The Determinants and Short-Term Consequences of Banks' Pledges to Disclose Financed Carbon Emissions

ABSTRACT

We examine the determinants and short-term consequences of banks' commitment to disclose harmonized financed carbon emissions. Using an international sample of publicly listed banks from 2014 to 2022, we find that larger banks, as well as those that are "doing good", are more likely to commit to such disclosures. Furthermore, we document that smaller banks announcing this commitment experience a negative stock market reaction. This reaction likely reflects the anticipated costly operational adjustments toward greener trajectories that we detect surrounding banks' commitment. Finally, stakeholder sentiment toward climate-related risks improves for these smaller banks around the commitment, consistent with the trajectory of their financed carbon emissions. Overall, our evidence suggests that smaller banks "walk the talk" when adopting environmental initiatives, while larger banks—despite being positioned as key players in the green transition—show no significant market response or operational changes. Our findings indicate that without properly enforced mandatory carbon disclosure regulations, the banking sector may fall short of achieving policy objectives aimed at effectively managing financed carbon emissions.

Keywords: PCAF; Financed Carbon Emissions; Banks; Voluntary Disclosure; ESG

> Financial institutions are the vital link in enabling the rapid and unprecedented economic transformation needed to meet the goals of the Paris Agreement. Through their lending and investing, financial institutions have the power to redirect capital to the sustainable technologies and solutions of the future and to the companies doing the most to prepare for a net-zero emissions economy.
> —Science Based Target, 2020

1. Introduction

In recent years, the role of banks in mitigating climate risk and global warming has been stressed by regulators, environmental advocates, investors, and market pundits. Large banks, in particular, are at the center of this critical discourse. Since the Paris Agreement, these institutions have channeled significant financing—totaling $6.9 trillion—into fossil fuel companies, with nearly half of this capital allocated to firms engaged in expansion within the sector (Rainforest Action Network et al., 2024). Critics have described banks as "the biggest laggards on climate action".[1] The 2022 European Central Bank (ECB) climate risk stress test revealed that more than 21% of European banks' interest income is derived from *highly* greenhouse gas (GHG)-intensive industries, underscoring the material transition risk these banks face (ECB, 2022a). Disclosures of financed carbon emissions are therefore essential, not only for banks to effectively manage climate risks but also for regulators and external stakeholders to assess the extent of banks' progress toward a net-zero economy.[2] In this context, our study examines one key environmental initiative—the Partnership for Carbon Accounting Financials (PCAF)—to analyze the determinants and short-term consequences of banks' decisions to commit to disclosing harmonized financed carbon emissions.

[1] https://www.responsible-investor.com/global-banks-are-the-biggest-laggards-on-climate-action-ri-survey-suggests/
[2] Descriptive evidence suggests that banks do not adequately disclose whether climate and environmental risks materially affect their risk profile (ECB, 2022b)

In 2015, PCAF was established at the Paris Climate Summit as a global initiative within the financial sector to develop and implement a standardized methodology for measuring, disclosing, and assessing GHG emissions associated with loans and investments.[3] This harmonized accounting approach aims to provide financial institutions with a science-based framework for reducing carbon emissions and aligning their portfolios with the goals of the Paris Agreement. By signing the PCAF commitment letter, institutions pledge to address the pressing challenge of climate change and decarbonize the economy, a call to action reflected in their commitment statement.[4] Mark Carney, former Governor of the Bank of Canada and the Bank of England, and U.N. Special Envoy on Climate Action and Finance, emphasized that "PCAF's work to standardize the approach to measuring financed carbon emissions is an important step to ensuring that every financial decision takes climate change into account."[5] Building on this context, our study investigates the factors influencing a bank's decision to commit to disclosing financed carbon emissions and analyzes the short-term implications of such commitments.[6]

The voluntary nature of joining PCAF implies that a bank's decision to participate may reflect its inherent characteristics regarding the perceived costs and benefits of disclosing financed

[3] Financed carbon emissions are considered as indirect GHG emissions (i.e., Scope 3 emissions). Direct GHG emissions are emissions from sources that are owned or controlled by the reporting company, which are also known as Scope 1 emissions. Indirect GHG emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting company are known as Scope 2 emissions. All other indirect GHG emissions (not in Scope 2) that occur in the value chain of the reporting company are Scope 3 emissions (see https://ghgprotocol.org/corporate-standard-frequently-asked-questions)

[4] By signing the commitment PCAF letter, financial institutions commit to adhere to this statement: "addressing the urgent challenge of climate change, and decarbonizing our economy, is more pressing now than ever". https://bankonourfuture.org/banks-sec-climate/

[5] https://carbonaccountingfinancials.com/newsitem/partnership-for-carbon-accounting-financials-pcaf-launches-uk-coalition

[6] While the PCAF methodology applies to all types of financial institutions (e.g., banks, insurance companies, asset managers), we focus on banks for three reasons. First, a significant portion of signatories are banks. Second, heterogeneity in business activities is likely to influence firms' perceived costs and benefits of joining PCAF in ways that we are unable to empirically model this heterogeneity efficiently (i.e., our tests using a more homogeneous sample are likely to be better specified and more powerful). Third, the role of banks in mitigating climate change is of particular interest to regulators and investors.

carbon emissions (Christensen et al., 2021). First, disclosure theory suggests that better-performing firms are more likely to disclose their performance to stakeholders, while underperforming firms may seek to conceal unfavorable outcomes. Second, socio-political theories propose that poor performers may use positive disclosures to address legitimacy threats stemming from poor underlying performance (i.e., greenwashing). Third, agency theory posits that CEOs may pursue such initiatives to enhance their personal reputations, potentially at shareholders' expense. Ultimately, the determinants of banks' decisions to join PCAF remain an empirical question upon which our study sheds some light.

The expected short-term capital market response to PCAF announcements remains ambiguous. A commitment to disclose financed carbon emissions could align with shareholder wealth maximization, indicating a potential positive stock market reaction. However, equity markets may also react negatively. For instance, capital markets may perceive PCAF participation as entailing significant disclosure and operational costs. Conversely, the announcement to join PCAF may have little market impact if investors already view banks as engaging in responsible practices, or if the commitment to emissions disclosure is perceived as mere "cheap talk". Ultimately, the market's assessment of banks' decisions to join PCAF is an empirical question that our study seeks to explore.

The international nature of the PCAF initiative allows for an examination of both country-level attributes and firm-specific factors that motivate banks to commit to financed carbon emissions disclosures. Using an international sample of publicly listed banks, we find, first, that larger banks are more likely to join PCAF. Second, we observe that banks already disclosing Scope 3 emissions and those that are signatories of the Carbon Disclosure Project (CDP) are more inclined to adopt the initiative, supporting the notion that banks engaged in responsible practices

are more likely to signal their commitment. Third, PCAF adopters are more likely to be headquartered in countries with higher levels of institutional development.

Our second set of analyses employs an event study methodology to assess the short-term economic implications of PCAF commitment on bank shareholders. Under the efficient market hypothesis, the market reaction reflects the net assessment of potential benefits versus costs associated with joining PCAF. The event study results show a negative market response, primarily driven by small and midsize banks. For large banks, the lack of a significant reaction aligns with the view that their actions may not reflect their public commitments to reduce GHG emissions (Rainforest Action Network et al., 2024). In contrast, the negative market reaction observed for smaller banks may suggest that these institutions are either genuinely "walking the talk" by implementing substantive structural changes or facing heightened agency costs or future costs related to the disclosure of financed carbon emissions. We also apply a difference-in-differences methodology to examine the effect of PCAF commitment on banks' cost of equity capital. The results are consistent with the event study, indicating that the market perceives costs associated with joining PCAF primarily for small and midsize banks.

Our third set of analyses reveals that PCAF commitment is associated with operational adjustments, but only for small and midsize banks. These institutions exhibit lower financed carbon emissions, lower loan growth, and diminished profitability post-PCAF commitment compared to the control group. Moreover, for these banks, attention to climate-related issues during earnings calls increases post-PCAF commitment. Nonetheless, the tone of discussions on climate topics during these calls becomes significantly more positive. Sautner et al. (2023) provide evidence that a positive tone in such communications is linked to tangible outcomes in the context of the net-zero transition.

Although the PCAF initiative is an important step to reach net-zero carbon by allowing banks to monitor financed carbon emission in an harmonized way —thereby enabling them to rapidly align their portfolio with the Paris Agreement—, the voluntary and self-regulated nature of such initiative is unlikely to make this goal possible on global scale as "bad banks" in that area are unlikely to adhere to such initiative or "walk the talk".

This paper makes several contributions to the literature. First, we add to the scarce literature related to voluntary disclosures of non-financial information by banks (e.g., Caby et al., 2022; Cornett et al., 2016). Although the financed carbon emissions of banks are currently under heightened regulatory and public scrutiny, relatively little is known about bank practices in this domain. To our knowledge, this is the first study to examine banks' decisions to commit to financed carbon emissions disclosures, and the associated management of climate-related risks, within the high-profile PCAF initiative or similar frameworks. Our findings suggest that larger banks and those with better environmental policies are more likely to commit to disclosing financed carbon emissions.

Second, our study contributes to the literature on climate risk pricing by examining whether banks' commitments to disclose—and implicitly manage—climate risk exposures are reflected in market returns. Bolton and Kacperczyk (2021) provide evidence that investors demand a carbon risk premium, implying that the market may respond not only to the costs of disclosures but also to whether banks are perceived as genuinely addressing climate risks. Prior research indicates that socially responsible disclosures may affect the cost of capital (e.g., Dhaliwal et al., 2011; El Ghoul et al., 2011). Distinct from broader socially responsible disclosures, our study focuses specifically on environment-related disclosures, particularly carbon emissions, within the context of the PCAF initiative. Our findings reveal no significant market reaction to large banks' commitments to

disclose financed carbon emissions, while the market views this commitment as costly for smaller banks.

Third, our paper contributes to the literature on the economic impact of banks' voluntary environmental commitments. Hasan et al. (2023) find that Task Force on Climate-Related Financial Disclosures (TCFD)-member banks reduce their aggregate loan supply to polluters, and their clients improve environmental performance post-TCFD. However, Berg et al., (2024) find no evidence that voluntary green pledges under the Equator Principles lead to greener credit allocation. Similarly, Sastry et al. (2024) report no association between banks' net-zero commitments and reductions in financed emissions. Consistent with these later findings, our results suggest that voluntary commitments by banks are unlikely to accelerate the transition away from carbon-intensive production.

The remainder of the paper is organized as follows. Section 2 provides further background information related to PCAF. Section 3 reviews the literature. In Section 4, we describe the data and research design. Section 5 and 6 present the empirical results. Section 7 concludes the paper.

2. Background

PCAF was established in 2015 at the Paris climate summit to help financial institutions measure and disclose the GHG emissions associated with their investments and loans. Initially launched by Dutch institutions, PCAF quickly expanded globally as interest in assessing financed emissions within the financial sector grew. It reached North America in 2018 and became a global initiative by 2019.As of July 31, 2023, 470 financial institutions have joined PCAF.

PCAF published the Global GHG Accounting and Reporting Standard (GHG Standard) in November 2020. The GHG Standard is based on the GHG Protocol and was developed through a collaboration between the PCAF and public consultation. The GHG Standard specifically targets

at financial institutions and proposed a harmonized accounting methodology of measuring financed carbon emissions, ensuring comparability, transparency, and consistency. PCAF requires its members to assess and disclose the GHG emissions associated with their portfolio of loans and investments within a period of three years.[7]

The GHG Standard has garnered industry recognition for increasing the harmonization of financed carbon emissions reporting (Spittle and Dietrich Brauch, 2021). The European Financial Reporting Advisory Group (EFRAG) recommends the GHG Standard to financial institutions for disclosing Scope 3 emissions (EFRAG, 2022), a view shared by the European Banking Authority (EBA, 2022).

PCAF's framework is endorsed by other major climate initiatives and frameworks, underscoring its importance for measuring and disclosing financed emissions. For example, the TCFD advises banks to use PCAF's methodology for reporting financed carbon emissions. PCAF also complements the Paris Agreement Capital Transition Assessment by including a broader range of financial assets (PCAF, 2021). The Science Based Targets initiative (SBTI) recommends that banks use PCAF's methods to measure progress toward carbon reduction goals aligned with the Paris Agreement (SBTI, 2024). Additionally, the CDP, which sends climate surveys to firms annually, incorporates PCAF commitment into its scoring system (PCAF, 2021).

3. Literature Review

We review the literature according to our primary research questions: (1) the determinants of voluntary disclosures of corporate socially responsible (CSR)-related information; and (2) the pricing of carbon emission disclosures.

3.1. The determinants of voluntary disclosures of CSR-related information

[7] Of the 470 Financial institutions that became PCAF signatories by July 31, 2023, 89 have begun disclosing their financed carbon emissions (details in Panel B of Appendix B).

3.1.1. Firm-level characteristics

Prior research identifies several firm-level characteristics influencing CSR disclosure decisions. First, firm size consistently emerges as a key determinant (e.g., Hahn and Kühnen, 2013; Matsumura et al., 2014). The literature provides two main rationales for this relationship: larger firms face greater public scrutiny and regulatory pressure to disclose CSR information (e.g., Cormier and Magnan, 2003), and they experience lower relative disclosure costs due to greater resources (e.g., Udayasankar, 2008). However, larger firms may also be more susceptible to greenwashing, driven by heightened investor pressure and the relatively higher costs of implementing CSR policies (Delmas et al., 2013; Wickert et al., 2016).

Second, a large body of the literature examines the relationship between firms socially responsible behaviors and CSR-related disclosures. However, the direction of this association remains ambiguous and not necessarily causal (e.g., Clarkson et al., 2008; Hummel and Schlick, 2016; Margolis et al., 2009; Waddock and Graves, 1997). Economics-based disclosure theories suggest that more socially responsible firms have greater incentives to report their performance to signal their CSR commitment, while poor performers are less inclined to disclose. Conversely, legitimacy theory posits that firms with poor ESG performance may disclose CSR information to improve their reputation, regain legitimacy, or divert attention from other underperforming areas.

Finally, a broad range of other firm-level determinants have been explored in the literature. For example, several studies report a positive relationship between financial performance and the extent of CSR reporting (e.g., Jizi et al., 2014; Ott et al., 2017), consistent with the view that financially successful firms are better positioned to absorb the costs of non-financial disclosures, and are thus more likely to voluntarily disclose such information. Other studies examine the impact of firm risk on CSR disclosures, showing that firms with lower systematic risk are more inclined

to engage in socially responsible disclosures (e.g., Meier et al., 2021; Moore, 2001; Roberts, 1992). These studies suggest that lower-risk firms tend to have more stable stock and economic performance, which arguably increases their likelihood of making CSR disclosures. Furthermore, other studies have investigated the relationship between CSR disclosures and corporate governance structures. For instance, Jizi et al. (2014) argue that the workload of individual board members can constrain the board's monitoring capacity, a challenge particularly salient in the complex and highly regulated banking sector. Consequently, larger boards are expected to exert greater pressure on banks to disclose CSR information, a prediction supported by their empirical findings.

3.1.2. External stakeholder and societal pressure

Several studies examine the impact of institutional investors and analysts—two critical external stakeholders—on firms' CSR disclosures. Evidence indicates that institutional investors positively influence firms' climate risk disclosures (e.g, Dyck et al., 2019; Ilhan et al., 2023). Analysts also affect the extent to which firms engage in CSR activities. Adhikari (2016) reports that U.S. firms with greater analyst coverage tend to be less socially responsible, while Hu et al. (2021) report the opposite relationship in China. These differing results is likely to be attributed to the distinct motivations driving CSR engagement. In the U.S., Adhikari (2016) argues that CSR spending reflects an agency problem, with financial analysts curbing discretionary expenditures. In contrast, Hu et al. (2021) suggest that, in China, where discretionary CSR spending faces significant constraints, analysts influence firms to engage in CSR activities based on the belief that doing good is beneficial for business. Recent evidence suggests increasing attention from analysts to climate-related issues. Sautner et al. (2023) document a growing prevalence of climate-related

discussions during earnings calls since the early 2000s, while Ben-Amar et al. (2024) report that analysts recognize the value of climate risk disclosures.

Broader societal pressures may further shape voluntary CSR disclosures. Firms may pre-emptively disclose non-financial information to mitigate regulatory scrutiny and societal pressure (e.g., Hillman and Keim, 2001; Innes and Sam, 2008). Recent descriptive evidence indicates that more institutionally developed countries have implemented stricter climate change policies compared to less developed nations (Block et al., 2024). As a result, firms operating in jurisdictions with heightened regulatory scrutiny over financed carbon emissions are likely to have stronger incentives to disclose their GHG emissions. Conversely, the prospect of litigation risk may deter voluntary disclosures (e.g., Healy and Palepu, 2001). Consequently, in countries with better regulatory environment (e.g., more institutionally developed countries), managers may be less inclined to provide CSR-related disclosures.

3.2. The pricing of carbon emission disclosures

Empirical evidence on the pricing of carbon emission disclosures are mixed. Carbon emissions disclosures can enhance market valuation for at least two reasons. First, these disclosures may mitigate the information asymmetry between firms and investors (e.g., Schiemann and Sakhel, 2019), which can then lower the cost of capital and boost firm valuation (e.g., Lang et al., 2012). Second, as a credible signal of CSR commitment, voluntary carbon emission disclosures can drive premium-priced sales (e.g., Mohr and Webb, 2005), attract talented employees (e.g., Bhattacharya et al., 2007) as well as a larger base of socially responsible investors (e.g., Chava, 2014), and improve access to financial resources and cheaper capital (e.g., Kölbel and Lambillon, 2022). Consistent with the notion that voluntary carbon emission disclosures may convey a

positive signal, Matsumura et al., (2014) provide evidence that firms failing to disclose carbon emissions face greater market penalties compared to those that do.

Conversely, carbon emissions disclosures may prompt negative market reactions First, such disclosures can impose proprietary costs (Li et al., 1997). Second, voluntary disclosures can increase litigation risks (Johnson et al., 2001), which can adversely affect firm value (Gande and Lewis, 2009). Jouvenot and Krueger (2019) outline two additional reasons for this relationship. First, increased regulatory scrutiny over carbon emissions may signal higher regulatory costs, such as carbon taxes. Consequently, if market participants perceive voluntary carbon emission disclosures as indicative of expected regulatory pressures (e.g., carbon taxes), they may react negatively. Second, disclosing GHG emissions can incur real costs associated with transitioning from high to low carbon-intensive investments through operational adjustments. Supporting the idea that the market may penalize firms for climate-related disclosures, Bratten and Cheng (2022) report negative market reactions to voluntary climate risk disclosures during conference calls of U.S. firms.

Moreover, voluntary climate-related disclosures may elicit no market reactions. One contributing factor is that current disclosures may be perceived as uninformative and imprecise (Ilhan et al., 2023), particularly regarding Scope 3 emissions, which involve greater discretion and estimation errors compared to Scopes 1 and 2 (Raghunandan and Rajgopal, 2023). Echoing the notion that reported GHG emissions may lack relevance, Aswani et al. (2024) show that disclosed GHG emissions reported by the firm is not associated with sock returns. Furthermore, the prevalence of greenwashing may undermine the credibility of climate disclosures. Supporting this perspective, Bingler et al. (2022) provide evidence that TCFD-related disclosures are mostly "cheap talk", with firms primarily reporting non-material climate risk information. Several studies

shows that banks' green pledges are not associated with a shift from brown to green lending consistent with voluntary commitments for decarbonization being "cheap talks" (e.g., Berg et al., 2024; Giannetti et al., 2024; Sastry et al., 2024).

4. Data and Research Design

4.1. Data and Sample

We collect data from two primary sources. Accounting data and stock price information, denominated in U.S. dollars (USD), are obtained from S&P Global Market Intelligence (S&P GMI), while ESG scores, GHG emissions, and board information are retrieved from Refinitiv ESG.

We start our sample selection with listed banks headquartered in OECD countries, identified in the S S&P GMI database. We restrict our sample to OECD countries for two reasons. First, these advanced economies have historically contributed the most to GHG emissions (Dhakal et al., 2023) and, therefore, bear a moral obligation to lead in mitigating climate change. Second, the OECD actively supports climate action aligned with the Paris Agreement's collective goals.[8] As a result, public and regulatory scrutiny of GHG emissions is heightened in OECD countries, and these economies possess more substantial resources to address and manage climate risk.

From the 417 PCAF signatories, we identify 106 banks that meet our core screening criteria. We further exclude banks that were not listed before joining PCAF, those with missing data from S&P GMI, and those with thinly traded stocks. We define thinly traded stocks as those with more than 50 missing stock prices or 50 zero returns during the year preceding their PCAF commitment (Kajüter et al., 2019). The final sample consists of 93 PCAF banks. We apply the same screening criteria to our control group of non-PCAF banks, yielding a sample of 763 banks. Table 1 outlines the sample selection criteria.

[8] See https://www.oecd.org/en/topics/policy-areas/climate-change.html

[Insert Table 1]

Table 2 presents the distribution of PCAF and non-PCAF banks across 35 OECD countries, highlighting significant cross-country heterogeneity. In several jurisdictions, such as Canada and Korea, the proportion of PCAF banks is notably high. However, in other advanced economies, including Greece and Turkey, none of the listed banks have yet joined PCAF.

[Insert Table 2]

4.2. Determinant analysis

As outlined in Section 3.1, we draw on prior literature and employ economic and institutional rationales to identify potential determinants influencing banks' decisions to join PCAF. Our model follows previous research on the determinants of accounting and regulatory choices (e.g., Bischof et al., 2022; Dong and Oberson, 2022; Fiechter et al., 2018).

$$\begin{aligned} PCAF_{it} = {} & \beta_0 + \beta_1 ROA_{it} + b_2 LOANS_{it} + b_3 NPL_{it} + b_4 CAPITAL\ RATIO_{it} \\ & + b_5 SIZE_{it} + b_6 Log\ BTM_{it} + b_7 BETA_{it} + b_8 ESGD_{it} + b_9 CDP_{it} \\ & + b_{10} ANALYST_{it} + b_{11} INST\ OWN_{it} + b_{12} CCH\ 2022_{it} \\ & + b_{13} INST\ DEV_{it} + b_{14} GDP\ GROWTH_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

Where i denotes bank and t denotes years. We use a *dynamic* probit model (Fiechter et al., 2018). The dependent variable, $PCAF$, equals one in the year prior a bank's announcement to join PCAF and is missing in years before and after. For non-PCAF banks, $PCAF$ is equal to 0 through the whole sample period.[9]

4.2.1. *Firm-level variables*

[9] The dynamic probit model makes use of longitudinal data, which can allow us to capture the unobserved heterogeneity, dynamic relations, and even causal effects (although our paper does not intend to claim any causal effect). In our setting, the dynamic model can guarantee the lagged response among the covariates.

In line with prior banking literature (e.g., Bischof et al., 2022; Cornett et al., 2016; Dong and Oberson, 2022; Jizi et al., 2014), we measure banks' financial performance using earnings before taxes over total assets in percentage (ROA), banks' business model using the ratio of gross loans to total assets ($LOANS$), asset quality using the ratio of non-performing loans to total gross (NPL), banks' capitalization using the total regulatory ratio in percentage ($CAPITAL\ RATIO$), banks' size as the natural logarithm of total assets ($SIZE$), growth prospect using the natural logarithm of the book to market ratio (BTM), and bank's exposure to systematic risk using banks' market beta ($BETA$).

With respect to banks' attitude towards social responsibility, we first consider whether the bank is ESG-rated using an indicator variable that equals one if the bank has an ESG score in Refinitiv, and 0 otherwise ($ESGD$). Sastry et al. (2024) suggest that banks with ESG ratings may enjoy reputational and financial benefits from engaging in climate-related commitments. Second, we include an indicator variable that equals one if the bank participated in the CDP prior to joining PCAF, and zero otherwise (CDP). This is motivated by the CDP's influence on PCAF commitment through its scoring framework (PCAF, 2021)

In additional analyses, we further assess the influence of socially responsible performance by including the bank's ESG score from obtained from Refinitiv ESG (ESG), as well as its individual components: environmental (E), social (S), and governance (G) scores. Additionally, we include $SCOPE3D$, an indicator variable that equals one if the bank disclosed Scope 3 emissions before joining PCAF, and 0 otherwise. Lastly, include the number of directors on the board ($BOARD\ SIZE$) as a proxy for good corporate governance practices in terms of voluntary CSR disclosure

4.2.2. *External Stakeholder and societal pressure variables*

We measure analyst coverage as the natural logarithm of one plus the number of analysts covering the bank ($ANANLYST$), setting missing values to zero (Brennan and Subrahmanyam, 1995). We include $INST\ OWN$, representing the percentage of common equity owned by institutional investors, to evaluate their influence on banks' green commitments.

To assess regulatory and institutional pressures related to climate issues, we employ two proxies. First, we use the climate change index obtained from the Yale Center for Environmental Law (Yale University) and Center for International Earth Science Information Network (Columbia University) for the year 2022 ($CCH\ 2022$). This index ranks countries based on their responses to climate change, with higher values indicating poorer country-level climate change mitigation performance. Second, we use $INST\ DEV$, which captures the overall level of institutional development using indices from Kaufmann et al. (2011). Following Beck et al. (2006), we use the first principal component of six country governance variables.[10] Lastly, $GDP\ GROWTH$ is the real GDP growth rate. Further details on the variable definitions are available in Appendix A.

4.3. Event Study

We conduct a short-window event study to examine the immediate stock market reaction to banks' announcements regarding their commitment to disclose financed carbon emissions through the PCAF initiative. More specifically, this technique estimates (cumulative) abnormal returns surrounding banks' announcements to join PCAF ($t = 0$). We base our tests on three windows ([0], [-1, +1], [-3,+3], and [-5, +5]) (e.g., Loipersberger, 2018). The announcement dates were retrieved from Factiva, Refinitiv (i.e., using the News and Research or the Fillings search engine), the bank website or the PCAF LinkedIn. Notably, among the 93 PCAF banks, eight have not publicly announced their participation.

[10] These six country governance variables are voice and accountability, government effectiveness, political stability, regulatory quality, rule of law, and control of corrupt.

Cumulative abnormal returns are calculated as the difference between the realized stock returns of bank *i* on day *t* and the expected returns that the bank would have shown in the absence of the event. To compute stock returns, we collect daily stock price information from Capital IQ. Expected returns are estimated using first the Fama-French three-factor model and alternatively with the Fama-French five-factor model plus momentum (e.g., Ramelli et al., 2021). The factors are obtained from the Kenneth R. French Data Library. We use the Fama/French North America factors to match the stocks of banks listed in North America and the Fama/French Developed ex US Factors to match the stocks of the remaining banks (e.g., Deng et al., 2022). The factor models are estimated using an estimation window that ranges from -272 days to -21 days prior to a bank's announcement date.

5. Empirical Results

5.1. Descriptive Statistics

The descriptive statistics for the 2014–2022 period are presented in Panel A of Table 3. To mitigate the influence of extreme values, all continuous variables have been winsorized at the 1st and 99th percentiles.

On average, the banks in our sample are profitable over the sample period, with a mean return on assets (ROA) of 1.1%. They hold 67.1% of their balance sheets in loans ($LOANS$), reinforcing that lending constitutes a significant portion of their activities, which implies that the disclosure of financed carbon emissions likely covers a large share of their assets. The average capital ratio ($CAPITAL\ RATIO$) of 15.6% indicates strong capitalization. The average bank size ($SIZE$) is 9.05, corresponding to approximately USD 98.4 billion in total assets (not tabulated). Additionally, 49.1% of bank-year observations have an ESG score ($ESGD$), with a mean ESG score (ESG) of 45, and a relatively large standard deviation of 20.9. On average, banks have 12

board directors ($BOARD\ SIZE$), and institutional investors hold 36.4% of common equity ($INST\ OWN$). The mean number of analysts following each bank ($ANALYST\ RAW$) is 4.

Panel B of Table 3 compares the means of the variables used in the determinant analysis for PCAF and non-PCAF banks. Significant structural differences emerge between the two groups. PCAF banks exhibit higher capital ratios, greater book-to-market values, higher exposure to systematic risk, stronger ESG scores, larger boards, and a higher proportion of institutional ownership. They are also more frequently covered by analysts and tend to be larger in size. In contrast, non-PCAF banks display a greater focus on traditional banking activities, with a higher proportion of loans on their balance sheets, and perform financially better. Additionally, PCAF banks are headquartered in countries with higher levels of institutional development and superior climate change mitigation performance. Notably, PCAF banks are more likely than non-PCAF banks to have committed to CDP prior to joining PCAF. Furthermore, among PCAF banks with an ESG score ($ESGD$=1), which covers 78% of bank-year observations, a larger proportion were already disclosing Scope 3 emissions before joining PCAF compared to their non-PCAF counterparts. These findings indicate that PCAF banks were already engaged in disclosing GHG emissions, particularly indirect emissions, before joining PCAF. Thus, their membership likely reflects a commitment to harmonize the measurement of financed carbon emissions rather than a new effort to disclose indirect emissions.

[Insert Table 3]

Table 4 presents descriptive evidence that banks previously committed to voluntary green pledges are more likely to disclose financed carbon emissions. We leverage two voluntary climate-risk disclosure initiatives not specifically targeted at financial institutions. First, we examine the CDP, which encourages voluntary disclosure of environmental impact, particularly carbon

emissions, providing investors and stakeholders with key information for firm valuation and portfolio decisions. Second, among CDP respondents, we identify whether banks also report to the TCFD. The TCFD framework structures climate-related disclosures around governance, strategy, risk management, and metrics and targets. While both initiatives promote climate transparency, CDP is broader in scope, covering environmental impact, while TCFD focuses on strengthening internal risk management and enabling more effective risk assessments for investors and financial institutions.

Our findings align with the view that PCAF banks were already committed to climate-related disclosures before joining PCAF. PCAF banks are more likely to be CDP respondents than non-PCAF banks (Table 4, Column 1), with the majority of PCAF banks being CDP respondents prior to joining PCAF (Table 4, Column 2), and exhibiting slightly higher CDP ratings (Table 4, Column 3). Additionally, most PCAF banks that are CDP respondents also report according to the TCFD recommendations (Table 4, Column 4). Finally, the majority of these banks were TCFD reporters before joining PCAF (Table 4, Column 5) and disclosing financed carbon emissions under the PCAF framework (Table 4, Column 6).

[Insert Table 4]

5.2. The Determinants for Joining PCAF—Results

Table 5 presents the results of estimating Eq. (1). In Column 1, we use all available bank-year observations. In Column 2, we further saturate the estimation model with year- and country-fixed effects to control for a PCAF adoption trend over time and to address concerns related to unobserved heterogeneity at the country level.[11]

[11] Note that $CCH\ 2022$ is not included in the estimation of Eq. (1) that includes year- and country-fixed effects with year as this variable is perfectly colinear with the fixed effect structure.

The findings in both columns consistently indicate that larger banks and CDP respondents are more likely to join PCAF, as evidenced by the positive and significant coefficients on $SIZE$ and CDP. In Column 1, we also observe that PCAF banks are more likely to be headquartered in countries with higher institutional development, indicated by the positive coefficient on $INST\ DEV$. The insignificant coefficient on $INST\ DEV$ in Column 2 likely reflects the reduced within-group variation after including the fixed effects.[12] Additionally, the positive and significant coefficient on $LOANS$ in Column 2 suggests that banks more focused on lending within a country are more inclined to join PCAF.

In columns 3 to 10, we narrow our focus to ESG-rated banks by replacing $ESGD$ with the ESG score (ESG) and its subcategory scores: environmental (E), social (S), and governance (G). We also include $SCOPE3D$ and $BOARD\ SIZE$, as these variables are also retrieved from Refinitiv ESG data. Even columns incorporate year- and country-fixed effects. The results indicate that banks disclosing Scope 3 emissions prior to joining PCAF are more likely to commit to disclosing financed carbon emissions under a standardized framework, as suggested by the positive coefficient on $SCOPE3D$.

In summary, our findings align with the literature on voluntary disclosure, revealing that larger banks are more likely to join PCAF. Furthermore, banks already engaged in climate-related voluntary disclosures, such as being CDP respondents or disclosing Scope 3 GHG emissions prior to joining PCAF, demonstrate a greater propensity to adopt PCAF. This suggests that the signaling costs associated with adopting a standardized approach to measuring financed carbon emissions are lower for these banks. Finally, we present evidence that the institutional context may influence

[12] In fact, the fixed effect structure (i.e., year and countries dummies) explain 98.1% of the observed variation in $INST\ DEV$ (not tabulated)

banks' decisions to join PCAF, as evidenced by the greater likelihood of PCAF adopters being headquartered in more institutionally developed countries.

[Insert Table 5]

5.3. Event Study—Results

Panel A of Table 6 reveals that announcing to join PCAF has a negative effect 0.34% for the 0-day window using the Fama-French five-factor model plus momentum. This impact is significant at the 10% level. The effect turns insignificant for larger windows, suggesting that there is not too much over- and undershooting of stock prices.

In Panel B, we analyze whether market reactions to banks' announcements of joining PCAF vary based on bank size. The sample is divided into two groups: small and midsize banks, which fall within the bottom and middle terciles of $SIZE$ in the year prior to their PCAF announcements, and large banks, defined as those in the top tercile. We focus on bank size due to descriptive evidence indicating that the largest banks are deeply involved in financing fossil fuel companies (Rainforest Action Network et al., 2024). While larger banks may face higher costs from committing to carbon emissions disclosures, they may also have stronger incentives to publicly commit to green initiatives without necessarily waling the talk (e.g., Sastry et al., 2024). Our findings indicate that the market reaction is concentrated among small and midsize banks, with no significant response observed for large banks.

Overall, our results suggest that commitments to harmonized GHG emissions disclosures are perceived by the stock market as signaling higher future costs for small and midsize banks. In contrast, large banks show no significant market reaction to such commitments. This lack of response implies that investors either do not view these banks as fully committed to their climate pledges, or that large banks are perceived to have already incorporated a carbon neutrality

trajectory, making the costs of disclosing financed emissions relatively minimal. However, this latter interpretation is inconsistent with recent descriptive and empirical evidence (e.g., Berg et al., 2024; Rainforest Action Network et al., 2024; Sastry et al., 2024).

[Insert Table 6]

5.4. *Cost of Capital*

Using a difference-in-differences (DID) methodology, we assess the effect of a bank's PCAF commitment on its cost of equity, serving as an alternative specification to evaluate the stock market's reaction to this announcement. Prior literature suggests that ESG concerns, including environmental issues, are linked to a higher cost of capital (e.g., Chava, 2014). As discussed in Section 3.2, mitigating these concerns through green pledges may help reduce uncertainty and offer clearer guidance to investors and other stakeholders, potentially attracting a larger base of socially responsible investors or reducing information asymmetry. However, addressing ESG issues may entail significant costs, potentially increasing a firm's cost of capital. Consequently, unless the commitment to disclose financed emissions is perceived as effectively addressing climate-related risks, PCAF commitment is unlikely to exert a significant influence on a bank's capital costs.

We test for changes in banks' cost of equity post-PCAF announcement using the following equation:

$$COE_{it} = b_0 + b_1 PCAF\_TREAT_{it} + CONTROLS + FIXED\ EFFECTS + \varepsilon_{it} \qquad (2)$$

COE is the cost of equity derived from the Capital Asset Pricing Model (CAPM) model. Appendix D details the construction of the cost of equity variable. $PCAF\_TREAT$ is a binary indicator set to one for bank-year observations following a bank's PCAF commitment, and zero otherwise. We follow Fu et al. (2012) and control ($CONTROLS$) for $SIZE\ LAGGED$ (the natural

logarithm of total assets at the beginning of the year in USD millions), $BETA\ LAGGED$ (the lagged value of a bank's market beta), and $Log\ BTM$ (the natural logarithm of the book to market ratio). Additional controls include $LOANS$ (the proportion of loans) to account for the bank's business model, and $CAPITAL\ RATIO$ (the total regulatory capital ratio) to account for regulatory capital levels. Finally, to alleviate concerns that macro environment and innate bank-level characteristics affect our results, we include bank and year fixed effects ($FIXED\ EFFECTS$).

Table 7 presents the results of estimating Eq. (2). In Column 1, the coefficient on $PCAF\_TREAT$ is positive and statistically significant at the 10% level, indicating an increase in the cost of equity following PCAF adoption. Columns 2 and 3 reveal that this effect is primarily driven by small and midsize banks, which experience a significant rise in the cost of equity post-commitment, while large banks show no notable change. These findings align with our event study results.

[Insert Table 7]

6. Discussion: Why Do Small Banks Experience a Negative Market Reaction?

So far, our findings indicate that larger banks and banks that are doing good are more likely to commit to disclosing financed carbon emissions in a harmonized manner. Additionally, we have shown that this commitment triggers a negative market reaction, but only for small and midsize banks. In this section, we examine potential drivers behind the adverse stock market reaction among small and midsize banks. We posit that this reaction is more likely attributed to anticipated real operational adjustments rather than proprietary costs, increased litigation risks, or stricter climate-related regulation, for four interrelated reasons. First, committing to disclose financed carbon emissions is not equivalent to actual disclosure. During our sample period, most banks had not yet disclosed their financed carbon emissions according to the PCAF standard (see Appendix

D). Second, banks have the flexibility to time their first disclosure within three years. Third, disclosure does not need to cover the entire portfolio, as the scope is at the discretion of the institution.[13] Fourth, there are no stringent enforcement mechanisms, and banks can withdraw from the PCAF initiative at any time.[14] Additionally, there is little reason to expect stricter climate-related regulation, to systematically affect more smaller banks, especially since larger banks are typically more involved in financing fossil fuel-heavy industries (Rainforest Action Network et al., 2024).[15] Overall, the voluntary nature of these disclosures and the lack of enforcement suggest that unless market participants expect banks to make substantive operational changes, a negative market reaction to such commitments is unlikely.

6.1. Does the PCAF commitment lead to a reduction in bank-level financed carbon emissions?

First, we examine whether the commitment to disclose financed carbon emissions is associated with a real intent to decarbonize the portfolio.[16] In fact, this commitment to disclosure presumably implies that banks also signal their ambitious level of tracking, measurement, understanding, and management of climate related risks. To test this conjecture, we estimate the following DID regression model:

[13] As of 2022, The 1in1000 programme of 2° Investing Initiative Germany reports that PCAF signatories do not comply with PCAF disclosures requirements. https://2degrees-investing.org/resource/0-of-pcaf-signatories-currently-comply-with-the-pcaf-standard/

[14] A recent example of such withdrawal involves the Equator Principles. In 2024, JP Morgan, Bank of America, Citi, and Wells Fargo exited this initiative. https://www.reuters.com/business/finance/jpmorgan-citi-wells-boa-are-no-longer-signatories-equator-principles-website-2024-03-05/

[15] Consistent with this argument, our analysis reveals that, over the sample period, large banks have significantly higher average total estimated downstream Scope 3 emissions ($SCOPE3\ DOWN$) compared to small and midsize banks. Furthermore, the average downstream Scope 3 emission intensity ($SCOPE3\ DOWN\ INT$) does not differ significantly between the two groups. (not tabulated)

[16] The PCAF list the following benefit on their website for companies that commit: "The harmonized accounting approach provides financial institutions with the starting point required to set science-based targets and align their portfolio with the Paris Climate Agreement." https://carbonaccountingfinancials.com/en/about

$$DV_{it} = b_0 + b_1 PCAF\_TREAT_{it} + b_2 ROA_{it} + b_3 Log\ BTM_{it} + b_4 LOANS_{it} \quad (3)$$
$$+ b_5 SIZE\ LAGGED_{it} + b_6 CAPITAL\ RATIO_{it} + b_7 GDP\ GROWTH_{it}$$
$$+ FIXED\ EFFECTS + \varepsilon_{it}$$

The dependent variable is either the firm's total estimated downstream Scope 3 emissions intensity ($SCOPE3\ DOWN\ INT$), which we measure as the ratio between total downstream Scope 3 emission in tonnes and the enterprise value including cash and short term investments in million US dollars, or the natural logarithm of the firm's total estimated downstream Scope 3 emissions measured in tCO2e ($SCOPE3\ DOWN$).[17] We focus on Refinitiv-estimated emissions rather than bank-disclosed figures for several reasons. First, only a limited number of banks disclose these emissions. Second, such disclosures may not encompass the entire portfolio. These limitations raise concerns about statistical power and the potential for changes in emissions to reflect shifts in coverage. Moreover, while estimated emissions may exhibit some bias, our primary interest lies in analyzing changes in emissions trajectories between large banks and other institutions. Thus, any potential bias is unlikely to significantly influence our inferences. $PCAF\_TREAT$ is a binary indicator set to one for bank-year observations following a bank's PCAF commitment, and zero otherwise. We control for the following which were defined earlier and in Appendix A: ROA, $Log\ BTM$, $LOANS$, $SIZE\ LAGGED$, $CAPITAL\ RATIO$, and $GDP\ GROWTH$. We include year and bank fixed effects ($FIXED\ EFFECTS$).

[17] The estimation of total downstream Scope 3 emissions is available starting from 2016. We focus on estimated total downstream Scope 3 emissions as a proxy for financed carbon emissions (Scope 3 – category 15), as financed carbon emissions are not (yet) available. However, financed carbon emissions (Scope 3 – category 15) are expected to constitute the bulk of total downstream Scope 3 emissions for commercial banks. Downstream Scope 3 emissions include transportation and distribution (Scope 3 – category 9), processing of sold products (Scope 3 – category 10), use of sold products (Scope 3 – category 11), end-of-life treatment of sold products (Scope 3 – category 12), downstream leased assets (Scope 3 – category 13), franchises (Scope 3 – category 14), and investments (Scope 3 – category 15).

Table 8 presents the results of estimating Eq. (3). In columns 1 and 4, the coefficient on $PCAF\_TREAT$ is negative and statistically significant, indicating a reduction in both the intensity and total volume of downstream Scope 3 emissions following PCAF adoption. Columns 2, 3, 5, and 6 show that this effect is predominantly driven by small and midsize banks. These findings align with the interpretation of the event study results, suggesting that market participants expected smaller banks to "walk the talk", whereas larger banks may have been perceived as engaging in "cheap talk".

[Insert Table 8]

6.2. How does small banks reduce their financed carbon emissions?

The previous analyses suggest that market participants view "walking the talk" as costly, with small and midsize banks demonstrating a reduction in financed carbon emissions. As a result, we expect these banks to implement *costly* operational adjustments. To test this hypothesis, we first examine changes in loan growth and subsequently assess shifts in financial performance.

To examine whether loan growth changes with the decision to join PCAF, we estimate the following DID regression model:

$$\begin{aligned} LOAN\ GROWTH_{it} &= b_0 + b_1 PCAF\_TREAT_{it} + b_2 DEPOSIT\ LAGGED_{it} \\ &+ b_3 SIZE\ LAGGED_{it} + b_4 CASH\ FLOW\ LAGGED_{it} \\ &+ b_5 EQUITY\ LAGGED_{it} + b_6 NPL\ LAGGED_{it} + b_7 GDP\ GROWTH_{it} \\ &+ FIXED\ EFFECTS + \varepsilon_{it} \end{aligned} \quad (4)$$

$LOAN\ GROWTH$ is the yearly change in total loans divided by total loans at the beginning of the year. $PCAF\_TREAT$ is a binary indicator set to one for bank-year observations following a bank's PCAF commitment, and zero otherwise. Following Bhat et al. (2019), we control for

$DEPOSIT\ LAGGED$ (total deposits over total assets, at the beginning of the year), $SIZE\ LAGGED$ (the natural logarithm of total assets at the beginning of the year in USD millions), $CASH\ FLOW\ LAGGED$ (earnings before taxes and loan loss provisions to total assets, at the beginning of the year), $EQUITY\ LAGGED$ (total equity over total assets, at the beginning of the year). $NPL\ LAGGED$ (nonperforming loans over total loans, at the beginning of the year). We further control for GDP growth ($GDP\ GROWTH$) which were defined earlier and in Appendix A. We include year and bank fixed effects ($FIXED\ EFFECTS$).

To examine whether financial performance changes with the decision to join PCAF, we estimate the following DID regression model:

$$\begin{aligned} ROA_{it} = {} & b_0 + b_1 PCAF\_TREAT_{it} + b_2 DEPOSIT\ LAGGED_{it} + b_3 SIZE\ LAGGED_{it} \\ & + b_4 LOANS\ LAGGED_{it} + b_5 EQUITY\ LAGGED_{it} \\ & + b_6 NPL\ LAGGED_{it} + b_7 GDP\ GROWTH_{it} + FIXED\ EFFECTS \\ & + \varepsilon_{it} \end{aligned} \quad (5)$$

ROA is earnings before taxes to total assets. $PCAF\_TREAT$ is a binary indicator set to one for bank-year observations following a bank's PCAF adoption, and zero otherwise. $LOANS\ LAGGED$ is the ratio of gross loans to total assets, at the beginning of the year. We control for the following which were defined above: $DEPOSIT\ LAGGED$, $SIZE\ LAGGED$, $EQUITY\ LAGGED$, $NPL\ LAGGED$, and $GDP\ GROWTH$. We include year and bank fixed effects ($FIXED\ EFFECTS$).

Table 9 presents the results of estimating Eq. (4). In Panel A, we report the analysis for loan growth. In Columns 1, the coefficient on $PCAF\_TREAT$ is negative and statistically significant, indicating a decrease in loan growth following PCAF adoption. Columns 2 and 3 show that this effect is predominantly driven by smaller banks. In Panel B, we report the analysis that

focuses on financial performance. While in Column 1, the coefficient on $PCAF\_TREAT$ is insignificant, the statistically negative coefficient on $PCAF\_TREAT$ in Column 2 and insignificant coefficient on $PCAF\_TREAT$ in Column 3 indicates that smaller banks exhibit lower financial performance after the decision to join PCAF than other banks. These findings align with the interpretation that smaller banks undertake operational adjustments following the decision to join PCAF, while larger banks mostly engaged in "cheap talk".

[Insert Table 9]

6.3. Investors attention and GHG emissions

An important follow-up question is how attention devoted to climate change topics by managers and market participants has evolved around PCAF adoption. To answer this question, we use the following equation:

$$DV_{it} = b_0 + b_1 PCAF\_TREAT_{it} + b_2 ROA_{it} + b_3 BETA_{it} + b_4 LOANS_{it} + b_5 SIZE\ LAGGED_{it} + b_6 CAPITAL\ RATIO_{it} + FIXED\ EFFECTS + \varepsilon_{it} \quad (2)$$

For this analysis, we use data from Sautner et al. (2022), which identifies from earnings conference calls the demand side (analysts) and the supply side (management) of a firms' climate change exposures. We use the ISIN code to link their measures with our sample of listed banks. Specifically, we focus on two climate risk measures as dependent variable (DV): $CCExp$ and $CCExpSent$. $CCExp$ captures exposures to climate change. $CCExpSent$ denotes the overall banks' sentiment towards climate change. $PCAF\_TREAT$ is a binary indicator set to one for bank-year observations following a bank's PCAF commitment, and zero otherwise. We control for the following which were defined earlier and in Appendix A: ROA , $BETA$, $LOANS$,

$CAPITAL\ RATIO$, and $SIZE\ LAGGED$. We include year and bank fixed effects ($FIXED\ EFFECTS$).

Table 10 presents the results of estimating Eq. (5). In Column 1, we find that the coefficient on $PCAF\_TREAT$ is positive and significant with $CCExp$ as dependent variable. These results indicates that the attention paid by analysts to firm-level climate change exposure or manager discussion of that topic increases following PCAF adoption. In other words, following the decision to join PCAF, climate-related issues are more discussed during earning calls. Columns 2 and 3 suggest the this result primarily driven by small and midsize banks. The results in Column 4 suggest that banks' sentiment towards climate issues are relatively more positive since banks joined PCAF. Again, the results presented in columns 5 and 6 indicates that banks' sentiment towards climate risk is incrementally more positive after joining PCAF for small and midsize banks.

[Insert Table 10]

To sum up, we find that small and mid-sized banks' decision to join PCAF is linked to a shift toward greener trajectories through tangible operational adjustments, while no detectable changes are observed for large banks. Although we do not assert causal identification—that the decision to join PCAF directly drives these outcomes—our results offer valuable insights into the divergent paths of green pledges between small and mid-sized versus large banks.

7. Conclusion and Discussion

We examine the determinants and short-term consequences of banks voluntarily committing to harmonized disclosure of financed carbon emissions. This study is both timely and relevant in light of increasing public scrutiny of carbon emissions and the growing need to assess the environmental impact of bank portfolios.

Using an international sample of banks from 2014 to 2022, our findings reveal that larger banks and those already engaged in carbon disclosure (i.e., reporting Scope 3 emissions and responding to the CDP) are more likely to join PCAF. An event study reveals a negative market reaction to PCAF announcements for small and midsize banks, whereas large banks experience no significant market response.

We explore potential drivers of these market reactions and find that for small and mid-sized banks, the decision to join PCAF is associated with a shift toward greener trajectories. These banks experience slower loan growth, weaker financial performance, and a reduction in financed carbon emissions, reflecting tangible operational adjustments. In contrast, no such changes are observed for large banks. Taken together with the event study results, we interpret this as the market expecting small and midsize banks to make substantive efforts ("walking the talk"), while large banks are anticipated to engage in symbolic gestures ("cheap talk").

Our results suggest that without mandatory financed carbon emissions disclosures and effective enforcement mechanisms, the financial sector is unlikely to address climate change in a timely manner. Larger banks, which play a key role in financing high-polluting industries, appear to be perceived as engaging in green pledges symbolically. Harmonized financed carbon emissions reporting could be instrumental in evaluating their progress toward a net-zero economy. Moreover, our findings indicate that banks already "doing good" are more likely to commit to emissions disclosure, depriving stakeholders of critical information from less environmentally proactive institutions.

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Appendix A

Variable descriptions.

Variable	Description	Source
PCAF DYN	For PCAF banks, PCAF DYN equals one in the year prior to the announcement of joining the PCAF and is missing in the years before and after. For non-PCAF banks, PCAF DYN equals zero for the whole sample period.	PCAF website
PCAF_TREAT	An indicator variable that equals one from the year of a bank's PCAF adoption, and zero otherwise.	PCAF website
ROA	Earnings before taxes to total assets.	S&P GMI
LOANS	The ratio of total gross loans to total assets.	S&P GMI
CAPITAL RATIO	The total regulatory capital ratio. (in%)	S&P GMI
SIZE	The natural logarithm of total assets in USD millions.	S&P GMI
Log BTM	The natural logarithm of the book to market ratio.	S&P GMI
BETA	The coefficient of the market return calculated from the the Capital Asset Pricing Model with prior one year daily data. We use the Fama-French North America factors to match the stocks from North America and the Fama-French Developed ex US Factors to match the stocks from elswhere. Stock returns are in excess of the risk-free rate. The risk-free rate is the U.S. one month T-bill rate.	S&P GMI, Kenneth R. French Data Library
ESGD	An indicator variable that takes the value 1 if the bank has an ESG score, and zero otherwise.	Refinitiv ESG
ESG	ESG Score.	Refinitiv ESG
E	The environmental pillar 'E' score	Refinitiv ESG
S	The social pillar 'S' score	Refinitiv ESG
G	The governance pillar 'G' score	Refinitiv ESG
SCOPE3D	An indicator variable that takes the value 1 if the bank has Scope 3 emissions disclosed in Refinitiv ESG prior to joining PCAF, and zero otherwise. We use data marked as *reported* by the firm and not *estimated* by Refinitiv.	Refinitiv ESG
BOARD SIZE	The number of directors on the board	Refinitiv ESG
CDP	An indicator variable that takes the value 1 if the bank has joined CDP prior to joining PCAF, and zero otherwise.	
ANALYST RAW	Number of analysts	S&P GMI
ANALYST	The natural logarithm of one plus the number of analysts.	S&P GMI

(continued on next page)

Appendix A
(continued)

Variable	Description	Source
INST OWN	Institutional ownership in %	S&P GMI
CCH 2022	Climate change index that ranks countries according to their response to climate change, obtained from the Yale Center for Environmental Law (Yale University) and Center for International Earth Science Information Network (Columbia University) for the year 2022.	epi.yale.edu
INST DEV	Index of the overall level of institutional development averaged over the sample period The underlying indicators are voice and accountability, government effectiveness, political stability, regulatory quality, rule of law, and control of corruption. We use the first principal component indicator of these variables.	Kaufman, et al. (1999)
GDP GROWTH	The real GDP growth. (in%)	S&P GMI
COE	We use the CAPM model. Our regression model is specified as $r_t - r_{F,t} = \alpha + \beta_1(r_{M,t} - r_{F,t}) + \varepsilon_t$, where r_t indicates the stock return and $r_{M,t}$ indicates the market return. We use the above model to estimate the factor loadings, α and β_1, using daily data in the past year. After estimating parameters, we follow García and Steele (2022) and plug in a constant market risk premium, $r_{M,t} - r_{F,t}$, of 8% to obtain the estimated expected return ($\widetilde{r_t}$). We use the Fama-French North America factors to match the stocks from North America and the Fama-French Developed ex US Factors to match the stocks from elsewhere. The risk-free rate ($r_{F,t}$) is the U.S. one month T-bill rate.	S&P GMI, Kenneth R. French Data Library
LOAN GROWTH	The yearly change in total loans divided by total loans at the beginning of the year.	S&P GMI
DEPOSIT	Total deposits over total assets.	S&P GMI
CASH FLOW	Earnings before taxes and loan loss provisions to total assets	S&P GMI
EQUITY	Total equity over total assets.	S&P GMI
NPL	Nonperforming loans over total loans	S&P GMI
SCOPE3 DOWN	The natural logarithm of total estimated downstream Scope 3 emissions measured in tCO2e	Refinitiv ESG
SCOPE3 DOWN INT	The ratio between total downstream Scope 3 emission in tonnes and the enterprise value including cash and short term investments in million US dollars	Refinitiv ESG
CC Exp	Score capturing exposure to climate change extracted from earnings calls – general score. (in ‰)	Sautner et al. (2022)
CCExpSent	Score capturing exposure to climate change extracted from earnings calls –overall sentiment. (in ‰)	Sautner et al. (2022)

Appendix B:

Distribution of PCAF signatories across years.

Panel A: Announcement								
	2015	2018	2019	2020	2021	2022	2023[a]	Total
# FIs joining PCAF each year	16	0	43	33	102	158	65	417
# Banks	6	0	16	19	59	63	27	190
# Banks included in the sample	0	0	2	12	34	37	8	93
Panel B: First disclosure								
	2015	2018	2019	2020	2021	2022	2023[a]	Total
# FIs providing first disclosures each year	0	3	7	13	25	26	15	89
# Banks	0	2	3	6	13	19	7	50
# Banks included in the sample	0	0	0	2	8	23	9	42

[a]Includes data until July 31st 2023

Appendix C

List of PCAF banks.

Name	Country	Joined	First Disclosure
AB Siauliu Bankas*	Lithuania	2022	2023
Aareal Bank AG	Germany	2021	.
Addiko Bank AG	Austria	2022	.
Aozora Bank, Ltd.	Japan	2022	2023
Arion banki hf.	Iceland	2021	2022
BAWAG Group AG*	Austria	2023	.
BKS Bank AG	Austria	2021	.
BNK Financial Group Inc.	South Korea	2022	.
BNP Paribas SA	France	2022	.
Banco Bilbao Vizcaya Argentaria, S.A.	Spain	2021	.
Banco Davivienda S.A.	Colombia	2022	.
Banco Santander, S.A.	Spain	2021	2022
Banco de Sabadell, S.A.	Spain	2022	2023
Bancolombia S.A.	Colombia	2020	.
Bank of America Corporation	United States of America	2020	.
Bank of Ireland Group plc	Ireland	2021	.
Bank of Montreal	Canada	2021	2022
Banque Cantonale Vaudoise	Switzerland	2023	.
Barclays PLC	United Kingdom	2020	.
Basler Kantonalbank	Switzerland	2021	.
Berner Kantonalbank AG	Switzerland	2020	2023
CaixaBank, S.A.	Spain	2021	2021
Canadian Imperial Bank of Commerce	Canada	2021	2022
Capital One Financial Corporation*	United States of America	2023	.
Citigroup Inc.	United States of America	2020	2022
Citizens Financial Group, Inc.	United States of America	2022	.
Close Brothers Group plc	United Kingdom	2022	.
Comerica Incorporated	United States of America	2020	2023
Commerzbank AG*	Germany	2023	.
Commonwealth Bank of Australia	Australia	2022	2022
Concordia Financial Group, Ltd.	Japan	2022	.
Coop Pank AS	Estonia	2022	2022
Crédit Agricole S.A.	France	2022	.
DGB Financial Group Co., Ltd.	South Korea	2021	2023
Danske Bank A/S	Denmark	2020	2021
Deutsche Bank Aktiengesellschaft	Germany	2021	2022
Erste Group Bank AG	Austria	2021	2022
Fifth Third Bancorp	United States of America	2021	.
Grupo Financiero Banorte, S.A.B. de C.V.	Mexico	2022	.
HSBC Holdings plc	United Kingdom	2021	2022
Hana Financial Group Inc.	South Korea	2021	.
Industrial Bank of Korea	South Korea	2021	2023
JAPAN POST BANK Co.,Ltd.	Japan	2022	.
JB Financial Group Co., Ltd.	South Korea	2021	2021
Julius Bär Gruppe AG	Switzerland	2022	2022
Juroku Financial Group,Inc.	Japan	2023	.
KB Financial Group Inc.	South Korea	2021	2021
KBC Group NV	Belgium	2019	2020
KeyCorp	United States of America	2022	.
Kvika banki hf.*	Iceland	2022	.
Kyushu Financial Group, Inc.	Japan	2022	.
Laurentian Bank of Canada	Canada	2022	.
Lloyds Banking Group plc	United Kingdom	2020	2021
Mediobanca Banca di Credito Finanziario S.p.A.	Italy	2022	2022
Metro Bank PLC	United Kingdom	2022	.
Mitsubishi UFJ Financial Group, Inc.	Japan	2021	2022

Appendix C
(continued)

Mizuho Financial Group, Inc.	Japan	2021		2021
National Bank of Canada	Canada	2021		2023
Nordea Bank Abp	Finland	2020		2022
OSB Group Plc	United Kingdom	2022	.	
OTP Bank Nyrt.*	Hungary	2023	.	
ProCredit Holding AG & Co. KGaA	Germany	2021		2022
Raiffeisen Bank International AG	Austria	2022		2022
Regions Financial Corporation	United States of America	2022	.	
Royal Bank of Canada	Canada	2021		2022
Shinhan Financial Group Co., Ltd.	South Korea	2020		2022
Shinsei Bank, Limited*	Japan	2022		2022
SpareBank 1 Helgeland	Norway	2023	.	
SpareBank 1 Nord-Norge	Norway	2022	.	
SpareBank 1 Nordmøre*	Norway	2022	.	
SpareBank 1 SMN	Norway	2021	.	
SpareBank 1 SR-Bank ASA	Norway	2021		2022
SpareBank 1 Østlandet	Norway	2020		2021
Sparebanken Sør	Norway	2021	.	
Sparebanken Vest	Norway	2022	.	
Sparebanken Øst	Norway	2022	.	
Standard Chartered PLC	United Kingdom	2022	.	
Sumitomo Mitsui Financial Group, Inc.	Japan	2021	.	
Sumitomo Mitsui Trust Holdings, Inc.	Japan	2022		2022
Svenska Handelsbanken AB (publ)	Sweden	2021		2021
Swedbank AB (publ)	Sweden	2022		2023
The Bank of Nova Scotia	Canada	2021		2022
The Chiba Bank, Ltd.	Japan	2022	.	
The Hachijuni Bank, Ltd.	Japan	2023	.	
The PNC Financial Services Group, Inc.	United States of America	2021	.	
The San-in Godo Bank, Ltd.	Japan	2022	.	
The Shizuoka Bank, Ltd.	Japan	2022	.	
The Toronto-Dominion Bank	Canada	2020		2022
Thurgauer Kantonalbank	Switzerland	2022	.	
Truist Financial Corporation	United States of America	2021	.	
U.S. Bancorp	United States of America	2021	.	
UmweltBank AG	Germany	2019		2020
Woori Financial Group Inc.	South Korea	2021	.	

This table presents the names of the 93 banks participating in the PCAF, along with their respective headquarters' countries. An asterisk (*) indicates banks that have not publicly communicated their participation in PCAF and are therefore excluded from the event study. The column labeled "Joined" specifies the year in which each bank formally joined PCAF, while the column titled "First Disclosure" indicates the year in which the bank first reported its financed carbon emissions.

Appendix D: Measure of Cost of Equity Capital

COE	The expected returns based on the CAPM model by running the following regression $r_t - r_{F,t} = \alpha + \beta(r_{M,t} - r_{F,t}) + \varepsilon_t$, where r_t is the stock return computed using stock prices denominated in USD and obtained from Capital IQ, $r_{F,t}$ is the risk-free rate and, $r_{M,t}$ is the market return. The factors are obtained from the Kenneth R. French Data Library. We use the Fama/French North America factors to match the stocks of banks listed in North America and the Fama/French Developed ex US Factors to match the stocks of the remaining banks. For each bank-year observation, the parameters of the model α and β are estimated using daily data in the past year. After the parameters are estimated, we follow García and Steele (2022) and plug in a constant market risk premium, $r_{M,t} - r_{F,t}$, of 8% to obtain the estimated expected return r_t, which is our cost of equity estimate.

Table 1

Sample selection.

Panel A: Sample selection for PCAF banks	
PCAF signatories as of July 31, 2023	417
Minus: non-banks	-134
Minus: banks headquartered in non-OECD countries	-69
Minus: non-listed banks	-108
Universe of listed OECD PCAF banks in S&P GMI	106
Minus: thinly traded stocks or banks with less than 50 valid trading days during the year	-2
Minus: banks whose date of joining PCAF is before their IPO	-3
Minus: banks with missing financial data	-8
Total number of PCAF banks in the initial sample	93
Panel B: Sample selection for non-PCAF banks	
Universe of listed OECD non-PCAF banks in S&P GMI	1118
Minus: thinly traded stocks or banks with less than 50 valid trading days during the year	-21
Minus: banks with missing financial data	-334
Total number of non-PCAF banks in the initial sample	763

This table presents the sample selection. Panel A shows the sample selection process for PCAF banks. Panel B shows the sample selection process for non-PCAF.

Table 2
Sample description.

Countries	Bank-year observations	# banks	# PCAF	Country Institutional Features	
				CCH 2022	*INST DEV*
Australia	85	10	1	71	2.21
Austria	40	6	5	46	1.45
Belgium	17	3	1	58	0.39
Canada	92	11	7	142	2.41
Chile	35	4	0	107	-1.56
Colombia	35	5	2	129	-7.91
Czechia	15	2	0	39	-1.20
Denmark	83	12	1	1	3.13
Estonia	9	2	1	42	0.62
Finland	34	5	1	3	3.52
France	148	18	2	51	-0.37
Germany	59	11	5	60	1.80
Greece	44	5	0	45	-5.16
Hungary	9	1	1	58	-4.22
Iceland	7	2	2	27	2.01
Ireland	23	3	1	56	1.48
Israel	68	8	0	93	-2.42
Italy	147	21	1	56	-3.77
Japan	765	93	14	85	0.93
Korea	86	11	8	126	-1.70
Lithuania	9	1	1	61	-1.31
Mexico	31	5	1	95	-9.21
Netherlands	12	2	0	32	2.86
New Zealand	9	1	0	88	3.42
Norway	201	28	9	70	3.42
Poland	91	11	0	96	-3.04
Portugal	12	2	0	100	-1.02
Slovakia	2	1	0	37	-3.18
Slovenia	5	2	0	19	-1.46
Spain	50	6	4	83	-2.05
Sweden	36	6	2	6	2.91
Switzerland	191	24	5	23	3.38
Turkey	98	13	0	166	-9.27
United Kingdom	76	11	7	2	1.29
United States of America	3551	510	11	101	-0.03
Total	6175	856	93		

This table presents country-level statistics. The first column shows the number of bank-year observations. The second column shows the number of banks within a country. The third shows the number of PCAF banks within a country. $CCH\ 2022$ is the climate change index that ranks countries according to their response to climate change, obtained from the Yale Center for Environmental Law (Yale University) and Center for International Earth Science Information Network (Columbia University) for the year 2022. $INST\ DEV$ is an index of the overall level of institutional development averaged over the sample period. The underlying indicators are voice and accountability, government effectiveness, political stability, regulatory quality, rule of law, and control of corruption (Kaufmann et al., 2011). We use the first principal component indicator of these variables.

Table 3
Descriptive statistics.

Panel A: Descriptive statistics						
Variables	N	Mean	StdDev	Q1	Median	Q3
PCAF	6175	0.122	0.327	0.000	0.000	0.000
ROA	6175	1.075	0.689	0.579	1.097	1.477
LOANS	6175	0.669	0.143	0.599	0.691	0.770
NPL	6175	0.019	0.030	0.005	0.011	0.022
CAPITAL RATIO	6175	15.596	4.158	12.980	14.740	17.450
SIZE	6175	9.050	2.148	7.324	8.877	10.460
Log BTM	6175	0.137	0.650	-0.286	-0.019	0.477
BETA	6175	0.708	0.524	0.240	0.711	1.077
ESGD	6175	0.491	0.500	0.000	0.000	1.000
SCOPE3D	3032	0.398	0.490	0.000	0.000	1.000
ESG	3032	44.969	20.863	29.264	40.176	60.582
E	3032	30.063	33.644	0.000	18.282	60.764
S	3032	44.518	23.761	26.382	38.924	63.392
G	3032	53.109	21.310	36.967	54.053	69.866
BOARD SIZE	3032	11.772	3.307	9.000	11.000	13.000
CDP	6175	0.124	0.329	0.000	0.000	0.000
ANALYST RAW	6175	3.979	5.501	0.000	2.000	5.000
ANALYST	6175	1.066	1.027	0.000	1.099	1.792
INST OWN	6175	36.347	28.298	11.614	30.256	57.843
CCH 2022	6175	88.987	28.459	85.000	101.000	101.000
INST DEV	6175	0.011	2.151	-0.698	0.440	0.782
GDP GROWTH	6175	1.927	2.449	1.590	2.240	2.820
COE	6175	0.057	0.042	0.020	0.057	0.087
LOAN GROWTH	6095	0.085	0.150	0.003	0.061	0.129
DEPOSIT	6095	0.746	0.152	0.682	0.795	0.852
CASH FLOW	6095	1.257	0.737	0.741	1.242	1.622
EQUITY	6095	0.097	0.032	0.074	0.097	0.117
SCOPE3 DOWN	2712	14.879	1.863	13.382	14.571	16.154
SCOPE3 DOWN INT	2712	794.825	420.212	540.655	738.667	950.986
CC Exp	2018	0.372	0.548	0.044	0.200	0.432
CCExpSent	2018	0.044	0.225	0.000	0.000	0.101

Table 3
(continued)

Panel B: Difference in means between PCAF banks and non-PCAF banks

	PCAF		non-PCAF		Difference in means
Variables	Mean	StdDev	Mean	StdDev	
ROA	0.938	0.621	1.094	0.696	-0.156***
LOANS	0.607	0.152	0.678	0.140	-0.071***
NPL	0.020	0.024	0.019	0.031	0.001
CAPITAL RATIO	16.683	3.611	15.445	4.207	1.238***
SIZE	11.896	1.802	8.654	1.877	3.242***
Log BTM	0.380	0.674	0.103	0.639	0.276***
BETA	1.018	0.444	0.665	0.520	0.353***
ESGD	0.782	0.413	0.450	0.498	0.332***
SCOPE 3D	0.942	0.233	0.267	0.442	0.675***
ESG	65.608	16.737	39.982	18.575	25.626***
E	67.639	24.746	20.984	28.880	46.655***
S	66.418	19.726	39.227	21.523	27.190***
G	65.438	20.546	50.131	20.406	15.307***
BOARD SIZE	12.908	4.055	11.498	3.038	1.411***
CDP	0.545	0.498	0.065	0.247	0.480***
ANALYST RAW	11.731	7.167	2.901	4.221	8.829***
ANALYST	2.257	0.910	0.900	0.928	1.357***
INST OWN	46.277	25.477	34.965	28.396	11.311***
CCH 2022	76.072	40.772	90.783	25.792	-14.711***
INST DEV	0.615	2.522	-0.073	2.081	0.688***
GDP GROWTH	1.733	2.767	1.954	2.400	-0.221*

Panel A reports descriptive statistics of the main variables used in the main analysis over the 2014 to 2022 period. We report the number of observations (N), the mean (Mean), the median (Median), the standard deviation (StdDev), the first quartile (Q1), the third quartile (Q3), the minimum (Min), and the maximum (Max). Panel B reports descriptive statistics for the variables used in the determinant analysis by PCAF and non-PCAF Banks. We report the mean (Mean), the standard deviation (StdDev), as well as the statistical significance of the difference of means (Difference in means) is based on the parametric *t*-test. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. Variable definitions can be found in Appendix A. All continuous variables are winsorized at 1% and 99%.

Table 4
CDP respondent

		PCAF adopters and CDP respondents	CDP respondents		PCAF adopters and CDP Respondents	
		CDP respondents prior to joining PCAF	CDP rating	TCFD	TCFD respondents prior to joining PCAF	TCFD respondents prior to disclosing financed carbon emissions
	(1)	(2)	(3)	(4)	(5)	(6)
PCAF	76.3%	90.1%	72.5%	94.4%	80.3%	90.1%
non-PCAF	9.6%	NA	68.5%	87.7%	NA	NA

This table provides descriptive information about banks committing to CDP and TCFD. In Column 1, the sample includes up to 93 PCAF banks and 763 non-PCAF banks. Column 1 shows the proportion of banks that are CDP respondent. In Column 2, the sample includes 71 PCAF banks that also commit to CDP. Column 2 shows the percentage of PCAF banks that are CDP respondents and that join the CDP initiative prior to PCAF. In Column 3, the sample includes 71 PCAF banks and 70 non-PCAF banks for which CDP ratings are not missing. CDP ratings are transformed into numerical values and range from 0 to 8, with 0 indicating the lowest rating and 8 indicating the highest rating. Ratings are normalized to take a value between 0 and 1 by subtracting the mean rating from the raw rating, and by dividing then this difference by the range of rating (i.e., difference between the highest and the lowest rating). Column 3 shows the average CDP rating in %. In Column 4, the sample includes 71 PCAF banks and 73 non-PCAF banks. Column 4 shows the percentage of TCFD and CDP respondents that join both initiatives prior to PCAF. Column 5 shows the percentage of PCAF banks that are TCFD respondents prior to the first disclosure of financed carbon emissions.

Table 5
Determinant analysis.

Dependent Variable: *PCAF*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ROA	0.21*	0.13	0.17	0.17	0.17	0.18	0.18	0.11	0.17	0.19
	(1.65)	(0.74)	(1.10)	(0.62)	(1.08)	(0.70)	(1.19)	(0.41)	(1.07)	(0.75)
LOANS	0.48	2.05**	1.01	2.58***	1.07	2.52**	0.99	2.97***	1.01	2.25**
	(0.98)	(2.53)	(1.53)	(2.64)	(1.63)	(2.57)	(1.50)	(2.86)	(1.58)	(2.36)
NPL	-5.29*	-5.03	-6.37	3.46	-6.49	3.51	-6.45	4.11	-6.39	3.71
	(-1.93)	(-1.12)	(-1.55)	(0.64)	(-1.54)	(0.64)	(-1.53)	(0.83)	(-1.57)	(0.67)
CAPITAL RATIO	0.06***	-0.00	0.06**	0.03	0.06**	0.03	0.05**	0.03	0.06***	0.03
	(4.12)	(-0.08)	(2.32)	(0.56)	(2.48)	(0.72)	(2.22)	(0.56)	(2.66)	(0.54)
SIZE	0.19***	0.55***	0.15	0.43**	0.16	0.49**	0.16	0.33	0.20*	0.53***
	(3.18)	(4.49)	(1.36)	(2.22)	(1.38)	(2.57)	(1.46)	(1.64)	(1.86)	(2.77)
Log BTM	0.69***	0.13	1.01***	0.15	0.98***	0.11	1.02***	0.19	0.97***	0.09
	(4.28)	(0.49)	(4.67)	(0.36)	(4.49)	(0.25)	(4.66)	(0.46)	(4.41)	(0.21)
BETA	0.04	0.05	-0.36*	0.02	-0.33*	0.09	-0.34*	0.08	-0.30	0.10
	(0.23)	(0.15)	(-1.86)	(0.05)	(-1.71)	(0.20)	(-1.77)	(0.17)	(-1.59)	(0.21)
ESGD	0.21	0.21								
	(1.14)	(0.73)								
SCOPE3D			1.06***	1.07**	1.05***	1.03**	1.06***	1.14**	1.15***	1.11**
			(3.70)	(2.32)	(3.64)	(2.31)	(3.63)	(2.38)	(4.09)	(2.51)
ESG			0.01	0.02						
			(1.48)	(1.55)						
E					0.01	0.01				
					(1.48)	(0.91)				
S							0.01	0.04**		
							(1.31)	(2.47)		
G									0.00	0.00
									(0.51)	(0.09)
BOARD SIZE			-0.01	0.01	-0.01	0.00	-0.01	0.02	-0.01	0.00
			(-0.21)	(0.23)	(-0.22)	(0.04)	(-0.30)	(0.43)	(-0.29)	(0.02)
CDP	0.74***	0.92***	0.41*	0.42	0.39*	0.45	0.43**	0.44	0.48**	0.54
	(4.01)	(2.87)	(1.90)	(1.08)	(1.85)	(1.13)	(1.99)	(1.14)	(2.28)	(1.48)
ANALYST	0.18	0.18	0.12	0.32	0.15	0.38	0.13	0.31	0.15	0.37
	(1.56)	(0.78)	(0.71)	(0.81)	(0.89)	(0.97)	(0.80)	(0.80)	(0.84)	(0.92)
INST OWN	0.00	-0.01	0.01***	-0.01	0.01***	-0.01	0.01***	-0.01	0.01***	-0.01
	(0.88)	(-1.16)	(2.68)	(-1.41)	(2.77)	(-1.23)	(2.73)	(-1.31)	(2.66)	(-1.05)
CCH 2022	0.00		0.01**		0.01**		0.01*		0.01**	
	(0.40)		(1.98)		(1.98)		(1.81)		(2.00)	
INST DEV	0.09**	-0.12	0.13***	-0.03	0.12**	-0.04	0.13***	0.06	0.12**	-0.02
	(2.36)	(-0.33)	(2.62)	(-0.06)	(2.56)	(-0.07)	(2.59)	(0.12)	(2.45)	(-0.04)
GDP GROWTH	-0.01	0.03	-0.03	0.04	-0.03	0.04	-0.03	0.04	-0.03	0.03
	(-0.58)	(0.60)	(-1.32)	(0.65)	(-1.35)	(0.79)	(-1.36)	(0.64)	(-1.25)	(0.60)
Constant	-6.51***	-1.19	-7.55***	-12.31***	-7.49***	-12.43***	-7.48***	-12.88***	-7.85***	-12.28***
	(-5.94)	(-0.62)	(-4.74)	(-4.16)	(-4.59)	(-4.14)	(-4.63)	(-4.27)	(-5.01)	(-4.02)
Year Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Country Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Pseudo R^2	0.36	0.63	0.44	0.64	0.44	0.63	0.44	0.65	0.43	0.63
N	5514	2904	2519	1249	2519	1249	2519	1249	2519	1249

Table 5
(continued)
This table presents coefficient estimates from probit regressions predicting bank to join PCAF. The depend variable $PCAF$ equals one in the year prior to the announcement of joining the PCAF and is missing in the years before and after. For non-PCAF banks, $PCAF$ equals zero for the whole sample period. Columns 1 and 2 includes all available bank-year observations. Columns 3 to 10 includes bank-year observations for which ESG scores are available through Refinitiv. Variable definitions can be found in Appendix A. All continuous variables are winsorized at 1% and 99%.*, **, and *** represent significance levels of 0.10, 0.05, and 0.01 (two-tailed), respectively. Robust *t*-statistics clustered by bank are shown in parentheses

Table 6

Reaction around the announcement.

Panel A: Stock market reaction

	Fama-French three-factor model		Fama-French five-factor model plus momentum	
Window	CAR	t-stat	CAR	t-stat
[0]	-0.414**	(-2.26)	-0.342*	(-1.82)
[-1.+1]	0.073	(0.29)	0.134	(0.51)
[-3.+3]	-0.021	(-0.06)	-0.060	(-0.17)
[-5.+5]	-0.040	(-0.08)	0.098	(0.20)

Panel B: Stock market reaction conditional on bank size

	Fama-French three-factor model				Fama-French five-factor model plus momentum			
	Small and Midsize Banks		Large Banks		Small and Midsize Banks		Large Banks	
Window	CAR	t-stat	CAR	t-stat	AR	t-stat	AR	t-stat
[0]	-0.616**	(-2.44)	-0.086	(-0.28)	-0.563**	(-2.26)	0.042	(0.12)
[-1.+1]	-0.311	(-1.09)	0.290	(0.58)	-0.264	(-0.94)	0.396	(0.76)
[-3.+3]	-0.223	(-0.50)	0.335	(0.58)	-0.359	(-0.78)	0.442	(0.78)
[-5.+5]	-0.041	(-0.07)	0.048	(0.08)	-0.060	(-0.10)	0.541	(0.88)

This table presents market reactions to banks' announcements to join PCAF around the announcement date. In Panels A and B, CAR is the cumulative abnormal return in stock markets using either the Fama-French three-factors model or the Fama-French five-factor model plus momentum (indicated at the top of each column). The estimation period starts 21 trading days prior the announcement day and ends 272 trading days prior the announcement day. In Panel B, we partition banks into two groups. Small and midsize banks are defined as those in the bottom and middle terciles of $SIZE$ in the year prior of banks' announcements to join PCAF. Large banks are defined as those in the top tercile of $SIZE$ in the year prior of banks' announcements to join PCAF. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01 (two-tailed), respectively. Robust *t*-statistics are shown in parentheses.

Table 7
Cost of Equity Capital and the Decision to Join PCAF

		Small and Midsize Banks	Large Banks
	(1)	(2)	(3)
Dependent Variable: *COE*			
PCAF_TREAT	0.003*	0.006**	0.001
	(1.70)	(2.14)	(0.32)
BETA LAGGED	0.000	0.005***	-0.007***
	(0.22)	(3.19)	(-3.56)
Log BTM	-0.007***	-0.007***	-0.007**
	(-4.03)	(-3.50)	(-1.99)
LOANS	0.010	0.013	-0.009
	(1.17)	(1.26)	(-0.58)
SIZE LAGGED	0.019***	0.017***	0.018***
	(8.84)	(6.48)	(4.70)
CAPITAL RATIO	0.001***	0.001***	0.001***
	(3.90)	(2.82)	(3.24)
GDP GROWTH	-0.002***	-0.002***	-0.003***
	(-5.16)	(-3.40)	(-5.96)
Constant	-0.132***	-0.108***	-0.122**
	(-6.21)	(-4.68)	(-2.59)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Adjusted R^2	0.74	0.75	0.62
N	6175	4118	2057

This table presents coefficient estimates and from OLS regressions examining the effect of joining PCAF on banks' cost of equity capital over 2014-2022. The dependent variable COE measures bank cost of equity capital based on the capital asset pricing model. Details for the computation COE are provided in Appendix D. The independent variable $PCAF\_TREAT$ is an indicator variable that equals one from the year of a bank's PCAF adoption, and zero otherwise. In columns 2 and 3, we partition banks into two groups. Small and midsize banks are defined as those in the bottom and middle terciles of $SIZE$. Large banks are defined as those in the top tercile of $SIZE$. The terciles are computed separately for PCAF and non-PCAF banks. Variable definitions can be found in Appendix A. All continuous variables are winsorized at 1% and 99%. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01 (two-tailed), respectively. Robust *t*-statistics clustered by bank are shown in parentheses.

Table 8

Downstream Scope 3 Emission and the Decision to Join PCAF

		Small and Midsize Banks	Large Banks		Small and Midsize Banks	Large Banks
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	*SCOPE3 DOWN INT*	*SCOPE3 DOWN INT*	*SCOPE3 DOWN INT*	*SCOPE3 DOWN*	*SCOPE3 DOWN*	*SCOPE3 DOWN*
PCAF_TREAT	-0.053**	-0.101***	0.023	-77.837***	-147.314***	30.514
	(-2.36)	(-3.47)	(0.55)	(-2.91)	(-4.97)	(0.62)
ROA	-0.068***	-0.077***	-0.067**	-24.567	-7.189	-96.562**
	(-3.51)	(-3.08)	(-2.59)	(-1.44)	(-0.49)	(-2.47)
Log BTM	-0.049	-0.038	-0.063	262.263***	351.539***	131.497
	(-1.17)	(-0.62)	(-1.52)	(5.76)	(8.46)	(1.55)
LOANS	0.572***	0.613***	0.487**	544.709***	521.848***	474.235
	(4.50)	(4.53)	(2.25)	(3.17)	(3.78)	(1.45)
SIZE LAGGED	0.734***	0.706***	0.720***	44.721	-8.256	-63.618
	(26.28)	(21.89)	(9.61)	(1.09)	(-0.23)	(-0.58)
CAPITAL RATIO	-0.011***	-0.014***	-0.003	-0.775	-8.140*	17.874
	(-3.45)	(-3.49)	(-0.53)	(-0.14)	(-1.92)	(1.47)
GDP GROWTH	0.008	0.022	-0.000	4.741	18.608***	-0.613
	(1.01)	(1.28)	(-0.01)	(0.74)	(3.05)	(-0.06)
Constant	7.530***	7.599***	7.989***	36.814	667.854*	1020.604
	(26.35)	(25.67)	(9.15)	(0.08)	(1.82)	(0.79)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.99	0.99	0.98	0.75	0.76	0.77
N	2698	1782	916	2698	1782	916

This table presents coefficient estimates and from OLS regressions examining the effect of joining PCAF on banks' GHG Scope 3 downstream emissions over 2016-2022. $SCOPE3\ DOWN\ INT$ is the Scope 3 downstream CO2 equivalents emission in tonnes scaled by the enterprise value including cash and short term investments USD in million. $SCOPE3\ DOWN$ is the logarithm of Scope 3 downstream CO2 equivalents emission in tonnes. $PCAF\_TREAT$ is an indicator variable that equals one from the year of a bank's PCAF adoption, and zero otherwise. In columns 2, 3, 5 and 6 we partition banks into two groups. Small and midsize banks are defined as those in the bottom and middle terciles of $SIZE$. Large banks are defined as those in the top tercile of $SIZE$. The terciles are computed separately for PCAF and non-PCAF banks. Variable definitions can be found in Appendix A. All continuous variables are winsorized at 1% and 99%. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01 (two-tailed), respectively. Robust *t*-statistics clustered by bank are shown in parentheses.

Table 9

Operational Adjustments and the Decision to Join PCAF.

Panel A: Loan growth

		Small and Midsize Banks	Large Banks
	(1)	(2)	(3)
Dependent Variable: *LOAN GROWTH*			
PCAF_TREAT	-0.034***	-0.062***	-0.003
	(-3.14)	(-4.47)	(-0.16)
DEPOSIT LAGGED	0.061	0.080	0.032
	(1.05)	(0.99)	(0.37)
SIZE LAGGED	-0.216***	-0.232***	-0.191***
	(-15.48)	(-12.84)	(-7.10)
CASH FLOW LAGGED	-0.008	-0.017*	0.011
	(-1.12)	(-1.83)	(1.24)
EQUITY LAGGED	0.311	0.580**	-0.952**
	(1.49)	(2.42)	(-2.36)
NPL LAGGED	-0.655***	-0.894***	-0.496***
	(-4.19)	(-3.64)	(-2.89)
GDP GROWTH	-0.003**	-0.002	-0.005**
	(-2.06)	(-0.82)	(-1.98)
Constant	1.973***	1.852***	2.239***
	(14.13)	(11.18)	(6.97)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Adjusted R^2	0.35	0.34	0.34
N	6095	4062	2033

Panel B: Bank profitability

		Small and Midsize Banks	Large Banks
	(1)	(2)	(3)
Dependent Variable: *ROA*			
PCAF_TREAT	-0.036	-0.093**	0.040
	(-1.14)	(-2.24)	(0.79)
DEPOSIT LAGGED	0.504**	0.461	0.456*
	(2.40)	(1.56)	(1.68)
LOANS LAGGED	0.669***	0.946***	-0.358
	(3.24)	(3.72)	(-1.23)
SIZE LAGGED	0.074*	0.077	-0.113
	(1.73)	(1.46)	(-1.46)
EQUITY LAGGED	0.420	-0.145	1.560
	(0.47)	(-0.14)	(0.99)
NPL LAGGED	-4.510***	-5.351***	-3.544***
	(-5.90)	(-4.25)	(-4.24)
GDP GROWTH	0.045***	0.053***	0.037***
	(6.35)	(4.08)	(4.68)
Constant	-0.437	-0.422	1.932**
	(-0.91)	(-0.74)	(2.02)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Adjusted R^2	0.74	0.69	0.79
N	6095	4062	2033

This table presents coefficient estimates and from OLS regressions examining the effect of joining PCAF on banks' acitivites over 2014-2022. In Panel A, the dependent variable $LOAN\ GROWTH$ is the yearly change in total loans divided by total loans at the beginning of the year. In Panel B, $PROFITABILITY$ is earnings before to total assets. The independent variable $PCAF\_TREAT$ is an indicator variable that equals one from the year of a bank's PCAF adoption, and zero otherwise. In columns 2 and 3 we partition banks into two groups. Small and midsize banks are defined as those in the bottom and middle terciles of $SIZE$. Large banks are defined as those in the top tercile of $SIZE$. The terciles are computed separately for PCAF and non-PCAF banks. Variable definitions can be found in Appendix A. Variable definitions can be found in Appendix A. All continuous variables are winsorized at 1% and 99%. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01 (two-tailed), respectively. Robust *t*-statistics clustered by bank are shown in parentheses.

Table 10

Attention Devoted to Climate Change Topics and the Decision to Join PCAF.

		Small and Midsize Banks	Large Banks		Small and Midsize Banks	Large Banks
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	*CCExp*	*CCExp*	*CCExp*	*CCExpSent*	*CCExpSent*	*CCExpSent*
PCAF_TREAT	0.237**	0.364***	0.064	0.125***	0.162**	0.078
	(2.41)	(2.62)	(0.53)	(2.66)	(2.36)	(1.29)
ROA	0.008	-0.019	0.052	0.004	0.011	-0.012
	(0.22)	(-0.48)	(0.71)	(0.28)	(0.77)	(-0.44)
Log BTM	0.112	0.106	0.099	0.018	0.013	0.019
	(1.59)	(1.45)	(0.67)	(0.69)	(0.39)	(0.46)
LOANS	-0.229	0.209	-0.483	-0.079	-0.073	-0.026
	(-1.00)	(0.78)	(-1.02)	(-0.79)	(-0.69)	(-0.11)
SIZE LAGGED	-0.294***	-0.100	-0.470***	-0.092***	-0.066**	-0.093
	(-3.19)	(-0.82)	(-3.19)	(-3.63)	(-2.55)	(-1.14)
CAPITAL RATIO	0.020**	0.013	0.025	0.005	0.002	0.008
	(2.23)	(1.29)	(1.45)	(1.39)	(0.65)	(1.05)
GDP GROWTH	-0.010	-0.005	-0.026**	0.005	0.001	0.002
	(-1.08)	(-0.29)	(-2.08)	(1.10)	(0.13)	(0.36)
Constant	3.312***	0.974	6.079***	0.971***	0.661**	1.085
	(3.26)	(0.80)	(3.21)	(3.34)	(2.46)	(1.03)
Country-year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.41	0.39	0.46	0.17	0.15	0.21
N	2018	1321	697	2018	1321	697

This table presents coefficient estimates and from OLS regressions examining the effect of joining PCAF on bank's climate change exposure over 2014-2022. The dependent variable $CCExp$ measures firm-specific exposure to climate change extracted from discussion between managers and investors during earning calls (Sautner et al., 2023). $PCAF\_TREAT$ is an indicator variable that equals one from the year of a bank's PCAF adoption, and zero otherwise In columns 2, 3, 5 and 6, we partition banks into two groups. Small and midsize banks are defined as those in the bottom and middle terciles of $SIZE$. Large banks are defined as those in the top tercile of $SIZE$. The terciles are computed separately for PCAF and non-PCAF banks. Variable definitions can be found in Appendix A. All continuous variables are winsorized at 1% and 99%. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01 (two-tailed), respectively. Robust *t*-statistics clustered by bank are shown in parentheses.