relies on debt for funding, most of which is either issued or underwritten by banks. A reliance on relationship-based bank-intermediated borrowing, combined with the large amount of capital required for coal projects, should make it particularly hard for companies to find replacement capital when their relationship lenders enact divestment policies. If divestment can have any effects, they should therefore be observable in the coal industry. Moreover, our results should bear external validity to the oil and gas industry, the largest source of carbon emission, as it is similarly capital intensive and dependent on bank-intermediated financing.

We implement the following research methodology. First, we develop a comprehensive set of strength measures to capture the rich heterogeneity and multi-dimensionality of the exit policies announced by banks across the world. Our baseline measure calculates the share of a set of hypothetical financial transactions with coal companies that are disallowed by the bank's coal exit policy at a given point in time. Equipped with these measures, we then construct a shift-share instrument that captures the heterogeneous exposure of coal firms to bank exit policies. The variation in this instrument is driven by variation in bank-borrower historic relationships, measured before the 2015 Paris Climate Agreement, which kick started the announcement of exit policies, as well as by variation in the strength and timing of such policies. We use this instrument to estimate the causal effects of the exit policies on borrower financial and real outcomes. This causal analysis raises an additional question, which matters for assessing the magnitude of the current impact of the divestment phenomenon: which banks adopt exit policies?

Our main results are as follows. We first document that, size weighted, most banks active in commercial bank lending and bond underwriting are implementing coal exit policies. There is however substantial heterogeneity in the strength and timing of these policies. Further, we document that policy adoption and strength are predicted by bank characteristics. In particular, the strongest and earliest adopted policies tend to be from banks with less exposure to the coal industry, which puts a cap to the impact the divestment phenomenon can have with its current adoption.

Second, we document that banks do seem to comply with their own coal exit policies. Bank intermediation of credit to coal companies drops significantly after a bank adopts a coal policy. Further, conditional on adopting a coal policy, measures of its strength further predict the decline in the bank's supply of capital to the coal industry.[2] This is in contrast to the findings of Haushalter et al. (2022), who study earlier bank exit polices related to mountaintop removal mining, and find no evidence banks adopting such policies reduce lending to targeted firms.

Next, turning to the financing effects of exit policies, we find evidence consistent with a significant reduction in the debt issuance of firms that have historic relationships with banks implementing strong policies. The magnitude of this effect is large: the average treatment conditional on treatment results in a reduction by 24% of annual debt issuance. These effects are more pronounced for firms whose activities are concentrated on coal, for small firms, and for mining firms. Substitution between exiting lenders and non-exiting ones, and into equity markets, an important concern over the effectiveness of such policy, appears to be limited. Consistently, borrowers exposed to bank exit policies also reduce their overall long-term debt.

Finally, we find evidence that bank exit policies are also affecting real activity in the coal sector. First, at the firm level, borrowers more exposed to bank exit policies exhibit a contraction of their total assets. More strikingly, we show that in a large sample of coal-fired power plants, those with parent companies more exposed to bank exit policies are more likely to be decommissioned in the years following the 2015 Paris Climate Agreement. Consistently, carbon emissions decrease for plants from firms exposed to exit policies, with reductions coming from plant retirement but also at plants that continue to operate. Overall, our results show that the existence and strength of these policies matter, and that they result in material effects aligned with their goal.

[2] We do not view endogenous policies as a threat to our causal identification at the borrower level, except if strong bans are correlated with clear pre-trends in credit demand from a bank's coal client base.

This paper connects to several strands of the literature. First, it contributes to the growing field studying climate finance, which explores the interaction between climate change and the financial system. Giglio et al. (2021) provides a comprehensive review of this literature. While the literature has so far mostly focused on how climate change is affecting financial markets and how they are adapting to it, our study focuses on how financial markets can be a tool to address or mitigate climate change. In that sense, our paper connects with studies analyzing the effect of other major tools to address climate change: regulatory actions, such as cap and trade policies (Ivanov et al., 2021, Colmer et al., 2022) or carbon taxes (Laeven and Popov, 2022), or innovation (Aghion et al., 2023, Bolton et al., 2022). Our study also relates to Adrian et al. (2022), who perform a cost-benefit analysis of a worldwide coal phase-out and estimates the amount of financing required to achieve it.

Second, our paper contributes to the burgeoning literature on how investors and financial institutions pursue non-financial objectives, and to what effect. Such objectives include pro-social ones, as in this study, but may also cover political ones (Siriwardane et al., 2023). This literature covers a range of methods financial institutions use to reach such objectives: capital allocation strategies like divestiture or deliberate investment in socially valuable firms such as impact investing (Green and Roth, 2023), ESG strategies (Pastor et al., 2023), activist strategies such as shareholder voting (Broccardo et al., 2022), or innovative security design (Loumioti and Serafeim (2022)).

The central question this literature tackles is assessing the effectiveness of such methods. Broccardo et al. (2022) argue that divestment policies are relatively ineffective because capital is easily substitutable, while in contrast activist of voting strategies can be more effective. Oehmke and Opp (2022) demonstrate the importance of consequentialist preferences in generating impact in the context of activist strategies.[3] Turning to the effectiveness of capital allocation strategies, which is the topic of this study, the literature highlights a set of necessary conditions for capital allocation policies to induce desired non-financial

[3] Gupta et al. (2021) highlight dynamic considerations that limit the impact of such strategies.

objectives. Of little debate is the fact that such policies are only successful if they significantly impact the price or quantity of capital.[4] Impact is magnified to the extent it is difficult for negatively affected firms to substitute into alternate sources of external capital, for example because policies are widely adopted of frictions limit the set of feasible capital providers. Similarly, capital allocation policies have limited impact on positively affected firms if they simply crowd out existing sources of capital (Green and Roth, 2023). Finally, policies that succeed at rationing capital or changing its cost are only impactful if activities of affected firms are sensitive to these changes (Hartzmark and Shue, 2023).

Empirical studies tackling this question have to date largely focused on specific campaigns or segments of the financial markets. Teoh et al. (1999) documents a negligible effect for the South African equity divestment on targeted firms' value. Consistently, Berk and van Binsbergen (2021) do not find any effect from ESG-motivated equity divestment on targeted firms' cost of capital and real investment decisions. Studies of debt market interventions find mixed results. Sachdeva et al. (2022) finds borrowers affected by the Department of Justice's "Operation Choke Point" perfectly substitute into new sources of capital. Kacperczyk and Peydró (2022) finds banks joining the Science-Based Targets Initiative (SBTi) affect borrowers' ability to raise capital, but do not generate an impact on environmental outcomes. Closest to our setting, Haushalter et al. (2022) finds no effects of bank exit policies targeting mountaintop removal coal mining.

Our contributions to this literature are to document empirically that exit strategies can in fact achieve their goals, and to clarify the set of necessary conditions under which they do. Haushalter et al. (2022) show banks do not seem to comply with their own mountaintop mining exit policies and thus that they have no impacts on targeted firms. Our novel measurement exercise shows, in an international sample, banks do comply with their broader coal policies–both the adoption of policies and the intensity of adopted policies predict subsequent declines in a bank's coal financing. Sachdeva et al. (2022) shows strik-

[4] There is, however, substantial debate on whether there are in equilibrium price effects. See, for example, Hong and Kacperczyk (2009), Baker et al. (2022), Larcker and Watts (2020), Aswani et al. (2023), Bolton and Kacperczyk (2021)

ingly that firms can substitute into new lending relationships when the set of banks subject to an exit policy is small. In contrast, we show that in the context of coal, the majority of banks have adopted exit policies and that there is no statistically detectable substitution of affected borrowers into non-exiting banks. Finally, our paper speaks to how the design of capital allocation strategies affects their success. Hartzmark and Shue (2023) demonstrate that carbon emissions of "brown" firms are much more sensitive to their cost of capital than are the emissions of "green" firms. While Kacperczyk and Peydró (2022) show credit allocation is affected by broad bank sustainability commitments, they find the effect is driven in part by new credit issued to green firms, and find no impact on the emissions of brown firms. Answered by our paper, importantly, is whether policies solely focused on brown firms achieve their intended effects on emissions.

An additional condition for exit policy effectiveness is the absence of "leakage", i.e. the migration of assets or activities to segments of the global economy where they will be less exposed to the policies that target them. Andonov and Rauh (2022) study patterns of ownership of polluting power plants, exploring the hypothesis that asset sales to less constrained owners limit the impact of regulatory and financial pressures. They find limited evidence for this channel, in particular noting that private, institutional, and foreign ownership accounts for only 11% of US coal-fired power capacity. In a broader setting, Duchin et al. (2022) find that ESG concerns induce sales of polluting assets, but pollution does not change under new ownership.

The remainder of the paper is organized as follows. In Section 2, we provide some background on the divestment movement and develop hypotheses about its effects. In Section 3, we describe our data and the data collection process. In Section 4, we develop a comprehensive methodology to measure divestment policy strength. Section 5 explores determinants of exit policy adoption and strength and banks' compliance with their own policies. In Section 6, we use a shift-share instrument approach to provide causal evidence for the financial effects of divestment policies. Section 7 documents the real effects of divestment policies in coal-fired power plants. Section 8 concludes.

2 Background

2.1 The Divestment Movement and the Coal Industry

The fossil fuel divestment movement started as a grassroots initiative attempting to address climate change by exerting social, political, and economic pressure on financial institutions to foster their exit from activities related to owning, financing or insuring companies involved in extracting, transforming or disproportionately consuming fossil fuels. As of October 2021, 1,485 institutions representing close to $40 trillion in assets worldwide have begun or committed to divesting from fossil fuel-related assets.[5] The divestment movement is affecting several segments of the capital markets: public equity, public and private debt, and insurance markets, with potentially important differences in effects in these different segments.

Within fossil fuels, coal has been the seminal target of such campaigns given the particularly high carbon-intensity of coal-related activities. The burning of coal represents an estimated 46% of CO2 emissions worldwide, and 72% of total greenhouse gas (GHG) emissions from the electricity sector.[6] A large number of NGOs, such as EndCoal and Reclaim Finance, specifically advocate for a general and immediate exit of financial institutions from activities related to the coal industry. In turn, a large number of banks, as shown in Figure 1, and insurance companies have implemented coal exit policies in the wake of the 2015 Paris Climate Agreement. A central argument for targeting coal is that no substitute source of energy is more carbon-intensive, which limits the risk of adverse equilibrium effects in terms of CO2 emissions.

The focus on coal from the divestment movement, and for the purpose of our study, is also motivated by specific institutional details of this industry that make it more likely to achieve measurable effects, given the economic mechanism that motivates exit policies.

[5] See https://www.stand.earth/sites/stand/files/divestinvestreport2021.pdf

[6] Source: International Energy Agency, www.iea.org.

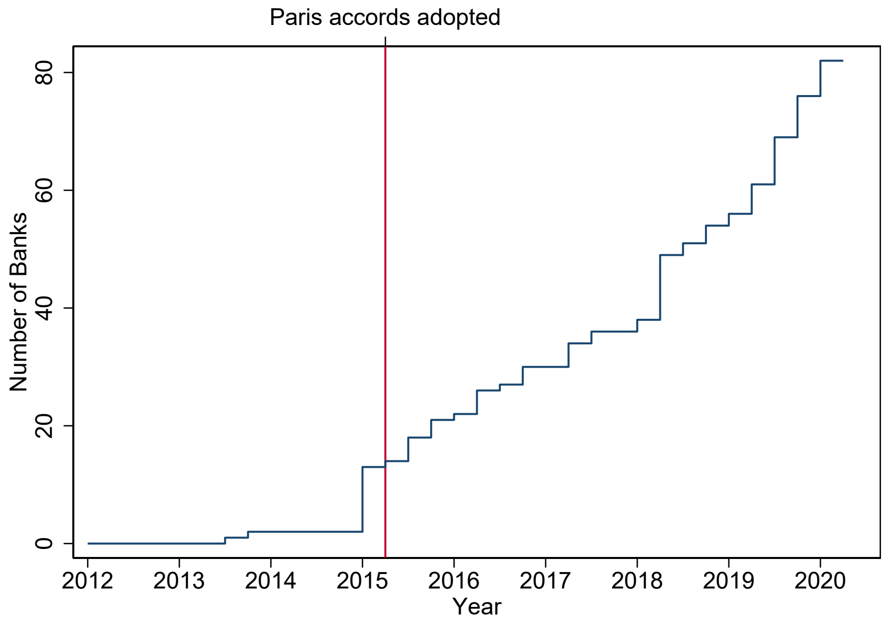

Figure 1: **Number of Banks with Active Coal Exit Policies**

2.2 Economic Framework for Divestment

The economic mechanism predicting financial and real effects from exit policies is the following.[7] Capital providers intentionally restrict the supply of capital to firms or projects meeting certain criteria by declining to provide them with debt or equity financing. The goal of such policies is to increase the cost of funding (price channel) or even ration capital (quantity channel) for targeted firms or projects, thereby affecting their feasibility and economic viability. For this supply shock to materialize and be sufficiently acute to generate sizable real effects, such policies need to be widespread to affect a significant share of the sources of available capital, or there should be important frictions in capital markets that prevent targeted firms from easily substituting to other providers or types of capital. In a capital market with low frictions, such as public equity, there should still be a threshold for the share of capital providers that divest above which it will have a meaningful effect on the cost of capital of targeted projects or firms, and in turn affect the demand for such capital through the price channel.

One interpretation of the studies showing negligible effect of equity divestment, e.g.

[7] Providing a normative framework for whether financial institutions should implement such policies is outside of the scope of this study.

Berk and van Binsbergen (2021), is that such a threshold is high and has not been reached yet. On the other hand, in parts of the capital markets where frictions are high, such as private debt markets, exit policies can be effective even if the share of divesting entities is relatively low. Examples of important frictions in debt markets are information asymmetry, which creates large switching costs for firms willing to change banks (Darmouni, 2020), or segmentation, either geographic or by types of capital providers (Becker, 2007, Mitchell et al., 2007), which limits the pool of capital providers that can replace divesting ones. If sufficiently large, such policies should therefore negatively affect investments and operations of the targeted firms.

In addition, the extent to which an industry relies on external capital, for instance because it relies on large and long-dated projects that cannot be funded with retained earnings, is likely to matter for whether divestment is effective. Outside financing also typically requires insuring the assets, which also speaks to the potential role exit policies by insurers can play.[8]

Such predictions motivate the choice of bank divestment from the coal industry as our main laboratory to identify significant effects from the implementation of exit policies by financial institutions. The coal industry is indeed a highly capitalistic industry, and is reliant on bank debt, which is a geographically segmented market with famously large informational frictions. A coal firm prevented from freely accessing capital might reduce its capital expenditures as it struggles to finance them, or reduce its asset utilization if it requires working capital financing. By changing the cost of capital, such policies should also affect what mining and power plant projects are NPV-positive, or can even be financed, leading to the cancellation of planned facilities, as well as facility sale or decommissioning.

We should further expect the strength of these mechanisms to vary within the coal industry. Smaller companies may have less access to alternative financing and thus be more impacted by exposure to divesting banks. Firms with a large share of their activity related to coal will also suffer more from the divestment policies. We might also expect

[8] A lack of available data on insurance contracts prevents us from including insurers in our analysis.

less profitable firms, with lower retained earnings, to be more affected by bank divestment. In addition, some firms might exhibit less pronounced financial effects because they are raising capital to diversify or change their business model, as is often fostered by the design of exit policies. We explore each of these hypotheses in detail in Section 6.

3 Data

For the purpose of our study, we develop a comprehensive and global dataset centered on the interaction of the financial system with the coal industry. Our dataset combines information on debt and equity transactions by coal firms obtained by consolidating a comprehensive set of financial databases, with firm-level financial statements and asset-level operational metrics. We also incorporate manually-collected bank coal exit policies. The assembled dataset covers the period 2009 to 2021.

3.1 Firm-level data: financing and real outcomes

The Global Coal Exit List (or "GCEL"), which covers both coal producers and users, serves as the basis for our sample of coal companies. This list, which was created by the NGO Urgewald, is a comprehensive list of companies that play a significant role in the coal sector and is the one used by the United Nations Principles for Responsible Investments (PRI). The companies in the GCEL have to meet one of the three criteria: i) The company's coal share of revenue or power production should be at least 20%, ii) The company's annual thermal coal production should be at least 10 metric tones or generation capacity should be at least 5 GW, iii) The company is involved in expansion or development of new coal infrastructure. This broad cutoff ensures all the major players in the coal industry are covered and thus, are included in our sample. There are 935 parent companies covered in the GCEL as of 2021, with an additional 1,849 subsidiary companies. Further, the GCEL also provides us with firm-level information related to its inclusion criteria, such as capacity (power), output (mining), fraction of revenue from coal and the share of power generated that is through coal. This sample of firms accounts for 84% of estimated worldwide annual coal production and 81% of installed coal power capacity. To observe the firms' loan borrowing activity, we use a combination of DealScan, the standard syndicated loan dataset, and IJGlobal, a dataset focused on project financing of assets in the energy sector. These datasets both have global coverage, and their overlap in terms of transactions is small.[9] While some debt transactions or even some firms are likely to be missing from these sources, for instance bilateral loans for corporate finance purposes or smaller firms from the list, these sources are the gold standard in terms of coverage of the large scale financing associated with the development or expansion of new facilities such as mines or powerplants, which is the focus of this study. We match firms from the GCEL to both the datasets to form a subsample of 485 out of the 935 parent companies in the GCEL. This subsample of firms accounts for 61% of estimated worldwide annual coal production and 67% of installed coal power capacity.

The loan borrowing dataset consists of 6,227 loan facilities issued from 2009 to 2021 across 485 GCEL borrowers and their subsidiaries. We complement this loan dataset with bond and equity issuances, which we obtain from SDC Platinum. The bond issuance dataset consists of 11,147 bonds issued in the same period to 280 GCEL parent companies and their subsidiaries, and the equity issuance dataset contains 777 equity issues from 175 GCEL companies.

We also use Orbis to obtain financial statements for the companies in our sample. We obtain annual statements from 2012 to 2020 for 818 parent companies on the GCEL. Combining data sources, we have both external capital raising and financial data for 333 parent companies, representing 56% and 65% of worldwide coal production and installed coal power capacity, respectively.

Panel A of Table 1 provides some summary statistics for this sample.

INSERT TABLE 1 HERE

[9] We remove duplicates between the two transaction datasets, and define them as any transaction between a bank and a firm which are at most 100 days apart and the difference in the amounts between the two dataset is less than 10 million USD.

3.2 Bank-Level Data

3.2.1 Lending and Underwriting Activity

We build a list of banks having participated in transactions reported in Dealscan and IJGlobal over our sample period. Table 2 provides summary statistics over their lending activity related to the coal and energy industry at large. These statistics illustrate that the coal industry represents a small fraction of the median bank lending activity, but that certain banks are highly exposed to the industry.

INSERT TABLE 2 HERE

3.2.2 Exit Policies

We obtain an initial list of bank divestment policies from the NGO Reclaim Finance, which actively tracks and publish the release of such bank policies. This list comprises all the banks that have released a divestment policy as of March 2021, as well as a timeline of when the initial policies were released and if there were any updates to the existing policies. We use this list to identify divesting banks and manually check for large banks not appearing on this list, that they do not have such a policy. We obtain both initial policy announcements and their updates from company websites. In total, we identify 82 banks that have released 126 policy statements specifically covering the coal industry between 2014 and 2021, 74 of which we can link to debt transactions with our sample of coal firms.

3.3 Asset-Level Data: Coal-fired Power Plants

We use the Global Coal Plant Tracker from Global Energy Monitor to obtain facility-level information on coal-fired power plants. This datasets covers 4,164 power plants globally, and contain information on production, capacity, facility characteristics, geographic location, and current ownership. Summary statistics are provided in Panel B of Table 1. The period covered is 2009 to 2021. We match this data with our main sample through the current ownership information.

We also collect CO_2 emissions data at the facility level from regulatory sources when they are publicly available. We obtain such data for 396 facilities located in the US, the European Union and Australia. For the US, the source is the Greenhouse Gas Reporting Program (GHGRP) initiated by EPA. Summary statistics are provided in Panel B of Table 1.

4 Measuring the strength of exit policies

While a large number of financial institutions have announced an exit policy for coal, a crucial question is whether and how binding such policies actually are. For example, despite having a coal exit policy in place since 2019, in March 2022 Goldman Sachs made a bilateral loan of $150m to Peabody, one of the largest coal mining companies, despite having a coal divestment policy in place.[10] This episode, and broader accusations of "greenwashing" by banks, calls for a robust measure of policy strength, to be related to actual changes in lending standards. A related question is which bank characteristics are predictive of the existence and the strength of divestment policies, which matters for the aggregate effect of exit policies.

4.1 Methodology

We develop a novel methodology for assessing the strength of a bank exit policy. We first define a series of variables that, when combined, allow to comprehensively describe the exit policy criteria for all the banks in our sample. The variables are listed and defined in Figure 2.

Any combination of these variables defines a hypothetical financing activity that is either allowed or disallowed by a bank's exit policy. We manually code each bank policy as boolean logical statements that describe the set of hypothetical financing activities that is allowed by a given bank in a given year.

For example, the exit policy of Deutsche Bank, in the 2016-2019 period, prohibits the

[10] https://www.ft.com/content/21031a45-c47b-453e-b5bb-fd9da80367dc

bank from engaging in financing related to the construction or expansion of coal-fired power plants. Starting in 2020 the policy expands in three dimensions. It further prohibits the financing of mountaintop mining in the United States, project financing of new thermal mining projects, and corporate financing of power companies that derive more than 50 percent of their revenue from coal-fired plants outside of Asia that lack a decarbonization strategy. Such financing is then banned in Asia starting in 2022. This policy is coded as:

```
ban = 1 if
    (year > 2016 & isPowerProj & (isNew | isExpansion)) |
    (year > 2020 & isMountaintopProj & CountryParent = "USA") |
    (year > 2020 & isMiningProj & isThermal & isNew) |
    (year > 2020 & isPowerCo & CoalFracRevParent > 0.5 & !hasDecarbonStrat
                & (ContinentParent != "Asia" | year > 2022))
```

We encode each bank policy in the same fashion and derive several proxies of exit policy strength from this coding.

The final column of Panel A in Figure 2 show how many banks in our dataset have policies that are *sensitive* to a given attribute. This measure of sensitivity picks up if the policy is ever, all else equal, sensitive to a given characteristic of a potential financing. This captures the extent to which policies make explicit bans (or carveouts) along a particular dimension. For example, 18 banks have policies that depend on whether or not the financing is for an existing bank customer. In practice, each of these banks is making a carveout to its policy to allow for continued financing to existing customers. Similarly, 22 banks allow for exceptions to their policies for borrowers with a "decarbonization strategy." Such a strategy is in general not well defined in the publicly available bank policy documents, which leaves significant room for discretion.

Our central measure of policy strength is the share of a comprehensive set of financing scenarios that a bank bans in a given year. The set of scenarios we use for this purpose is reported in Panel B of Figure 2.[11] Banks that ban a larger share of the scenarios described by this coding have stronger divestment policies. Alternatively, we can use an indicator variable capturing if a bank has *any* active policy in a given year as a parsimonious alternative measure. Together these measures can capture the intensive and extensive margins of bank divestment policies in a robust yet parsimonious manner.

Finally, we include or develop several alternative measures of policy strength. *Reclaim Finance Score* is the general measure of policy strength as attributed by the NGO Reclaim Finance. *Reclaim Finance Phaseout Score* is the subscore focusing on whether the policy is consistent with a phasing-out of lending to coal firms. The *Complexity Score* is the fraction of the 16 policy variables described above to which a given policy is sensitive to in a given year. More complex policies are a function of more variables. While the strongest feasible policy, i.e. a total ban on any coal-related project, would be a simple policy to state, no banks in our sample adopt such ban. A genuine phasing-out of coal lending may call for a complex policy as it requires a schedule of criteria.

4.2 Outcomes

Figure 3 plots the share over time of banks banning a subset of scenarios. This figure illustrates that divestment policies disproportionately target new projects vs existing ones or expansions, project finance vs. corporate finance, and power generation vs. mining.

INSERT FIGURE 3 HERE

Overall, the heterogeneity across banks in terms of strength of coal lending bans appears to be substantial, which motivates the importance of accounting for exit policy strength when studying the effects of such policies.

[11]Using all possible scenarios provides similar results, but makes the exercise less intuitive.

5 Exit Policies and Bank Financing of the Coal Industry

5.1 Determinants of Exit Policy Strength

Appendix Figure B2 displays the share of banks having an active divestment policy in place for a given year (Panel A), and the average strength of such policies, conditional on having a policy (Panel B), both broken down by geographic region. European banks appear to have been leading the movement, both in terms of exit policy penetration and strength. North America and Asia are however catching up on both dimensions.

To further explore the determinants of exit policies, we estimate in Table 3 cross-sectional regressions relating policy adoption and policy strength to observable characteristics of a bank. We use four different dependent variables: an indicator variable for having an exit policy as of 2020 (column 1 and 2), an indicator variable for having implemented the policy before 2019 conditional on having such a policy (column 3 and 4), policy strength as of 2020 (column 5 and 6), and maximal policy strength (column 7 and 8). Large banks appear to be significantly more likely to have an exit policy, and to have adopted this policy early. Consistent with the previous figure, geography also matters: European banks are more likely to have a policy, and for this policy to be strong. Banks with a large share of their lending going to the coal industry have weaker policy, suggesting that economic incentives play a role in the design of the policy. This relationship appears to result from Asian banks being active in coal lending and having weaker policies, as introducing continent fixed effects drives down the coefficient on coal share of lending in column 8. A bank's exposure to the broader energy sector is not a determinant of coal exit policy adoption or strength. While these results suggests that bank policy design is endogenous to its client base, we do not view this source of endogeneity as a threat to the causal identification strategy we implement later in the paper, as it relies on borrower level variation in exposure to coal exit policies. These findings however highlight an important caveat to the aggregate effects of exit policies: for them to effectively lead to a massive phasing out of coal assets, they need to be adopted by the banks the most active in financing the coal industry.

INSERT TABLE 3 HERE

5.2 Policy Strength and Bank Financing of Coal

To assess whether banks are following through on their policies, and validate our measures of strength, we study the annual coal lending and underwriting activity of banks with strong divestment policies. In Figure 4, we plot the aggregate amount of loan issuance, scaled by the 2010 amount, over time, for banks with a strong exit policy, i.e with a strength measure above the median conditional on having a policy, and for the other banks in our sample. Banks with a strong exit policy reduce significantly more their lending over our sample period than banks with no or weak policies. This reduction is particularly evident from 2015, the date of the Paris Climate agreement that kick started the bank coal exit policies.

INSERT FIGURE 4 HERE

Table 4 reports regressions of bank financing activity on measures of exit policy existence and strength. In column 1, we regress the log of debt origination amount for a given bank in a given year on an indicator variable for this bank to have an exit policy in place in that year. Debt origination includes both loan issuance and bond underwriting, as both are typically covered by the exit policies. We include both bank and year fixed effects to absorb the composition effects on bank time-invariant characteristics previously documented, as well as general trends in coal debt issuance. In column 2, we interact the active ban indicator variable with our baseline measure of policy strength previously described, which is time-varying. In column 3 to 6, we interact an indicator for being after 2015 with the maximum strength of a bank policy, therefore focusing exclusively on the cross-sectional heterogeneity in policy strength.

In general, the existence of a coal exit policy, and its strength are associated with decreased coal lending and bond underwriting. Interestingly, column 2 shows that conditional on a bank having a coal policy in place in a given year, our measure of time-varying policy strength provides no further explanatory power in predicting the banks volume of coal financing. In contrast, the maximum future policy strength of a bank is more informative, which is consistent with genuine policies being designed around a progressive strengthening of the policy. This intensive margin effect is robust to the alternative measures of strength. Conditional on having an active coal exit policy, a one standard deviation increase in the maximum bank policy strength is associated with a 20 to 30 percent decline in coal financing in the post 2015 period, which is economically large and suggests the policy design is of first-order importance.[12]

INSERT TABLE 4 HERE

6 Effects of Exit Policies

6.1 Identification Strategy

Our central identification strategy relies on exploiting the plausibly exogenous variation in exposure to bank exit policies at the borrower level resulting from heterogeneity in pre-existing banking relationships, and bank-level variation in exit policy existence, timing and strength.

We thus construct a shift-share instrument capturing a borrower's exposure to exiting banks based on the banks with whom it had a lending or bond underwriting relationship for the period 2009-2014.[13]

The intensity of a ban is measured as the unweighted fraction of scenarios banned by bank b in year t, which we label $B_{b,t}$. Let $w_{f,b}$ be the share of firm f financing volume with bank b. Our main instrument is defined as:

$$Bank\ Exit\ Exposure_{g,t} = \sum_{b} w_{f,b} \times B_{b,t} \tag{6.1}$$

We then precisely measure the effects of being exposed to exit policies on firm outcome

[12] We do not take a stance on whether this relationship results from selection or treatment, as it likely is a combination of the two.

[13] We fix the set of relationship banks for a given borrowers to avoid variation in our instrument resulting from using a rolling-window to identify relationship banks.

Y by running the following specification:

$$Y_{f,t} = \beta Bank\ Exit\ Exposure_{g,t} + \delta_f + \mu_{f,t} + \epsilon_{f,t} \tag{6.2}$$

where δ_f are firm fixed effects, and $\mu_{f,t}$ are year fixed effects in column 1, and country-year and size quintile-year fixed effects in the other columns. The country-year fixed effects aim at absorbing possible confounding factors such as local demand, local price of competing energies, or regulatory action targeting coal. Most of these factors are likely to be mostly uniform at the country level, and will therefore be adequately absorbed. The size quintile fixed effects mitigate concerns over possible trends correlated with size, for instance if small firms in general have a harder time getting financing over time.

Overall, our identifying assumption is that our instrument is not correlated with firm-level unobserved time-varying characteristics directly affecting the outcome variable. Given our panel setting, such characteristics would need to correlate cross-sectionally with the exit policy existence and strength, and in the time-series with the timing of the implementation of the ban, while being orthogonal to country-level and firm size trends.

6.2 On Financing Transactions

As a first take on the data, we plot in Figure 5 the aggregate amount of loan issuance in a given year, scaled by its 2010 amount, for coal firms with high treatment over the period, i.e. with above median cumulative bank exit exposure conditional on being treated, and the rest of coal firms from our sample. The figure suggests that firms highly exposed to bank exit policies borrow less than firm with no or low exposure to such policies.

INSERT FIGURE 5

We then estimate the causal effects of being exposed to bank exit policies on financing by using $IssuedAmount_{f,t}$, the total amount of bank loans and corporate bonds issued by firm f in year t, as the borrower outcome of interest. We group these two types of debt to abstract from substitution between loans and debt, in particular because bank divestment policies typically cover both loan issuance and bond underwriting activities. Aggregating both types of transactions also reduces the amount of zeroes in our outcome variable, which helps with statistical power.

Regression coefficients are displayed in Panel A of Table 5. The regression coefficients in column 1 and 2 show that any prior borrowing from a lender that subsequently adopts a divestment policy predicts subsequent declines in loan issuance. While this relationship appears to be at the border of statistical significance for the general sample, the predictive power is strongly reinforced by interacting it with indicators for the borrower having an above median share of revenues derived from coal, and or a below median size, as measured by total assets.

INSERT TABLE 5

We further confirm these results by using the previously described set of alternative measures of ban strength in the same specification: *Reclaim Finance Score*, *Reclaim Finance Phaseout Score*, *Transition score*, and *Complexity score*. Results are displayed in Appendix Table B1. The relationship is robust across the board when using these alternative measures of ban strength.

To mitigate concerns over pre-existing trends that could confound our analysis, we plot in Figure 6 the coefficients from regressing the cumulative amount of debt financing since 2010 for a given firm on the interaction between year fixed effects and the previously used indicator variable for being highly exposed to bank exit policies. We observe a lack of pre-trend for the 2010-2014 period. The effects we identify might however have started the year before the Paris Climate Agreement, which is consistent with our interpretation of exit policy disclosure as not necessarily representing a sharp discontinuity in banks lending and underwriting policies, and potentially slightly lagging their initiation.

Finally, in Appendix Table B2, we explore whether our results are driven by firm exposure to banks' broader climate commitments, or it is specific exposure to targeted coal exit policies that limit coal firm debt issuance. To do this we study firm exposure to banks adopting the Science Based Targeting Initiative (SBTi) studied in Kacperczyk and Peydró (2022). We construct a new shift share instrument, SBTi Adoption Exposure, defined as the volume weighted share of firm f's relationship banks that have adopted SBTi commitments as of year t. Controlling for exposure to broader bank climate commitments does not significantly affect the magnitude of the impact of exposure to bank coal exit policies.

6.3 Adjustment Margin for Financing Transactions

We now turn to studying how firms that face exposure to bank exit policies reduce borrowing and the extent to which they substitute to different lenders or other forms of capital. First, we decompose the amount of debt financing into components from banks with and without coal exit policies, and into components from relationship and non relationship banks. We replace the dependent variable in equation 6.2 by these quantities, and report the regression coefficients in Panel B of Table 5.

Columns 1 and 2 show that exposure to coal exit policies results in debt financing contraction mostly from exiting banks. There is however no evidence of substitution to non-exiting banks, as if anything the financing from these banks also comes down. Columns 3 and 4 show that most of the debt financing contraction associated with policy exposure comes from relationship banks. Firms do not compensate by increasing financing from non-relationship banks.

Next, columns 5 and 6 decompose observed borrowing declines into the intensive and extensive margin. In column 5 the dependent variable is an indicator of whether the firm issued debt in that year. In column 6 the dependent variable is the log of debt issuance and the sample is limited to firm-years in which there is positive debt issuance. We find significant effects only on the extensive margin. A one standard deviation higher bank exit policy exposure corresponds to a 3.2 percentage point decline in the probability of a firm issuing debt in a given year, or equivalently a 5.6% reduction in the baseline rate of debt issuance.

Finally, column 7 shows that firms do not seem to compensate for reduced debt financing through equity issuances. Overall, these findings are consistent with the important switching costs in debt markets previously documented in the literature, although the lack of substitution towards equity issuance is also striking.

6.4 Effects on Capital Structure

We then turn to test whether these effects on financing transactions translate into measurable effects on firm capital structure. We run similar specifications as in equation 6.2, using the log of long term debt and book leverage as the dependent variables. Regression coefficients are displayed in Panels A and B of Table 6. This exercise also mitigates potential concerns over our transaction data lacking private debt transactions that have become popular in certain segments of the economy (Chernenko et al., 2022).[14]

Exposure to divestment policies translate into a lower amount of long term debt, and a reduction in book leverage. Turning to the cross-section of coal firms, we observe that these effects are larger for small firms than for large firms, but are of similar magnitude for low vs. high coal share of revenues. We reconcile this latter result with the transaction level results as follows. There are two drivers to debt stock: new issuance, and debt repayment. New issuance appears to react much more to bank exit exposure for high coal share firms. However, debt repayment sensitivity might also differ between these two groups, and thus leads to net effect on debt stock to be of comparable magnitude.

INSERT TABLE 6

7 Real Effects

Having documented that bank exit policies translate into a reduction in the external financing of targeted firms, we now turn to exploring effects on investment policy and operations.

In theory, facing limited access to finance their coal assets, affected firms may choose not to invest in their existing assets. They may also decide to change the operation of existing

[14]To further alleviate this concern, we conduct a manual data collection exercise described in Appendix A.

assets, for example by selling assets, closing plants, and reducing output quantity or quality. On the other hand, they may react by acquiring new assets, or start new projects, either to maximize short-term profitability, or to pivot towards less carbon-intensive activities.[15]

We first use our central specification to test whether firms exposed to exit policies reduce their total assets. Panel C of Table 6 uses the log of total assets as the dependent variable in equation 6.2. The negative coefficients are consistent with a shrinkage of firms exposed to such policies. As expected, such shrinkage is also concentrated in firms exhibiting a high share of their activity tied to coal. se(To fully trace-down the effects of exit policies on coal assets, we focus on coal-fired power plants, for which we have more granular data than coal mines. In particular, we are able to observe the age and capacity of each plant and track its operating status over time, including its retirement. We hypothesize that owners of coal plants with limited access to finance may choose to retire plants earlier than otherwise expected, in line with the exit policies' objective. To test this hypothesis we estimate a Cox Proportional Hazard model at the plant level, estimating determinants of the hazard rate of plant retirement. We depart from our previous time-varying measure of policy strength and instead interact a cross-sectional measure of borrower exposure to coal exit policies with a post-2015 indicator in certain specifications. We adopt this formulation because plant closure decisions are unlikely to line up exactly with the timing of coal exit policies at a borrower's relationship banks.

Panel A of Table 7 shows that coal-fired power plants owned by firms more exposed to coal exit policies are more likely to face early retirement than plants owned by less exposed firms. Coefficients higher than one indicate the variable increases the hazard rate of plant retirement. The first column shows the cross sectional measure based on exposure to strong exit policies does not predict plant retirement in the full sample period. However, this variable significantly predicts early retirement in the post 2015 period. All else equal, after 2015 a plant with a one standard deviation higher exposure to coal lending bans is 20% more likely to be retired in a given year, relative to a baseline retirement rate in the

[15]Thus, exit policies could affect firm real outcomes even in the absence of (firm-level) financial effects.

sample of roughly 6%. Column 3 shows that the magnitude of the effect is significantly amplified for plants owned by small firms. Column 4 shows that plants owned by borrowers with a low share of coal activity are more likely to close because of coal lending bans, but not significantly so. This is consistent with the notion that more diversified firms are better able to substitute into different investment opportunities. Column 5 shows that large plants are equally likely to be retired as smaller ones because of financial pressures.

INSERT TABLE 7 HERE

Last, in Panel B of Table 7, we study the effects of coal exit policies on CO2 emissions for the coal fired power facilities for which we can obtain such data. We regress facility annual CO2 emissions (scaled by 2014 levels) on Bank Exit Exposure, and on an indicator of whether the plant is active in a given year. Higher exposure to exit policies results in lower emissions. We then decompose this effect into the extensive margin effect identified in the retirement analysis, as well as a potential intensive margin effect on plants that continue to operate. Column 2 studies the intensive margin by limiting the sample to plant-years with continued operations. A one standard deviation higher exposure to strong bank exit policies has large negative effects on the emissions of operating plants. Though we lack the data to verify, it is likely this effect is coming from reduced plant utilization rather than increase emissions abatement, given the relatively large magnitude of the effect. Column 3 confirms that in this subset of coal fired power plants we still see the same effect on plant retirement documented above.

8 Conclusion

We study whether divestment policies are an effective tool to address climate change, using coal lending bans by banks around the world as a laboratory. We first develop a comprehensive measure of policy strength, and document a large heterogeneity along this dimension. Using a shift-share instrument combining the lending ban strength measure and timing with borrower-bank relationships, we document large effects of the policies on coal firm debt issuance, outstanding debt and total assets, and the operating status of coal power plants. We find no evidence of substitution between divesting lenders and non-divesting ones, suggesting the wide adoption of coal exit policies in the banking sector is critical in explaining the success of these policies.

In contrast to previous work on more limited exit policies and broader bank decarbonization commitments, we find evidence that banks comply with their own policies, that exposure to these policies materially limit the ability of firms to issue debt, and that they affect the operating decisions of impacted firms, reducing carbon emissions.

There are two likely explanations for these new findings. First, consistent with economic logic on the effectiveness of exit policies, we detect these effects in a setting where substitution to alternative sources of capital is difficult, both due to credit market frictions and because of the wide adoption of coal exit policies. Second, our careful measurement of the strength of bank exit policies affords increased precision in measuring these effects at both the bank and firm levels.

Whether exit policies and other investor strategies will be effective at inducing similar outcomes in other contexts is ultimately an empirical question. However, our analysis provides relevant guidance for investors and climate advocates working to combat climate change or achieve other non-financial outcomes and researchers looking to analyze related initiatives. Further unanswered in our study is the extent to which financing pressures are mitigated by changes in asset ownership, whereby dirty assets that are difficult to finance externally are sold to investors or firms with internal financing capacity. This is a fruitful topic for further research.

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Figures

Figure 2: **Measuring Exit Policy Strength**

Panel A: Variable List

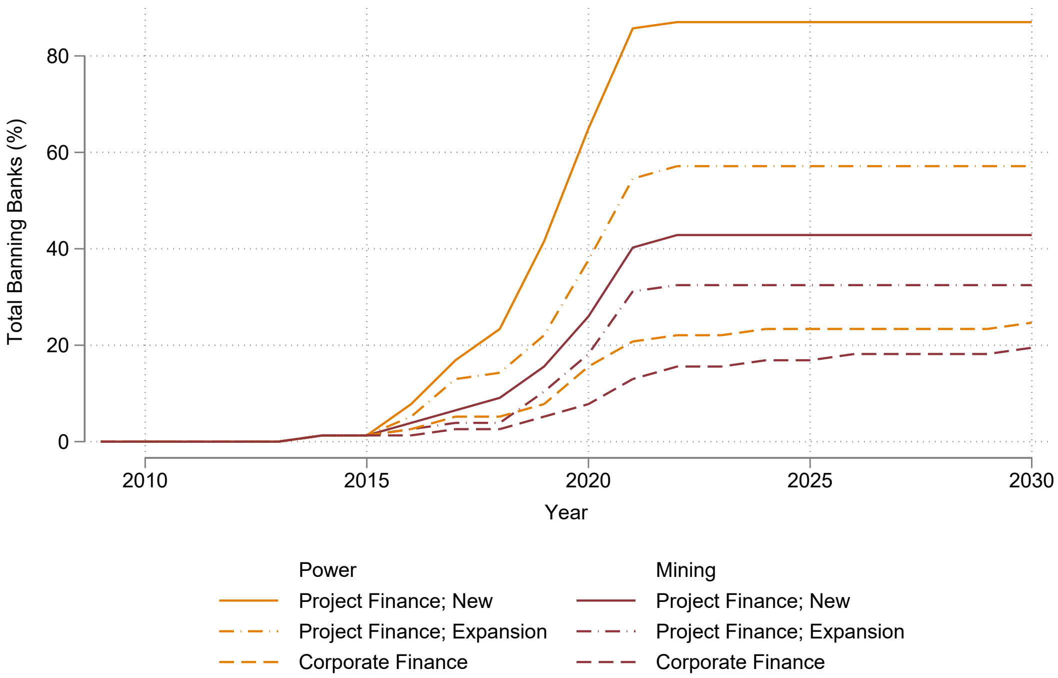
Variable Name	**Definition**	**Share of Policies Conditioning**
isNew:	= 1 if proceeds used for new coal assets/project	82%
isPowerProj:	= 1 if project is a power project	77%
isMiningProj:	= 1 if project is a mining project	51%
isMiningCo:	= 1 if company a mining company	46%
isPowerCo:	= 1 if company a power company	42%
CoalFracRevParent:	= fraction of revenue from coal of parent company	42%
isExpansion:	= 1 if proceeds used for expansion of capacity/life of coal assets	41%
isThermal:	= 1 the project uses thermal coal	35%
hasDecarbonStrat:	= 1 if Company has plan to decarbonize/diversify from carbon	30%
TimeRestriction:	= 1 if ban has a time schedule	28%
isMountaintopComp:	= 1 if company is doing mountaintop mining	26%
isNewCustomer	= 1 if the borrower a new customer	24%
isLowCarbonProj:	= 1 if proceeds used for carbon transition / low carbon project	20%
isProjFin:	= 1 for project finance	18%
CoalSharePowerParent:	= coal share of power production of parent company	15%
GeographicalRestriction:	= 1 if ban only applies to certain country or continent	11%
isMountaintopProj:	= 1 if proceeds used for mountaintop mining	7%

Panel B: Scenario List

	Share of Banks Prohibiting	
Scenario	As of 2020	At maximum
isPowerProj=1, isNew=1, isNewCustomer=1, isProjFin=1	73%	96%
isPowerProj=1, isNew=1, isNewCustomer=0, isProjFin=1	69%	93%
isPowerProj=1, isExpansion=1, isNewCustomer=1, isProjFin=1	54%	74%
isPowerProj=1, isExpansion=1, isNewCustomer=0, isProjFin=1	46%	69%
isPowerProj=1, isNewCustomer=1, isProjFin=0	38%	55%
isPowerProj=1, isNewCustomer=1, isProjFin=0, CoalFracRevParent $\geq$ 0.2	22%	36%
isPowerProj=1, isNewCustomer=0, isProjFin=0, CoalFracRevParent $\geq$ 0.2	19%	34%
isMiningProj=1, isNew=1, isNewCustomer=1, isProjFin=1	50%	73%
isMiningProj=1, isNew=1, isNewCustomer=0, isProjFin=1	30%	43%
isMiningProj=1, isExpansion=1, isNewCustomer=1, isProjFin=1	41%	59%
isMiningProj=1, isExpansion=1, isNewCustomer=0, isProjFin=1	32%	50%
isMiningProj=1, isNewCustomer=1, isProjFin=0	38%	53%
isMiningProj=1, isNewCustomer=1, isProjFin=0, CoalFracRevParent $\geq$ 0.2	19%	34%
isMiningProj=1, isNewCustomer=0, isProjFin=0, CoalFracRevParent $\geq$ 0.2	15%	30%

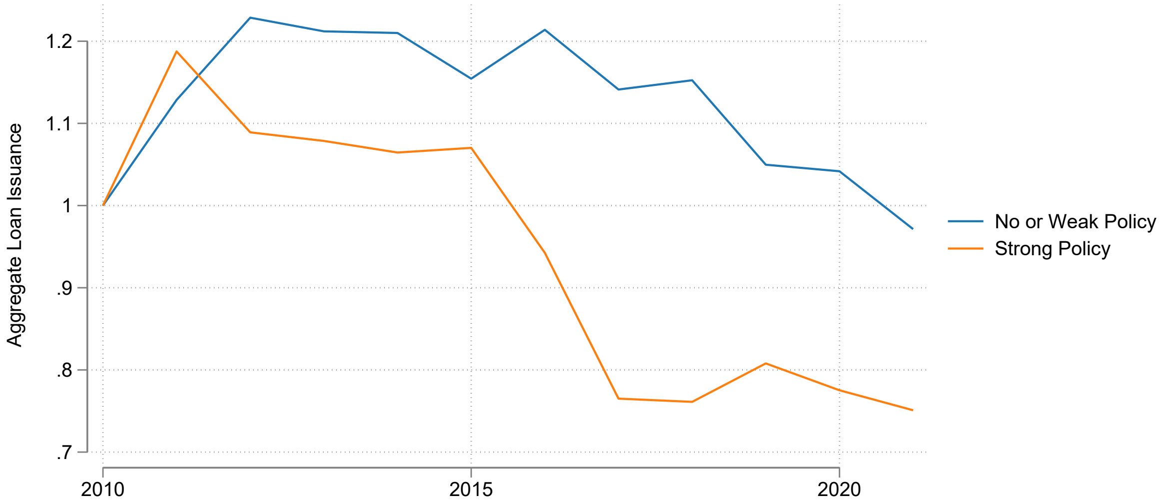
Notes: Panel A provides the list of variables used to encode bank coal exit policies, and the share of policies conditioning on each variable. Panel B provides the list of scenarios we consider in constructing our baseline measure of ban intensity, and the share of banks banning each of them, as per their policy applicable in 2020, or as per their stronger policy in the future.

Figure 3: **Divestment Policies: Representative Scenarios**



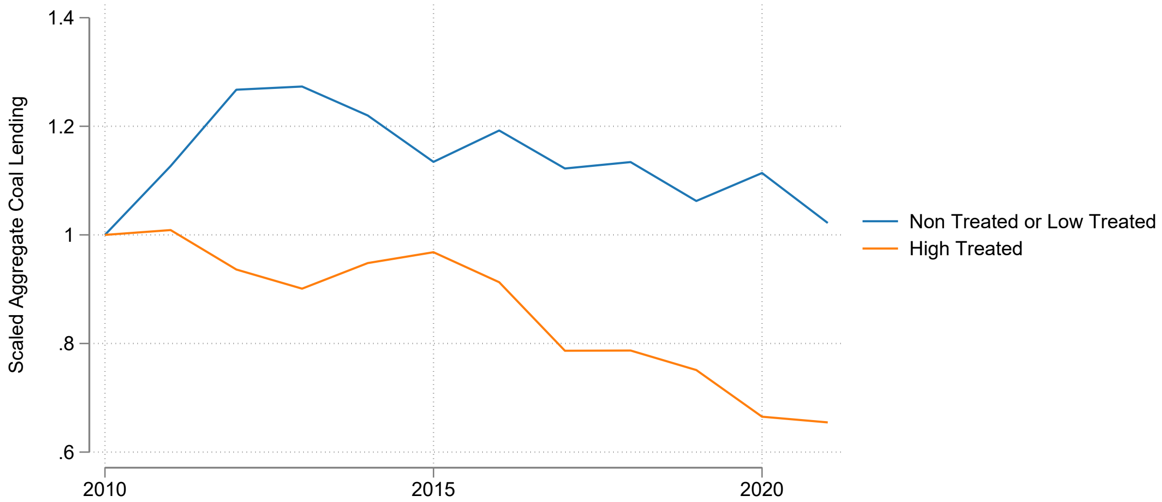
Notes: This figure plots for six selected scenarios the share of banks with an exit policy that would ban such a project in a given year. Scenarios related to coal-fired power plants are in orange, and scenarios related to coal mining projects are in maroon. For each sector, we consider: (i) project finance for a new project, (ii) project finance for an expansion of an existing project and (iii) corporate finance for general purpose.

Figure 4: **Aggregate Loan Issuance by Bank Exit Policy Strength**



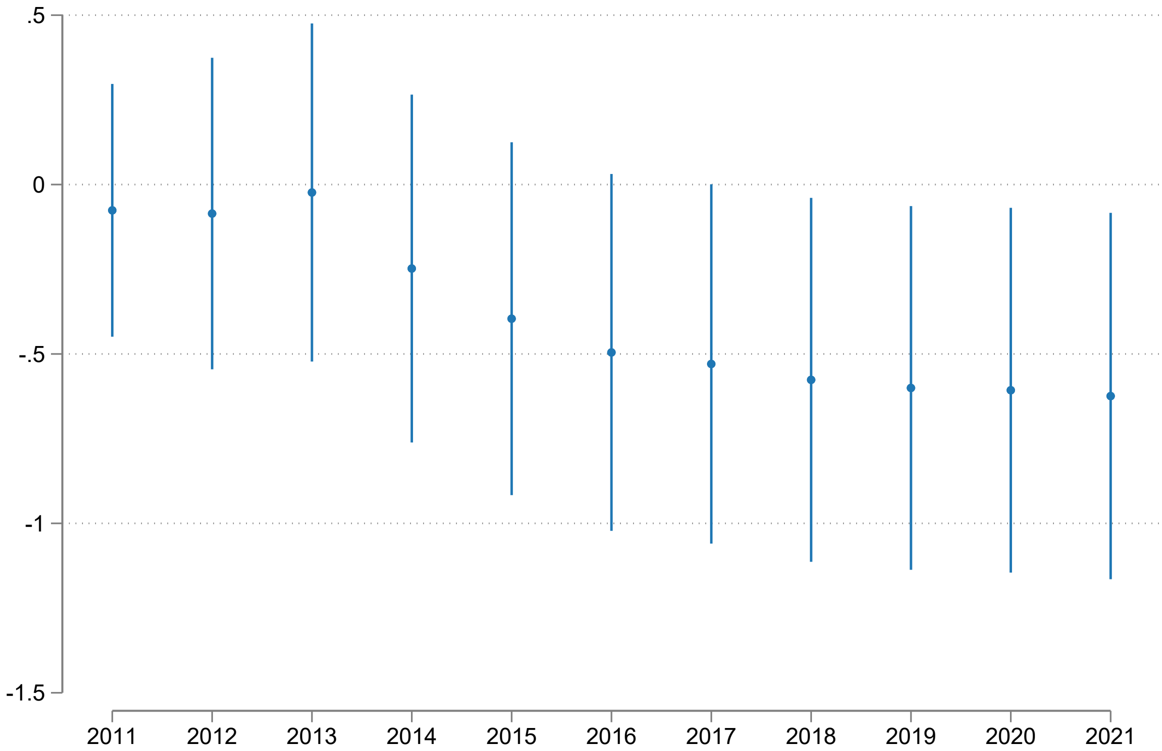
Notes: This figure plots the three year moving average aggregate amount of loan issuance in a given year, scaled by the 2010 issuance amount, for banks with an exit policy above-median strength, and banks with no exit policy or an exit policy of below-median strength. Exit policy strength is measured as the maximum share of scenarios that are banned by a bank under its latest policy.

Figure 5: **Aggregate Loan Issuance by Borrower Treatment**



Notes: This figure plots the three year moving average aggregate amount of loan issuance in a given year, scaled by the 2010 issuance amount, for coal firms with high treatment over the period, i.e. above-median cumulative *Bank Exit Exposure* over the 2015-2020 period conditional on being treated at any point, and the rest of coal firms from the sample. *Bank Exit Exposure* is defined in Section 4.

Figure 6: **Cumulative Effects on Firm Debt Issuance**



Notes: This figure plots the OLS coefficients and their corresponding 90% confidence intervals obtained when regressing the log of the cumulative amount of debt financing since 2010 of a given firm on the interaction between year fixed effects and an indicator variable for being a highly treated firm , i.e. above-median cumulative *Bank Exit Exposure* over the 2015-2020 period conditional on being treated at any point. Regressions include firm and year fixed effects and standard errors are clustered at the borrower level.

9 Tables

Table 1: **Summary Statistics: Coal Industry Firms and Assets**

Panel A: GCEL firms with financing transaction data available ***(N=486)***

Active in:	Count	Share (%)	*Geography:*	Count	Share (%)
Mining	213	52	North America	79	19
Power Generation	298	73	Europe	55	13
Services	166	40	Asia	222	54
			Others	54	14

Firm Characteristics	Mean	Median	SD	p10	p90
Annual Coal Production (Mt)	28.4	10.9	60.7	1.6	65.25
Installed Coal Power Capacity (MW)	4,888	1,655	13,506	128	9,634
Coal Share of Power	0.62	0.64	0.33	0.18	1.00
Coal Fraction of Revenue	0.45	0.37	0.30	0.10	0.90
Firm Financials ***(N=352)***					
Assets	26,726	5,841	84,322	273	57,851
Debt	6,255	1,232	12,352	0	17,304
Net Income	498	90	1,345	-116	1,602
ROA	0.34%	1.90%	10.55%	-6.40%	6.65%
Bank Exit Exposure Variables					
Mean Exit Exposure	0.03	0.00	0.05	0.00	0.10
Max Exit Exposure	0.18	0.00	0.24	0.00	0.54
Max Exit Exposure (Complexity)	0.13	0.00	0.17	0.00	0.41
Exit Exposure (Reclaim Finance)	0.07	0.00	0.10	0.00	0.24
Exit Exposure (Phaseout)	0.05	0.00	0.10	0.00	0.16

Panel B: Coal Fired Power Plants linked to GCEL Firms ***(N=4,164)***

	Mean	Median	SD	p10	p90
Age (as of 2014)	30.2	31	20	3	58
Capacity (in MW)	365.8	270	355	55	720
Emissions Data Available ***(N=396)***					
CO2 emissions in 2014 (in Mt)	4.2	2.7	4.9	0.3	11.0
CO2 emissions in 2020 (in Mt)	3.1	1.6	4.0	0.1	8.3

Notes: Panel A provides summary statistics for the sample of firms resulting from the merge of the Global Coal Exit List (GCEL) with Dealscan, IJGlobal, and SDC Platinum financing transactions. Firm characteristics are from the GCEL. Financial characteristics are obtained from Orbis. Assets, Debt, and Net Income are expressed in millions of US dollars. Bank Exit Exposure Variables are defined as per the methodology described in section 4. Panel B provides summary statistics for a sample of coal fired power plants owned by GCEL firms. Age, Capacity and active status is from Global Plant Tracker, and CO2 emissions are from regulatory sources.

Table 2: **Summary Statistics: Banks**

	Mean	Median	SD	p10	p90
All banks (N=1058):					
Coal share of lending volume	0.11	0.04	0.17	0	0.35
Energy share of lending volume	0.23	0.11	0.29	0	0.72
Coal lending average volume ($m)	4389	155	20260	6.8	4922
Banks with a coal exit policy (N=74):					
Coal share of lending volume	0.08	0.06	0.10	0.01	0.15
Energy share of lending volume	0.17	0.15	0.12	0.08	0.28
Coal lending average volume ($m)	46619	18676	61204	789	132632
Exit Policy Strength Measures (N = 74):					
Mean Strength	0.28	0.27	0.18	0.07	0.54
Max Strength	0.55	0.57	0.32	0.14	1
Max Strength (Complexity)	0.34	0.31	0.19	0.06	0.63
Strength (Reclaim Finance)	7	8	2.5	4	10
Strength (Reclaim Finance Phaseout)	1.8	0	2.8	0	7

Notes: This table provides summary statistics for the sample of banks active in financing the coal industry (as per Dealscan, IJGlobal, and SDC Platinum) over the period 2010 to 2020. Lending volume variables are calculated based on Dealscan and IJGlobal data. Exit policy strength measures are described in Section 4.

Table 3: **Determinants of Bank Exit Policy Adoption and Strength**

	Has Exit Policy		Policy Before 2019		Policy Strength: 2020		Policy Strength: Max	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Coal Share of Lending	-0.049	-0.019	-0.825	-0.285	-1.266	1.723	-3.516**	0.048
	(0.030)	(0.031)	(0.586)	(0.573)	(1.660)	(1.727)	(1.730)	(1.856)
Energy Share of Lending	-0.020	-0.031*	0.704	0.391	0.122	-2.180	2.154	0.226
	(0.014)	(0.016)	(0.434)	(0.498)	(1.180)	(1.323)	(1.292)	(1.442)
Bank Size	0.047***	0.044***	0.083***	0.102***	0.033	0.067	0.058	0.036
	(0.004)	(0.004)	(0.025)	(0.029)	(0.068)	(0.064)	(0.066)	(0.066)
Asia		-0.017		-0.067		-0.767*		-0.197
		(0.016)		(0.149)		(0.408)		(0.414)
Europe		0.105***		0.114		0.193		0.884**
		(0.028)		(0.162)		(0.412)		(0.395)
North America		-0.011		-0.319		-0.918**		0.171
		(0.019)		(0.206)		(0.457)		(0.536)
Observations	1058	1058	74	74	74	74	74	74
R^2	0.225	0.251	0.154	0.250	0.025	0.226	0.088	0.253

Notes: This table reports the coefficients of bank-level OLS regressions in which the dependent variable is a measure of exit policy adoption or strength. The first two columns model whether a bank adopts a coal exit policy. The remaining columns restrict the sample to banks which adopt coal exit policies. The dependent variable in column 3 and 4 is an indicator of whether the bank first adopts its coal policy before 2019. The dependent variable in column 5 and 6 is the bank's exit policy strength as of 2020. The dependent variable in columns 7 and 8 is the maximum exit policy strength of the bank over all years the coal policy is defined into the future. The explanatory variables are the share of bank lending to the coal industry over 2010 to 2014, the share of lending to the energy industry, bank size (measured by the log of the aggregate lending in the 2010-2014 period). Robust standard errors are reported in the parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table 4: **Bank Financing of Coal Activity**

	Coal Debt Origination (log)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{\text{Has Exit Policy}\}_{b,t}$	-0.467**	-0.565**	-0.390**	-0.365**	-0.374*	-0.388**
	(0.187)	(0.256)	(0.191)	(0.184)	(0.197)	(0.187)
Exit Policy Strength$_{b,t}$		0.051				
		(0.101)				
$\mathbb{1}\{\text{Year} \geq 2015\} \times$ Max Exit Policy Strength$_b$			-0.187*			
			(0.101)			
$\mathbb{1}\{\text{Year} \geq 2015\} \times$ Max Exit Policy Strength (Reclaim Finance)$_b$				-0.286***		
				(0.095)		
$\mathbb{1}\{\text{Year} \geq 2015\} \times$ Max Exit Policy Strength (Reclaim Finance Phaseout)$_b$					-0.266***	
					(0.091)	
$\mathbb{1}\{\text{Year} \geq 2015\} \times$ Max Exit Policy Strength (Complexity)$_b$						-0.232***
						(0.089)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,232	1,232	1,232	1,232	1,104	1,232
Adj-R^2	0.770	0.770	0.771	0.772	0.761	0.771

Notes: This table reports the coefficients of bank-year level OLS regressions in which the dependent variable is the log of the total coal debt origination (loan issuance and bond underwriting) by a given bank in a given year. The first column relates the amount of debt financing to whether the bank has an active exit policy in place in that given year. The second column adds our time-varying measure of bank exit policy strength. The third column uses instead the maximum exit policy strength of a bank interacted with a post-2015 indicator. The remaining columns use alternative definitions of exit policy strength in a similar fashion. All ban strength measures are standardized by their cross-sectional standard deviation. Robust standard errors are reported in the parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table 5: **Effects of Bank Divestment on Coal Firm Debt Issuance**

Panel A: Baseline Results

	Debt Issuance (log)					
					Power	Mining
	(1)	(2)	(3)	(4)	(5)	(6)
Bank Exit Exposure$_{f,t}$	-0.167**	-0.219**			-0.074	-0.320**
	(0.070)	(0.097)			(0.136)	(0.144)
Low Coal Share$_f$ $\times$ Bank Exit Exposure$_{f,t}$			-0.116			
			(0.112)			
High Coal Share$_f$ $\times$ Bank Exit Exposure$_{f,t}$			-0.422***			
			(0.147)			
Low Assets$_f$ $\times$ Bank Exit Exposure$_{f,t}$				-0.447**		
				(0.175)		
High Assets$_f$ $\times$ Bank Exit Exposure$_{f,t}$				-0.151		
				(0.124)		
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country x Year FE	No	Yes	Yes	Yes	Yes	Yes
Size x Year FE	No	Yes	Yes	No	Yes	Yes
Observations	4,472	4,199	3,887	3,432	1,833	2,184
Adj-R^2	0.477	0.530	0.534	0.518	0.557	0.520

Panel B: Adjustment Margin

	Debt Issuance (log)						Equity
	Coal Policy Bank		Relationship Bank		Margin		
	Yes	No	Yes	No	Extensive	Intensive	
Bank Exit Exposure$_{f,t}$	-0.186**	-0.074	-0.210***	-0.098	-0.032**	-0.093	0.043
	(0.081)	(0.076)	(0.074)	(0.084)	(0.016)	(0.070)	(0.043)
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,199	4,199	4,199	4,199	4,199	2,333	4,199
Adj-R^2	0.635	0.498	0.564	0.566	0.399	0.612	0.185

Notes: Panel A of the table above reports the coefficients of the OLS regressions in which the dependent variable is the log of 1 + debt issuance. Debt issuance includes loans and bonds. The explanatory variable is the main instrument developed in this study and described in Section 4, *Bank Exit Exposure*$_{f,t}$, i.e. a shift-share instrument combining the share of financing provided by relationship banks during the 2010-2014 period, and the *Exit Policy Strength*$_{b,t}$ of such banks as measured by the share of scenarios banned by their policy in place in a given year. The explanatory variable is standardized. We also present the regression coefficients interacting *Bank Exit Exposure*$_{f,t}$ with the firm's coal share (of revenue or of electricity produced) and whether it is above or below the median borrower size in our sample, as measured by total book assets. Panel B present coefficients from similar regressions where the dependent variable is changed to study whether firms exposed to exit policies substitute away to different forms and providers of capital. The first two columns separate out debt provided by banks that do and do not have coal exit policies. The third and fourth columns separate debt provided by ex-ante relationship banks or non-relationship banks. The dependent variable in the final column is the log of 1 + public equity issuance. Standard errors in both panels are clustered at the borrower level and are reported in the parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table 6: **Balance Sheet Effects**

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Long-Term Debt (log)						
Ban Exposure$_{f,t}$	-0.142***	-0.332***			-0.358**	-0.317**
	(0.053)	(0.101)			(0.139)	(0.139)
Low Coal Share$_f$ × Bank Exit Exposure$_{f,t}$			-0.371***			
			(0.110)			
High Coal Share$_f$ × Bank Exit Exposure$_{f,t}$			-0.347**			
			(0.134)			
Small Firm$_f$ × Bank Exit Exposure$_{f,t}$				-0.394***		
				(0.143)		
Large Firm$_f$ × Bank Exit Exposure$_{f,t}$				-0.217***		
				(0.074)		
Panel B: Leverage (log)						
Ban Exposure$_{f,t}$	-0.081*	-0.264***			-0.278**	-0.243**
	(0.043)	(0.084)			(0.120)	(0.100)
Low Coal Share$_f$ × Bank Exit Exposure$_{f,t}$			-0.301***			
			(0.093)			
High Coal Share$_f$ × Bank Exit Exposure$_{f,t}$			-0.239**			
			(0.106)			
Small Firm$_f$ × Bank Exit Exposure$_{f,t}$				-0.327***		
				(0.117)		
Large Firm$_f$ × Bank Exit Exposure$_{f,t}$				-0.166***		
				(0.059)		
Panel C: Total Assets (log)						
Ban Exposure$_{f,t}$	-0.047***	-0.074**			-0.066**	-0.060
	(0.018)	(0.031)			(0.032)	(0.042)
Low Coal Share$_f$ × Bank Exit Exposure$_{f,t}$			-0.037			
			(0.031)			
High Coal Share$_f$ × Bank Exit Exposure$_{f,t}$			-0.081*			
			(0.048)			
Small Firm$_f$ × Bank Exit Exposure$_{f,t}$				-0.078*		
				(0.047)		
Large Firm Size$_f$ × Bank Exit Exposure$_{f,t}$y				-0.059*		
				(0.032)		
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country x Year FE	No	Yes	Yes	Yes	Yes	Yes
Size x Year FE	No	Yes	Yes	No	Yes	Yes
Observations	2,115	1,953	1,792	1,954	871	968
Adj-R^2	0.644	0.650	0.669	0.649	0.704	0.631

Notes: This table reports the coefficients from OLS regressions where the dependent variables are the log of long term debt (Panel A), log of total assets (Panel B), and log leverage, defined as the debt to assets ratio (Panel C). Explanatory variables are as per Table 5. Standard errors are clustered at the borrower level are reported in the parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table 7: **Facility Level Effects**

Panel A: Effects on Coal-fired Power Plant Closures

	Plant Closure				
	(1)	(2)	(3)	(4)	(5)
Bank Exit Exposure (Max)$_f$	0.948	0.740**	0.721*	0.711	0.744*
	(-0.381)	(-1.980)	(-1.952)	(-1.250)	(-1.886)
$Year \geq 2015$ × Bank Exit Exposure (Max)$_f$		1.619***	1.740***	1.443	1.580***
		(3.169)	(3.600)	(1.324)	(2.851)
$Year \geq 2015$ × Bank Exit Exposure (Max)$_f$ × Small Firm			5.150*		
			(1.928)		
$Year \geq 2015$ × Bank Exit Exposure (Max)$_f$ × Low Coal Share				1.641	
				(1.514)	
$Year \geq 2015$ × Bank Exit Exposure (Max)$_f$ × Large Plant					1.211
					(0.660)
Country Strata	Yes	Yes	Yes	Yes	Yes
Time Trend	Yes	Yes	Yes	Yes	Yes
Observations	30,618	30,618	30,618	29,836	30,618

Panel B: Effects on Coal-fired Power Plant CO2 Emissions

	Emissions	Active Facilities Only	Active (1/0)
	(1)	(2)	(3)
Bank Exit Exposure (Max)$_f$ × $\mathbb{1}\{Year \geq 2015\}$	-0.085**	-0.056*	-0.045***
	(0.034)	(0.027)	(0.016)
Facility FE	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes
Observations	3,676	3,337	3,739
Adj-R^2	0.497	0.471	0.411

Notes: Panel A reports the hazard ratios from a Cox proportional hazard model of the survival of a sample of coal-fired power plants. Plant status data is from Global Plant Tracker. The main explanatory variable is th Standard errors are clustered at the country level and reported in the parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively. Panel B reports the coefficients of OLS regressions where the dependent variable is the CO2 emissions for a given plant in a given year relative to 2014 levels for columns 1 and 2. In 2, we restrict the sample to plant-year observations where the plant is active. In column 3, the dependent variable is an indicator variable for the plant being active in the given year. The sample corresponds to coal-fired power plants from USA, European Union and Australia, for which we can obtain CO2 emission data from regulatory sources. t-statistics are adjusted for clustering at the borrower level and are reported in the parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Appendix A: Potential bias arising from non-bank lending

Our main empirical result shows that bank exit policies significantly decrease coal firms' debt issuance. However, there is one concern that coal firms might also borrow from other capital sources besides those we are able to observe in our sample of loan and bond issuances. For example, it is possible that affected firms may substitute into the non-bank loan market (Chernenko et al., 2022). To the extent substitution occurs to such unobservable forms of capital, our methodology overestimates the impact of the exposure to bank exit policies on the ability to raise external capital.

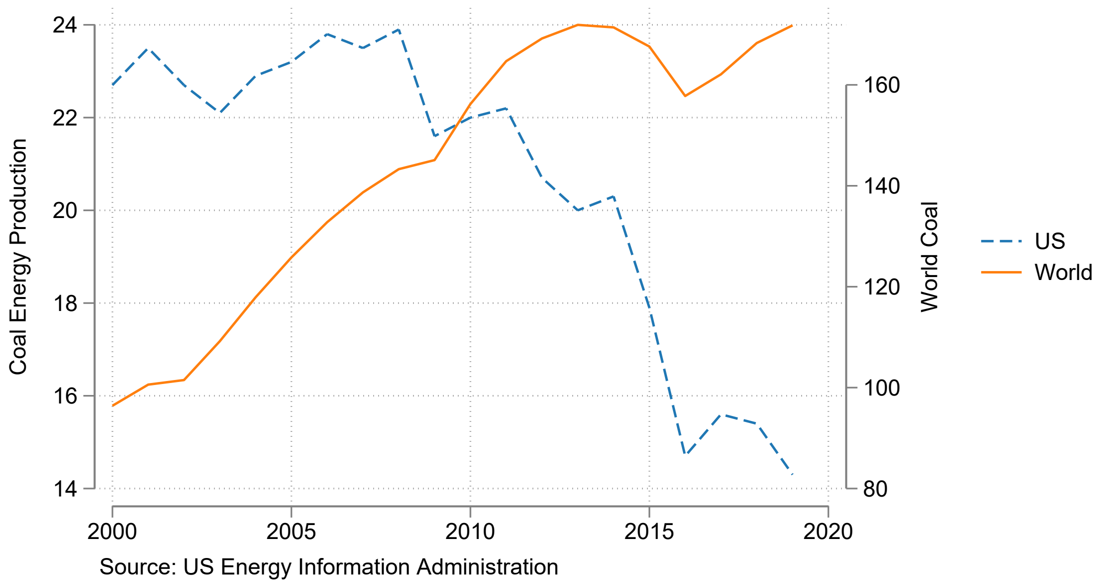
To explore this concern, following the methodology of Chernenko et al. (2022) we conduct a detailed analysis of US publicly traded companies in our sample, for which we are able to observe all debt contracts. Publicly traded firms are required to make disclosures about all materially important agreements, including debt issuance. The goal is to explore the extent to which our sample of debt issuance transactions captures the full set of debt issuance conducted by these firms. For the 38 US publicly traded coal companies in our sample, we obtained through CapitalIQ all credit agreements, debt and loan agreements, underwriter agreements and security purchase agreements from 2015 to 2021. Following the main analysis of the paper we exclude amendments to existing credit agreements. We read through each document, recording each debt issuance we were unable to match to our main sample.

In total, we find through SEC disclosures only 41 transactions we could not match to our dataset, compared with 1633 total transactions in our main dataset for these 38 companies during the 2015-2021 period. These missing transactions occur for only 16 of the 38 companies in the analysis. In aggregate, these transactions amount to $11.9 billion of debt capital, or around 1.4% of the $836 billion in debt transactions recorded in our dataset. None of the 41 transactions missing in our dataset involved exclusively non-bank lenders. Unconditionally, for US publicly traded borrowers in our sample, our data on average fails to capture 1.7% of their debt issuance volume. Further, among these 38 firms, there is no correlation between exposure to bank exit policies and the extent to which our dataset under-reports debt transactions.

Overall, this analysis suggests it is unlikely that our results are being driven by failing to capture substitution into sources of external financing not observable in our data. Unobservable borrowing could of course be higher in private US companies or international companies in our analysis. However, the extremely low prevalence of such borrowing in the US public coal firm sample and its lack of correlation with exit policy exposure suggests any effects in the broader sample are likely quite limited.

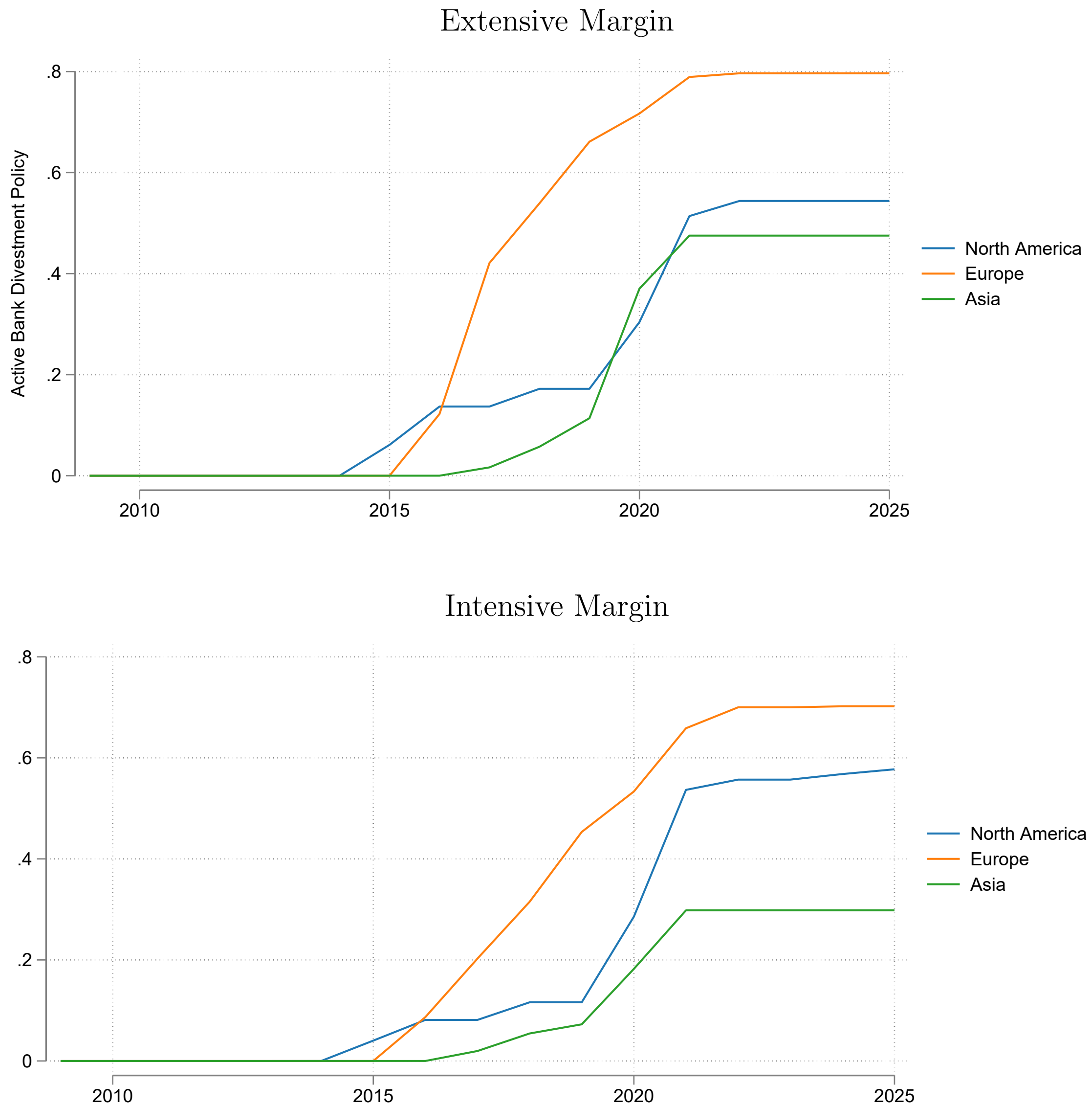
Appendix B: Additional Figures and Tables

Figure B1: Evolution of World and US Consumption of Thermal Coal



Notes: This figure displays the evolution of coal energy production for the US and globally over the 200 to 2020 period.

Figure B2: **Policy Strength by Region**



Notes: This figure shows the geographic breakdown and intensity of bank exit policies over time. The upper graph shows the fraction of banks with any active policy in a given year, regardless of policy strength, weighted by the banks' fraction of aggregate syndicated loan origination in the 2009-2014 period. This captures the "extensive margin" of borrower exposure to coal exit policies. The lower graph captures the "intensive margin" by showing, conditional on the bank having released a exit policy, the average intensity of these policies over time. This is also weighted by the banks' fraction of aggregate syndicated loan origination in the 2009-2014 period.

Table B1: **Effects of Divestment Policy on Coal Firm Debt Issuance: Robustness with Other Measures of Ban Strength**

	Debt Issuance (log)			
	(1)	(2)	(3)	(4)
Bank Exit Exposure$_{f,t}$	-0.219**			
	(0.097)			
Bank Exit Exposure (Reclaim Finance)$_{f,t}$		-0.316***		
		(0.108)		
Bank Exit Exposure (Reclaim Finance Phaseout)$_{f,t}$			-0.250***	
			(0.095)	
Bank Exit Exposure (Complexity)$_{f,t}$				-0.271***
				(0.094)
Borrower FE	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes
Size x Year FE	Yes	Yes	Yes	Yes
Observations	4,199	4,199	4,199	4,199
Adj-R^2	0.530	0.531	0.530	0.530

Notes: The table above reports the coefficients of the OLS regressions in which the dependent variable is the log of 1 + debt issuance. Debt issuance includes loans and bonds. Column 1 is the same as column 3 in the previous table. *Reclaim Finance Score* is the general measure of ban strength as attributed by the NGO Reclaim Finance. *Reclaim Finance Phaseout Score* is the subscore focusing whether the policy is consistent with a phasing-out of lending to coal firms. *Transition score* is the sum of indicator variables for the ban excluding new projects, expansion projects, and new clients. *Complexity score* is the number of underlying variables on which the ban is conditioned. The explanatory variables are Standard errors are clustered at the borrower level and are reported in the parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table B2: **Effects on Debt Issuance (SBTi)**

	Debt Issuance (log)			
	(1)	(2)	(3)	(4)
Bank Exit Exposure$_{f,t}$	-0.167**	-0.139*	-0.219**	-0.241**
	(0.070)	(0.084)	(0.097)	(0.112)
SBTi Adoption Exposure$_{f,t}$		0.384		-0.259
		(0.563)		(0.724)
Borrower FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Country x Year FE	No	No	Yes	Yes
Size x Year FE	No	No	Yes	Yes
Observations	4,472	4,472	4,199	4,199
Adj-R^2	0.477	0.477	0.530	0.530

Notes: The table above reports the coefficients of the OLS regressions in which the dependent variable is the log of 1 + debt issuance. Debt issuance includes loans and bonds. SBTi Adoption Exposure is defined as described in Section 6.2 measures are.... Standard errors are clustered at the borrower level and are reported in the parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.