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Research article

Fiscal monitoring policy and corporate carbon emissions in U.S firms

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ABSTRACT

This paper examines the impact of U.S. state-level adoption of fiscal monitoring policies (FMP) on corporate environmental performance (measured by firm-level greenhouse gas (GHG) emissions). Using a sample of firms that constitute the S&P 500 index from 2002 to 2023, the regression analysis reveals a positive and significant influence of the adoption of the FMP on corporate GHG emissions, with the adoption of the FMP resulting in a 16.18 % increase in corporate GHG emissions. This suggests that tight monitoring leads local governments to focus on the short-term economic growth at the cost of environmental performance. The main finding is robust to alternative estimators, alternative measures of corporate GHG emissions, and to several endogeneity treatments. Additional analyses demonstrate that corporate diversification, cultural tightness-looseness, right-to-work laws, and the inevitable disclosure doctrine negatively moderate the relationship between adoption of FMP and corporate GHG emissions. These findings could be useful for the decision-making of firm managers, investors, and policymakers, when dealing with climate, environment, and corporate issues.

1. Introduction

Climate change, mostly caused by greenhouse gas (GHG) emissions, jeopardizes social welfare and economic stability. It has garnered significant attention from governments and policymakers during the last two decades, highlighting the critical need for the business sector to cut emissions in order to achieve a low-carbon economy (Barroso et al., 2024). Prior research shows that several stakeholders, including governments, banks, customers, suppliers, and institutional investors, have been involved in reducing corporate carbon emissions (Martinsson et al. (2024); Azar et al., 2021; Bai and Ru, 2024; Kacperczyk and Peydró, 2024; Bartram et al., 2022; Song et al., 2024; Benlemlih et al., 2023). However, the impact of governance, particularly from the perspective of local governments, is unclear. According to Hossain et al. (2023) and Bingler et al. (2024), business GHG emissions are one of the most significant contributors to global warming. As a result, business organizations face significant pressure from a variety of external stakeholders (for example, activist investors, governments, regulators, and so on). In this context, many businesses around the world have recently begun to measure, control, and eventually reduce GHG emissions.

A recent strand of literature has focused on the impact of company GHG emissions on business valuation and policy. Chang et al. (2024) find that high-climate risk enterprises tend to purchase back their own shares and reduce cash dividends. Choi and Luo (2021) show a negative link between GHG emissions and market value. Homroy (2023) indicates that GHG emissions have an economically significant impact on business performance, with a one-standard deviation rise in GHG emissions leading to a 0.14 fall in corporate earnings. According to Cao et al. (2023), enterprises in pilot program towns face significant pressure to reduce GHG emissions, increase labor investments, and achieve lower labor investment efficiency. Shu et al. (2023) indicate that increasing company GHG emissions leads to a statistically and economically significant fall in financial leverage. Goodell et al. (2024) discover a negative link between GHG emissions and firm liquidity. However, this latest line of research does not address the possibility that the level of corporate GHG emissions is influenced by governmental governance idiosyncrasies. Such a study deficit cannot be neglected, given that the United Nations' Sustainable Development Goals (SDGs), which attempt

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to tackle climate change and its potential peculiarities, emphasize the importance of understanding the potential drivers influencing corporate GHG emissions. In this paper, we aim to address the gap in academic literature by concentrating on the state adoption of fiscal monitoring policies (FMP), given their influence on local governments and, in turn, potentially on corporate behavior and performance.

Several states in the United States have utilized the FMP to identify and predict local government fiscal distress. The reasons under which the FMP was adopted in the United States ranged from responding to financial challenges in local communities (for example, Colorado) to enhancing understanding of local municipal fiscal issues. States that implement the FMP rely on many factors to analyze the financial information of the local municipality: (i) leverage ratios (short-term debt issuances divided by revenues, or revenue divided by annual debt payments). (ii) liquidity ratios (assigned or unconstrained fund balance divided by total expenditures, or current assets divided by total liabilities). (iii) operating ratios (operating deficit/operating margin). Some states assess corporate and government activities separately, examining trends and levels of fiscal monitoring measures. Furthermore, US states prioritize the quality and timeliness of financial reports. Nakhmurina (2024) indicates that the FMP is an important disciplinary instrument for requiring state government participation during times of financial difficulty. The state intervention may take the form of appointing a fiscal officer who assumes decision-making responsibility for the local municipality or imposing expenditure limits on local governments.

Investigating the impact of FMP adoption on business GHG emissions is important for various reasons. First, FMP limits local governments' borrowing and spending, ensuring fiscal stability (Picchio and Santolini, 2020). In this regard, Boukari and Veiga (2018) show that a local government's fiscal deficit leads to an increase in central government debt and spending, undermining long-term sustainability and economic welfare. Second, FMP fosters good governance at the local government level by increasing local government officials' education and comprehension of accounting and finance, as well as disciplining them through increased monitoring. States can execute successful monitoring if they have sufficient resources (e.g., a state auditor's office, regulatory authority, and accounting knowledge) to ensure compliance by local officials (Nakhmurina, 2024). Third, FMP helps to improve reporting quality although local officials may not pay close attention to state monitoring because their career advantages are determined by voter preferences (Cuny et al., 2020). Fourth, FMP minimizes local corruption, which is important because local corruption discourages corporate investment by destroying investment prospects and economic growth. In a corrupt climate, corporations bribe public officials and form political relationships to reduce political risk (Johnson et al., 2011).

To investigate the influence of FMP adoption on corporate GHG emissions, we collected data covering all S&P 500 members between 2002 and 2023. Two opposing hypotheses are generated. The first hypothesis suggests a negative link between FMP adoption and GHG emissions. It states that the implementation of FMP decreases local corruption, and as a result, corporations operating in FMP states have more effective law enforcement, regulation, and resource allocation, forcing corporate organizations to adopt feasible environmental policies and therefore lower GHG emissions. The second hypothesis, on the other hand, predicts a positive association between FMP adoption and GHG emissions, stating that tight monitoring may encourage local governments to prioritize short-term economic growth above long-term sustainability, a practice known as "short-termism." Local governments devote more time, effort, dedication, resources, and focus to short-term economic growth while becoming more tolerant of corporate environmental performance. As a result, they anticipate that environmental legislation and initiatives would be ineffective. Methodologically, we use difference-in-difference (DiD) regressions with two-way fixed effects for industry and time.[1]

This paper makes several contributions to the academic literature. Firstly, to the best of our knowledge, it is the first paper to establish empirical and theoretical linkages between the state-adoption of FMP and corporate environmental performance. In doing so, it advances our understanding of the potential impact of the adoption of FMP on corporate environmental performance, notably by extending the corporate environmental performance literature (e.g., Barroso et al., 2024; Bauckloh et al., 2023; Gaganis et al., 2023; Provaty et al., 2024), and thereby the factors contributing to corporate GHG emissions. Secondly, it adds to the growing body of knowledge (e.g., Knust and Oesch, 2024; Nakhmurina, 2024), which investigates the impact of FMP on corporate investment, reporting quality, political entrenchment, local corruption, and financial health of local governments by shedding light on the adoption of FMP as an exogenous shock to the local government governance and its influence on corporate environmental policy. Thirdly, it contributes to the line of research that tests the relationship between geographical location of business organizations and organizational outcomes. Particularly, it documents that local governments at corporate locations play an important role in impacting organizational outcomes such as corporate financial reporting (Dyreng et al., 2012), cash dividends (John et al., 2011), and stock liquidity (Bernile et al., 2015). Our paper differs from earlier studies in that it highlights the impact of local governments as a location-related variable that assists in exploring regional variations in organizational outcomes. Our analysis hereby provides evidence that geographical location influences key organizational environmental outcomes.

Our findings show that the influence of FMP adoption on GHG emissions is positive and statistically significant, which supports our second hypothesis, suggesting that FMP adoption impairs corporate environmental performance. Economically, the adoption of FMP results in a 23.12 % increase in corporate GHG emissions. This main finding is robust not only to alternative estimators, namely, Newy-West, Sys-GMM, and WLS, but also to alternative measures, namely, industry-adjusted GHG emissions, GHG emissions intensity, and GHG emission growth. Furthermore, the main finding is not propelled by an endogeneity bias, as confirmed by several endogeneity treatments, namely, reverse causality (or violation of parallel trends assumption), the use of CEO characteristics as new controls to address omitted variable bias, impact threshold for an omitted confounding variable (ITCV), and propensity score matching (PSM). Notably, additional analyses demonstrate that corporate diversification, cultural tightness-looseness, right-to-work laws (RTW), and inevitable disclosure doctrine (IDD) can negatively moderate the relationship between the adoption of FMP and corporate GHG emissions.

The rest of the paper is structured as follows: Section 2 reviews the related literature and develops the research hypotheses. Section 3 describes the dataset, variables, and econometric framework. Section 4 presents and discusses the baseline results. Sections 5 and 6 conduct robustness checks and endogeneity treatment tests, respectively. Section 7 examines the moderating effects. Section 8 concludes the paper.

2. Related literature and hypotheses development

2.1. Related literature

A very few studies examine state-level fiscal monitoring policies and their impact on organizational outcomes. Nakhmurina (2024) explores the effect of state-level fiscal monitoring legislation on reporting quality, political entrenchment, local corruption, and the financial health of local governments between 2009 and 2017, and shows the following

[1] Standard errors are clustered at the state level because the independent variable is a state-level variable.

results: firstly, state adoption of fiscal monitoring rules is associated with a considerable increase in reporting quality. Secondly, implementing state fiscal monitoring policies reduces the likelihood of incumbent politicians being re-elected. Thirdly, the implementation of state budgetary monitoring policies is connected with a large reduction in corruption. Fourthly, the implementation of state fiscal monitoring policies leads to a major improvement in the financial health of local governments. Knust and Oesch (2024) investigate the impact of state budgetary monitoring policies on company investment from 1995 to 2018, showing that states implementing fiscal monitoring policies see an increase in corporate investment. This statistically and economically advantageous impact encompasses both capital expenditures and R&D expenses.

The literature on corporate environmental performance falls into two categories. The first category considers the repercussions of corporate environmental performance. In this vein, Griffin et al. (2017) find a negative and significant relationship between corporate GHG emissions and market value. Economically, they discover that one unit increase in corporate GHG emissions diminishes the market value of a corporation by 0.05 %. Haque and Ntim (2020), Choi and Luo (2021), Adu et al. (2023), and Orazalin et al. (2024) display a statistically significant and negative relationship between corporate carbon performance and firm market value. Siddique et al. (2021) and Downar et al. (2021) show a negative and significant relationship between corporate carbon performance and accounting measures of financial performance, whereas Bolton and Kacperczyk (2021) find a positive and significant relationship between corporate carbon performance and stock returns.

The second category focuses on the key factors influencing corporate environmental performance. Haque (2017) discovers a statistically negligible link between corporate governance and financial performance. In contrast, Oyewo (2023) finds a curvilinear relationship between corporate governance and financial performance. Qian and Schaltegger (2017) show evidence of a positive and statistically significant relationship between carbon disclosure and carbon performance. Moussa et al. (2020) find that company carbon policies influence the relationship between environmental orientation and business environmental performance. Bauckloh et al. (2023) reveal that a carbon reporting scheme can significantly improve business environmental performance. Wang et al. (2023) show that business political connections have a significant impact on environmental performance. Tomar (2023) investigates the impact of production facilities on company environmental performance and concludes that upgrading production facilities results in a 7.9 % reduction in corporate carbon emissions. Cui et al. (2023) demonstrate that upgrading the social credit system leads to a considerable reduction in corporate carbon emissions. Provaty et al. (2024) study the role of organizational capital in corporate environmental performance, showing that increasing organizational capital investments can improve corporate environmental performance.

2.2. Hypotheses development

State governments have increasingly intervened and monitored the financial situation of their local governments over the past few decades. In the 1970s, large U.S. cities faced fiscal crises, which stimulated the attention of state governments to react to the fiscal distress of their local governments. This rapidly grows the procedure of systematically evaluating and monitoring the financial situation of local governments across several U.S. states. In this regard, U.S. states engage in fiscal monitoring to understand the financial situation of local governments and, in turn, detect and predict fiscal distress. Kim et al. (2022) explain that local government officials and employees are prone to agency conflicts stemming from attempts to entrench elected officials and reinforce corruption and financial malpractice. Nakhmurina (2024) shows that FMP has significant influence on local entity governance, including corruption, reporting and disclosure characteristics, fiscal financial health, and political entrenchment (electoral outcomes). Knust and Oesch (2024) reveal that FMP can substantially impact corporate policies through reducing local corruption. More specifically, the adoption of FMP leads to an increase in capital and R&D expenditures because local corruption in the absence of FMP may discourage corporate investments by reducing investment opportunities and economic growth.

In this paper, we develop two competing hypotheses. H1 conjectures a negative relationship between FMP and GHG emissions, suggesting that FMP adoptions are beneficial for corporate environmental performance. There are several reasons why FMP adoptions can be associated with lower corporate GHG emissions. The first reason lies in the corruption channel. Several theories may explain why firms in corrupt environment may have poorer environmental performance. First, public choice theory entails that governmental officials tend to be self-interested and may exploit their positions for personal gains. Here, in corrupt environments, environmental regulations can be circumvented through bribes. Therefore, firms may emit more carbons since enforcement is weak or selective (Mbaku, 1999; Wilson and Damania, 2005). Second, Stakeholder theory entails that firms balance stakeholder interests, but this balance depends on institutional pressures. Here, in corrupt environments, pressure from government stakeholders for environmental responsibility is distorted or reduced, allowing firms to prioritize profits over emissions control (Morrison et al., 2024).

Moreover, existing studies show that the adoption of FMP leads to a significant reduction in corruption (Knust and Oesch, 2024; Nakhmurina, 2024). Corruption has been long seen as a key hindrance to effective environmental policies as it leads to inefficient environmental regulations and can significantly weaken law enforcement (Zhang et al., 2016). Therefore, states implementing FMP are expected to have a lower level of corruption and, in turn, more efficient regulations and law enforcement, leading to lower corporate GHG emissions and, therefore, better corporate environmental performance. Moreover, corruption may prevent the implementation of environmental policies and initiatives as it leads to weak institutions, political networking, and the fabrication of elections, "governmental corruption." In this vein, the United States Agency for International Development (USAID) explained that corrupt governmental officials engaged in bribery and embezzlement took funds allocated for environmental programs. Taken together, corruption leads to inefficient allocation of environmental resources and harmful environmental practices and policies (Callen and Long, 2015). The second reason lies primarily in transparency and accountability. Empirical evidence from previous studies shows that FMP results in a substantial enhancement in governmental reporting and disclosure (Nakhmurina, 2024; Guillamón et al., 2011). Accordingly, local governments may impose penalties on firms that violate environmental regulations, which stimulate firms to enhance their environmental policies to avoid penalties, reputation costs, and bad relationships with local officials. Moreover, local governments may force firms to disclose their environmental information as environmental transparency (i.e., registration of pollution emission and transfer, mandatory disclosure of environmental information, and establishment of monitoring lists for principal firms) plays an important role in tracking progress and environmental governance, stimulating firms to engage in environmentally friendly policies, and enforcing corporate environmental performance. According to legitmacy theory, firms engage in better environmental policies to strengthen their legitmacy and avoid any dispute against public policy, public good, or society's value systems (Sun et al., 2019; Clarkson et al., 2011). This is consistent with Zhou et al. (2022), who reveal that regulatory and community pressures enhance corporate environmental performance "stakeholder theory. Thus, our first hypothesis is formulated as.

H1. Ceteris paribus, the state-level adoption of fiscal monitoring policy (FMP) is expected to have a significant and negative impact on corporate GHG emissions.

Conversely, the second hypothesis (H2) conjectures a positive relationship between FMP and GHG emissions. Several theories may explain why non-corrupt environment may be characterized by poorer environmental performance. First, agency theory entails that managers tend to respond to external monitoring and incentives. Here, the adoption of fiscal montoring that increases scruiting and, in turn, reduces corruption may lead the governamental officials to prioritize short-term economic growth over long-term environmental policies in order to signal good behavior to regulators. Further, strong monitoring and scruting may promote fear over boldness, which leads to defensive and short-term focus rather than long-term efforts (e.g., incentivize environmental innovations and proactive environmental initiatives) (Shailer, 2018). Second, transaction costs theory entails that fiscal monitoring causes bureaucratic procedures "or regulatory complexity" and increases the costs of transaction and coordination. Here, excessive bureaucratic procedures may discourage or slow down the establishment of effective environmental policies and incentives, resulting in delays or cancellations of governmental green investments or proactive environmental initiatives (Barbier, 2011; Nygaard, 2022; Baker and Haddad, 2024).

Moreover, empirical research provides several reasons for such a positive relationship, which implies that FMP adoptions can weaken corporate environmental performance. These reasons lie primarily in short-termism. In this regard, tight external monitoring may urge local governmental officials to focus on short-term economic growth at the cost of environmental performance. Local governments thus tend to allocate more time, efforts, commitments, resources, and attention to short-term economic growth while becoming more tolerant of corporate environmental performance. Accordingly, local government officials are not anticipated to develop efficient environmental regulations (Smulowitz et al., 2023; Calmfors and Wren-Lewis, 2011; Mio et al., 2020). We expect firms operating in FMP states, where there is strong fiscal monitoring, to have inferior environmental performance. Therefore, our second hypothosis is formulated as.

H2. Ceteris paribus, the state-level adoption of fiscal monitoring policy (FMP) is expected to have a significant and positive impact on corporate GHG emissions.

3. Research design

3.1. Data and sample

Using LSEG (formerly Refinitiv), we gathered accounting and market data pertaining to all companies in the S&P 500 index over the period 2002–2023. The sample contains 485 unique firms with 10,670 firm-year observations. We selected S&P 500 companies because they are the 500 leading companies in the U.S. economy. Thus, they are quite visible and, in turn, are prone to stronger stakeholder pressures and public scrutiny to disclose their environmental performance in particular and ESG practices in general (Flammer et al., 2021; Reid and Toffel, 2009; El Ouadghiri et al., 2021; Liston-Heyes and Ceton, 2009). All continuous variables are winsorized at 1 % and 99 % to ease the influence of outliers.

3.2. Variables

Our dependent variable is the firm-level GHG emissions (in tons), which are used as a proxy of corporate environmental performance. Firm-level GHG emissions are calculated as the sum (total) of direct (scope 1) and indirect (scope 2) corporate emissions, following Haque (2017), Provaty et al. (2024), and Downar et al. (2021). Scope 1 reflects the emissions induced directly from corporate owned assets, whereas Scope 2 reflects emissions induced indirectly from steaming, bought energy, circulation and transmission deficits, freezing, heating up, and the like.

Our main independent variable is the state-level adoption of FMP, which is constructed as a dummy variable that equals 1 if a firm is headquartered in a state that has implemented the FMP in year *t* and zero otherwise. Table 1 presents a timeline of US states adopting the FMP and those not adopting it over the sample period. We notice that 10 states introduced the FMP before our sample period (before 2001), namely, Connecticut, Iowa, Kentucky, Maryland, Minnesota, New Hampshire, New Jersey, North Carolina, South Dakota, and Washington. Furthermore, 13 states introduced FMP within our sample period (from 2002 to 2023), namely, Colorado, Florida, Louisiana, Michigan, Nevada, New Mexico, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Tennessee, and Virginia.

We consider a range of control variables (firm size, firm market-to-book (M-B) ratio, firm leverage, firm sales growth, firm tangibility, firm capital expenditures, firm age, institutional ownership, US state income, US state per capita, US state income growth) and fixed effects, following previous studies (Qian and Schaltegger, 2017; Nadeem et al., 2021; Provaty et al., 2024; Haque, 2017; Barroso et al., 2024). ***Firm size*** is computed as the natural log of the market capitalization of the firm. Evidence from the existing literature indicates that size is associated with increased political costs that may obstruct giant firms from paying attention to their environmental performance. ***Firm M-B ratio*** is our second control variable, which considers the potential influence of

Table 1
States adopting fiscal monitoring policies.

State	State name	Year	State	State name	Year
AL	Alabama		MT	Montana	
AK	Alaska		NE	Nebraska	
AZ	Arizona		NV	Nevada	2015
AR	Arkansas		NH	New Hampshire	Before sample period
CA	California		NJ	New Jersey	Before sample period
CO	Colorado	2013	NM	New Mexico	2012
CT	Connecticut	Before sample period	NY	New York	2013
DE	Delaware		NC	North Carolina	Before sample period
DC	District of Columbia		ND	North Dakota	
FL	Florida	2001	OH	Ohio	2016
GA	Georgia		OK	Oklahoma	
HI	Hawaii		OR	Oregon	2015
ID	Idaho		PA	Pennsylvania	2014
IL	Illinois		RI	Rhode Island	2016
IN	Indiana		SC	South Carolina	
IA	Iowa	Before sample period	SD	South Dakota	Before sample period
KS	Kansas		TN	Tennessee	2014
KY	Kentucky	Before sample period	TX	Texas	
LA	Louisiana	2014	UT	Utah	
ME	Maine		VT	Vermont	
MD	Maryland	Before sample period	VA	Virginia	2017
MA	Massachusetts		WA	Washington	Before sample period
MI	Michigan	2002	WV	West Virginia	
MN	Minnesota	Before sample period	WI	Wisconsin	
MS	Mississippi		WY	Wyoming	
MO	Missouri				

Source: Nakhmurina (2024) and Knust and Oesch (2024).

growth opportunities on corporate environmental performance. The literature shows that investment and growth opportunities may restrict firms' capability to fund environmental projects (Bolton and Kacperczyk, 2023). *Firm leverage* is computed as the ratio of total debt to total assets. It is used to consider the possible impact of finance strategies on corporate environmental performance (Wang and Gao, 2024). *Firm sales growth* is used to control for the potential impact of firm sales growth on firm performance. The literature demostrates that high-performing firms are more likely to invest in corporate environmental performance (Broadstock et al., 2018). *Firm tangibility* is computed as the ratio of property, plant, and equipment (PPE) to total assets. It is used to control for the potential impact of assets' unique peculiarities on corporate environmental performance (Konar and Cohen, 2001). *Firm capital expenditures* (*CAPEX*) is computed as the ratio of capital expenditures to total assets, which controls for the potential impact of capital expenditures on corporate environmental performance. Huge capital expenditures may force firms not to invest significantly in environmental projects (Clarkson et al., 2011; Trumpp and Guenther, 2017). *Firm age* is computed as the natural log of the number of years since a firm has been registered in the equity market. It controls for the potential impact of firm age on corporate environmental performance, given evidence from the literature that older firms are less likely to invest in environmental projects than younger ones (Kim et al., 2021; Leyva-de la Hiz and Bolívar-Ramos, 2022). Institutional ownership is computed as the percentage of shares held by institutional shareholders, since it influences corporate environmental policies (Safiullah et al., 2022). Given that our independent variable is a state-level variable, we control for three US state-level economic circumstances by including state income (measured as the natural log of state income), state per capita (measured as the natural log of state per capita), and state income growth. In this regard, the literature shows that local economic conditions significantly influence corporate policies (Nguyen and Qiu, 2022; Qiu and Wang, 2018). Finally, consistent with Provaty et al. (2024); Gaganis et al. (2023); Cohen et al. (2023); Jung et al. (2018); and Hossain et al. (2023); we account for the differences in corporate environmental policies across industries and years by using industry and year fixed effects.

3.3. Econometric framework

Consistent with the previous research, such as Nakhmurina (2024) and Knust and Oesch (2024), we apply a difference-in-difference (DiD) regression using OLS estimators, where firms in FMP states represent a treatment group, whereas those in non-FMP states represent a control group. The exogeneous variation to local corruption is stemming from the US state staggered approval of the US state-level FMP.

$$GHG_{ist} = \beta_0 + \beta_1 FMP_{s,t} + +\beta_2 Controls_{ist} + \alpha_f + \gamma_t + \varepsilon_{s,t} \tag{1}$$

where GHG is our dependent variable, measured by the natural logarithms of volume of firm-level GHG emissions (scope 1 + scope 2). Consistent with Downar et al. (2021), Haque (2017), Clarkson et al. (2011), and Provaty et al. (2024), we use the natural logarithm of GHG emissions because the probability distribution of GHG data is skewed. FMP is the US state-level adoption of fiscal monitoring policy, constructed as a dummy variable that takes the value of one if a firm headquartered in a US state adopting the FMP and zero otherwise. The list of control variables includes size, M-B ratio, leverage, sales growth, tangibility, capital expenditures, firm age, institutional ownership, state income, state per capita, state income growth, industry fixed effects, and year fixed effects, as mentioned in detail in the previous subsection (subsection 3.2). α_f refers to industry fixed effects (SIC 4-digit code). γ_t represents year-fixed effects. Here, we did not add firm-fixed effects in the baseline regression model since firm-fixed effects may not succeed in detecting relationships in the data when the independent variable is persistent (Chi and Su, 2016; Hoberg et al., 2014; Boubaker et al., 2022). In fact, our independent variable (the adoption of FMP as a proxy for corruption) is empirically evidenced as persistent by several studies (Mishra, 2006; Seldadyo and De Haan, 2011). ε_{ist} refers to error terms that are clustered at the state and year levels (state × year) to account for two-way dependence across state and over time (see Chava et al. (2020) and Bhandari and Bhuyan (2023)).

According to Knust and Oesch (2024), this model specification is based on the assumption that a credible causal interpretation of β_1 is that the average change in GHG emissions should be the same in both groups in the absence of FMP. A possible shortcoming here is that there may be confounding factors that influence both the FMP and GHG emissions. However, our identification strategy mitigates these concerns in two ways. Firstly, the adoption of FMP is exogeneous to firms and adopted by US state governments. Therefore, it is unprobable that the FMP adoption is induced by firm-specific peculiarities. Secondly, FMP adoption is staggered throughout US states and over years. In turn, the confounding elements would have to be staggered throughout states and time, coinciding with the state's adoption of FMP.

4. Empirical analysis

4.1. Summary statistics for the variables

The descriptive statistics for all variables are presented in Table 3. The average of GHG emissions is 13.40, and its standard deviation is 2.31. The summary statistics of GHG emissions are close to those of Haque (2017) and Provaty et al. (2024). The main independent variable, FMP, has an average of 34.1 %, indicating that 34.1 % of the sample firms are headquartered in FMP states. FMP has a standard deviation of 0.474. Regarding control variables, we notice that on average the firm leverage is 0.679, sales growth is 8 %, firm age is 22.673 years, and institutional ownership is 58.030.

We report the correlation estimates in Table 4, which show a negative association between FMP and GHG emissions (coefficient = −0.071). This indicates that firms in FMP states are associated with lower GHG emissions. The maximum correlation is 0.447, while the minimum correlation is 0.002 in absolute terms. This suggests that

Table 2
Definitions of variables.

Variable	Definition
GHG emissions	It represents the GHG emissions disclosed by firms and is computed as the natural logarithm of the sum of indirect (scope 2) and direct (scope 1) GHG carbon emissions. Scope 1 refers to the direct emissions produced firm-own resources such as on-site discharges from leased cars, fossil fuels, and the like. Scope 2 refers to the indirect emissions produced by steaming, heating up, freezing, bought energy, and the like. The lower the carbon emissions, the higher the carbon performance of the firm and vice versa.
Fiscal monitoring	The adoption of fiscal monitoring policies by a U.S. state and constructed as dummy variable that takes 1 if a firm's headquartered in state adopting the fiscal monitoring policies and zero otherwise.
Size	The natural log of company's market capitalization in year *t*.
MB	The ratio of market to book ratio and it captures a firm growth opportunities.
Leverage	The ratio of total debt scaled by total assets in year *t*.
Sales growth	The percentage change in annual sales.
Asset newness	The ratio of property, plant, and equipment to total assets.
CAPEX	The ratio of routine investments to total assets.
Firm age	The natural log of the number of years since a firm has been publicly listed.
Institutional ownership	The percentage of shares held by institutional shareholders.
State income	The natural log of state income.
State per capita	The natural log of state per capita.
State income growth	The percent of change in annual state income.

Table 3
Summary statistics of variables under study.

Variable	Mean	Median	Standard deviation	Minimum	Maximum
GHG emissions (log)	13.400	13.280	2.310	5.598	18.927
Fiscal monitoring	0.341	0.000	0.474	0.000	1.000
Size (log)	16.504	16.482	1.457	3.478	21.535
M-B	0.002	0.001	0.002	0.000	0.024
Leverage	0.679	0.626	0.477	0.072	4.016
Sales growth	0.080	0.061	0.184	−0.413	0.933
Asset new	0.632	0.663	0.239	0.068	0.999
CAPEX	−0.003	0.079	0.848	−0.612	0.968
Firm age	22.673	24.000	11.949	0.000	42.000
Institutional ownership	58.030	40.301	67.009	0.000	98.521
State income (log)	27.208	27.091	0.848	24.748	28.639
State per capita (log)	10.749	10.737	0.192	10.380	11.187
State income growth	0.014	0.016	0.027	−0.067	0.087

This table provides the descriptive statistics (mean, median, standard deviation, minimum, and maximum values) of independent, dependent, and control variables. Definitions of variables are presented in Table 2.

correlation estimates are relatively small, less than 0.50, which alleviates multicollinearity concerns.

4.2. Baseline results

We report the results of baseline regression in Table 5. Column (1) presents the influence of FMB on GHG emissions without control variables, indicating a significant and positive influence of FMP on GHG emissions at the 1 % level (coefficient = 0.187). Column (2) shows, after excluding industry-fixed effects, a positive influence of FMP on GHG emissions at the 10 % level of significance (coefficient = 0.120). In Column (3), the influence of FMB on GHG emissions, excluding year-fixed effects, is positive and significant at the 1 % level of significance (coefficient = 0.180). Column (4) indicates that the influence of FMB on GHG emissions, after including all controls and all fixed effects, is positive and significant at the 1 % level (coefficient = 0.150).

Overall, the baseline findings offer robust evidence on the statistically significant and positive influence of FMP on corporate GHG emissions, suggesting that firms in FMP states generate more GHG emissions than those in non-FMP states. This evidence supports our second hypothesis (H2) that conjectures a positive influence of FMP on corporate GHG emissions. In other words, firms in FMP states tend to have weaker environmental performance compared to those in non-FMP states. This is consistent with agency and transaction costs theories. Thus, rigorous state monitoring can encourage local governments to prioritize short-term economic growth over environmental performance. As a result, local governments tend to devote more time, effort, dedication, and resources and focus on short-term economic growth while becoming more tolerant of corporate environmental violations.[2]

Furthermore, our findings are economically significant, with the adoption of FMP resulting in a 16.18 % $((e^{0.150} - 1) \times 100)$ increase in GHG emissions on average. We also estimate model (1) after excluding all financial firms (SIC codes 6000–6999) and find robust and consistent

[2] In light of the discussion in Section 2.2, local government officials are not expected to develop efficient environmental regulations and policies, to provide incentives for promoting environmental initiatives, or to impose painful penalties on those violating environmental regulations or failing to adopt best environmental practices.

Table 4
Correlation matrix.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1-GHG	1.000												
2- FMP	−0.071***	1.000											
3- Size	0.203***	0.010***	1.000										
4-MB	−0.293***	−0.009	0.226***	1.000									
5- Leverage	0.058***	0.134***	0.014	0.067***	1.000								
6- Growth	−0.066***	−0.035**	0.073***	0.176***	−0.033**	1.000							
7- Asset new	0.369***	−0.002***	−0.065***	−0.275***	−0.051*	−0.044***	1.000						
8- CAPEX	−0.010	0.079***	0.101***	−0.020***	−0.006***	0.120***	0.152***	1.000					
9- Firm age	0.110***	0.052***	0.106***	−0.058***	0.076***	−0.097***	−0.012***	0.003***	1.000				
10- Institutional ownership	0.006	−0.129***	−0.044***	0.251***	0.120***	0.038***	−0.067***	−0.102***	−0.135***	1.000			
11- State income	−0.137***	−0.247***	0.169***	0.130***	−0.156***	0.073***	−0.138***	0.012**	−0.070***	0.106***	1.000		
12- State per capita	−0.375***	0.214***	0.196***	0.203***	−0.036***	0.102***	−0.016	0.240***	−0.038***	−0.030***	0.281***	1.000	
13- State income growth	−0.083***	0.067***	0.124***	0.106***	0.015***	0.174***	0.046***	0.419***	0.037***	−0.015***	0.167***	0.447***	1.000

The table demonstrates the correlations among the independent, dependent, and control variables. ***, **, and * refer to 1 %, 5 %, and 10 % significance levels, respectively. Definitions of variables are presented in Table 2.

Table 5
Baseline regression results.

Variable	Model (1)	Model (2)	Model (3)	Model (4)
Constant	13.316*** (0.033)	56.848*** (3.095)	24.549*** (1.725)	16.481*** (2.225)
FMP	0.187*** (0.062)	0.120* (0.070)	0.180*** (0.060)	0.150*** (0.054)
Size		0.845*** (0.033)	0.944*** (0.042)	0.965*** (0.040)
MB		−0.514*** (0.058)	−0.487** (0.043)	−0.464*** (0.044)
Leverage		−0.033*** (0.004)	0.042** (0.018)	0.042** (0.018)
Growth		−0.008 (0.005)	−0.005 (0.003)	−0.006* (0.003)
Asset new		2.472*** (0.352)	0.188 (0.114)	0.276** (0.120)
CAPEX		−0.180* (0.101)	−0.104* (0.062)	−0.096 (0.061)
Firm age		0.197*** (0.067)	0.058 (0.049)	0.080 (0.051)
Institutional ownership		8.768*** (2.320)	0.058 (1.734)	0.556 (1.731)
State income		−0.061 (0.083)	−0.155*** (0.037)	−0.183*** (0.039)
State per capita		−5.894*** (0.305)	−2.697*** (0.147)	−1.941*** (0.228)
State income growth		1.544*** (0.512)	0.354 (0.321)	0.708** (0.295)
Industry FE	Yes	No	Yes	Yes
Year FE	Yes	Yes	No	Yes
R^2 (%)	4.7 %	37.23	39.66	37.85
F-statistics P-value	9.07 (0.003)	168.76 (0.000)	136.97 (0.000)	96.14 (0.000)
Obs	6474	6474	6474	6474

The table demonstrates the baseline regressions results. Figures in parentheses are standard errors. ***, **, and * refer to 1 %, 5 %, and 10 % significance levels, respectively. Definitions of variables are presented in Table 2.

evidence, showing a statistically significant and positive influence of FMP on GHG emissions at the 1 % level (coefficient = 0.181, t = 3.55).[3]

5. Sensitivity analysis

We conduct a wide range of sensitivity analysis for our results, including the use of decomposed total GHG emissions, alternative GHG emissions measures, and different estimators.

5.1. Decomposition of GHG emissions

We decompose the total GHG emissions into direct emissions (scope 1) and two indirect emissions (scope 2 and scope 3), and then regress each scope of GHG emissions separately on FMP. This allows us to offer a more comprehensive picture of the influence of FMP on GHG emissions, which should guide corporate management in developing viable policies and in making informed decisions on alleviating corporate GHG emissions. The estimated results are presented in Table 6. Column (1) reports the results of the influence of FMP on scope (1) emissions, showing a statistically significant and positive influence of FMP on scope (1) emissions at the 1 % level (coefficient = 0.331). Column (2) considers scope (2) emissions, revealing a statistically significant and positive influence of FMP on scope (1) emissions at the 5 % level (coefficient = 0.196). Column (3) reports the results of the influence of FMP on scope (3) emissions. It shows statistically a significant and positive influence of FMP on scope (1) emissions at the 5 % level (coefficient = 0.294). These results emphasize the dominant influence of FMP on GHG emissions

[3] These results are not presented here but available from the authors upon reasonable request.

Table 6
Decomposition of GHG emissions.

Variable	Scope 1	Scope 2	Scope 3
Constant	22.811*** (2.858)	1.630 (3.628)	12.308** (6.054)
FMP	0.331*** (0.077)	0.196** (0.097)	0.294** (0.141)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
R^2	27.31	30.00	11.97
F-statistics P-value	38.86 (0.000)	63.06 (0.000)	17.00 (0.000)
Obs	6336	6394	6216

This table demonstrates the regression estimates of the impact of FMP on the three sources of GHG emissions, namely, direct emission (scope 1), and indirect emissions (scope 2&3). Figures between parentheses are standard errors. ***, **, and * refer to 1 %, 5 %, and 10 % significance levels, respectively. Definitions of variables are presented in Table 2.

across various sources of corporate carbon emissions.

5.2. Alternative GHG emissions measures

This section considers alternative measures of GHG emissions, namely, industry-adjusted (measured as corporate-level total emissions minus industry average based on 2-digit SIC codes), GHG intensity (measured as the total GHG emissions scaled by total assets), and GHG growth (measured as the annual growth rate in total GHG emissions). The results are reported in Table 7. Column (1) focuses on industry-adjusted GHG emissions, showing statistically significant and positive influence of FMP on GHG emissions at the 1 % level (coefficient = 3.117). Column (2) shows the statistically significant and positive influence of FMP on GHG intensity at the 1 % level (coefficient = 0.001). Column (3) considers GHG growth, demonstrating a statistically significant and positive influence of FMP on GHG intensity at the 10 % level (coefficient = 0.001). Fortunately, our findings are robust to the use of alternative measures of GHG emissions.

5.3. Alternative estimators

Here, we consider alternative estimators, namely, Newey-West, Sys-GMM, and WLS, and report the results in Table 8. Starting with the Newey-West estimator, which controls for heteroscedasticity and autocorrelation, Column (1) shows statistically significant and positive influence of FMP on GHG emissions at the 1 % level (coefficient = 0.527). Regarding the Sys-GMM estimator, which captures the dynamic behavior of corporate policies (i.e., environmental policies), Flannery and Hankins (2013) and Dang et al. (2015) argue that corporate policies are dynamic and thus require dynamic panel data modeling. The estimated results from Column (2) show a statistically significant and

Table 7
Sensitivity: Alternative measures of GHG emissions.

Variable	Industry-adjusted	GHG intensity (GHG/TA)	GHG growth
Constant	0.000*** (0.854)	0.007*** (0.001)	0.003 (0.045)
FMP	3.117*** (0.113)	0.001*** (0.001)	0.001* (0.001)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
R^2	11.16	5.55	1.49
F-statistics P-value	36.14 (0.000)	8.10 (0.000)	2.04 (0.020)
Obs	6409	6415	6330

This table demonstrates the regression results using three different measures of GHG, namely, industry-adjusted GHG emissions, GHG scaled by total assets, GHG emissions growth. Figures between parentheses are standard errors. ***, **, and * refer to 1 %, 5 %, and 10 % significance levels, respectively. Definitions of variables are presented in Table 2.

Table 8
Sensitivity: Alternative estimators.

Variable	Newey-west	Sys-GMM	WLS	Stacked regression
Constant	−65.640*** (7.525)	1.347* (0.801)	46.235*** (6.242)	−22.001** (2.631)
GHG_{t-1}		0.910*** (0.017)		
FMP	0.527*** (0.247)	0.064** (0.028)	0.486*** (0.178)	
Treat				0.294*** (0.088)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2				
F-statistics P-value	137.48 (0.000)		357.22 (0.000)	
Instrument		595		
Obs	6455	6389	6427	6377

This table demonstrates the regression results using three different estimators namely, Newey-West, Sys-GMM, WLS, and stacked regression. Figures between parentheses are standard errors. ***, **, and * refer to 1 %, 5 %, and 10 % significance levels, respectively. Definitions of variables are presented in Table 2.

positive influence of FMP on GHG emissions at the 5 % level (coefficient = 0.064). Moving to Column (3), we consider the WLS estimator, which captures heterogeneity across various sectors (4-digit SIC code). The results show statistically significant and positive influence of FMP on GHG emissions at the 1 % level (coefficient = 0.486). Column (4) explains the influence of FMP on corporate carbon emissions employing the stacked regression. Empirical evidence suggests that the basic DiD estimator may be biased due to the timing of treatment of unique units (or states) (Baker et al., 2022). To address this issue, we use the stacked regression approach. This estimation technique aligns and stacks events in event-time, avoiding using previously handled units as effective units of comparison, similar to a scenario in which events occur concurrently. The finding shows that FMP's influence on corporate carbon emissions remains positive and statistically significant at the 1 % level (β = 0.294), which supports the baseline findings. Taken together, our results remain unchanged when using alternative estimators, suggesting their robustness.

6. Endogeneity bias

Although we have applied DiD regressions, there is a potential presence of exogenous shocks that vary by time and location (Gormley and Matsa, 2011; Karpoff and Wittry, 2018). Accordingly, we address such a concern by considering several endogeneity checks, namely the dynamic DiD method, the addition of new controls, ITCV, and propensity score matching.

Firstly, we employ the dynamic DiD method to address reverse causality (or violation of parallel trend assumption). Reverse causality, in this context, indicates that some U.S. states may generate more GHG emissions than others, which may stimulate the introduction of FMP. This can be addressed by investigating the timing of changes in GHG emissions relative to the timing of FMP introduction. If there was an increase in the GHG emissions before the introduction of FMP, this would cast doubt on our results, which can be attributed to the violation of the parallel trend assumption. This violation means that the trends in GHG emissions of the affected group (treatment) and unaffected group (control) are parallel prior to the introduction of FMP. To address this concern, we investigate the GHG emissions over three years around (before and after) the introduction of FMP. The related results are reported in the first three columns of Table 9. Consistent with the related literature, we delete all firm-year observation where firms are

Table 9
Endogeneity: Reverse causality or parallel trend and Placebo tests.

Variable	Parallel trend			Placebo
	FMP $Year_{-3\ to\ 0}$	FMP $Year_{+1}$	FMP $Year_{+2\ to\ +3}$	
Constant	14.869*** (2.057)	15.269*** (2.056)	15.580*** (2.049)	15.950*** (2.251)
FMP	0.064 (0.043)	0.120*** (0.042)	0.162*** (0.043)	
Placebo FMP				0.079 (0.050)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2 (%)	41.99	42.25	42.41	37.52
F-statistics P-value	77.03 (0.000)	76.72 (0.000)	79.01 (0.000)	89.76 (0.000)
Obs	6423	6412	6416	6417

The table demonstrates the violation of trend parallel assumption or reverse causality. Figures in parentheses are standard errors. ***, **, and * refer to 1 %, 5 %, and 10 % significance levels, respectively. Definitions of variables are presented in Table 2.

headquartered in states that have never introduced the FMP and construct three factors, namely, $FMP_{-3\ to\ 0}$, FMP_{+1}, and $FMP_{+2\ to\ +3}$. These three variables are dummies that take the value of one if a firm's headquarter is located in an FMP state (e.g., Colorado, Louisiana, Nevada, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Tennessee, and Virginia) for 3-years prior to the introduction of FMP, for the first effective year (i.e., first year after the introduction of the FMP), and two to three years after the introduction of the FMP, respectively, and zero otherwise.

Our results suggest that the post-introduction factors, FMP_{+1} and $FMP_{+2\ to\ +3}$, are positive and significant at the 1 % level. However, the pre-introduction variable, $FMP_{-3\ to\ 0}$, is insignificant, suggesting that firms in FMP states tend to face an increase in GHG emissions only after the introduction of FMP and not prior to it. Accordingly, we can conclude that our findings are not induced by reverse causality or the violation of the parallel trends assumption.

Secondly, states that adopt fiscal monitoring policies may also simultaneously show weak environmental enforcement or have political ideologies that are less supportive of environmental regulation. These omitted confounders, if correlated with both FMP adoption and firm emissions, may bias the estimates. The staggered nature of FMP adoption across states is a strength but is not fully exploited to address this concern. A falsification test (e.g., placebo test) would help validate the parallel trends assumption more rigorously and bolster the claim of causal identification.

Here, we employ the Placebo test to handle this issue. Each state that accepts or rejects the FMP is allocated a pseudo- FMP adoption (rejection) year at random, which differs from the actual FMP adoption (rejection). Following that, we use the pseudo- FMP year to construct an indicator variable, Placebo FMP, using the same method as the baseline estimation. We rerun model (1), but this time with Placebo FMP instead of the original. The placebo test results are shown in the final column of Table 9. The coefficient for Placebo FMP is statistically insignificant, meaning that these randomly selected pseudo-RTW adoption (rejection) years have no significant link with corporate carbon emissions.

Thirdly, we address potential omitted variable bias. Hossain et al. (2023) demonstrate that the personal attributes of CEOs influence the corporate environmental performance by discouraging or encouraging the pursuit of efficient environmental policies. To ensure the robustness of our findings to omitted variable concern, we add a number of CEO attributes, namely, CEO age, CEO gender, CEO education (measured as whether a CEO holds an MBA degree or not), external CEO who was appointed from outside the firm, CEO tenure, and altogether as new control variables. CEO data is collected from Boardex, LinkedIn profiles, and companies' web pages. The results are reported in Table 10, showing that the inclusion of several CEO attributes as new control variables does not substantially alter our main finding that FMP exerts a positive and significant influence on GHG emissions.

Fourthly, we use the impact threshold for an omitted confounding variable (ITCV) technique to deal with omitted confounding factor bias.[4] The ITCV technique generates the correlation coefficient between the most influential control variable and an omitted variable needed to disprove our findings. Such a technique suits our study, as the confounding factor is unobservable. The estimated results are reported in Table 11. The ITCV value of 0.0328 reflects the smallest products of the partial correlation between the GHG emissions and other explanatory factors. Table 11 also shows that the correlation coefficient between the introduction of FMP and GHG emissions with unobservable confounding factors would be 0.181 to refute our findings. Given that the confounding factor is not known, we compute the raw and partial influence of each explanatory variable and compare it with the minimum values of the correlation coefficients. Taken together, none of the single impact factors of the regressors is larger than the minimum values of the correlation coefficients. As a result, we conclude that the baseline results in subsection 4.2 are not driven by unobservable confounding factors.

Fifthly, to strengthen further our conclusion, we perform the propensity score matching (PSM) method, which compares the GHG emissions in firms in FMP states with those in non-FMP states of similar firm characteristics. Accordingly, firms in FMP states can act as treatment group, while those in non-FMP states can act as control group. Here, we allow the PSM to vary by 0.10. Considering the baseline model, the estimated results in Table 12 show that average GHG emissions are 13.306 in firms in FMP states and 12.964 in non-FMP states. The difference between the two is positive and statistically significant at the 1 % level (coefficient = 0.341), which is consistent with the baseline results. Thus, our main findings are not driven by the observed firm characteristics, which eases this source of endogeneity bias. Appendix A reports the PSM statistics of matched samples.

7. Moderating effects

We consider the moderating effect of corporate diversification, cultural tightness-looseness, right-to-work laws (RTW), and inevitable disclosure doctrine (IDD) on the relationship between FMP and GHG emissions.

7.1. Corporate diversification

Corporate diversification is a contentious strategy mechanism that is viewed differently by shareholders, creditors, and directors. For example, creditors and directors may favor corporate diversification to reduce firm-specific risk and the likelihood of an unexpected decline in cash flows, which could damage the firm's capacity to repay its loans. However, shareholders may dismiss corporate diversification because they can diversify personal portfolios at a lower cost (Martin and Sayrak, 2003). Diversification includes both costs and advantages. Diversification may exacerbate agency issues, as directors may engage in business diversification to protect management entrenchment and discretion, human capital, and private interests (Berger and Ofek, 1995; Morck et al., 1990). Diversification, on the other hand, may allow businesses to benefit from economies of scale, build internal capital markets, and increase credit capacity (Shleifer and Vishny, 1992; Lewellen, 1971). There are two opposing hypotheses in the literature for how business diversification may influence managerial myopia or "short-termism". To begin, the formation of an internal capital market as a result of company diversification allows for the pursuit of long-term projects (e.g., R&D activities) that optimize shareholder value, therefore dispelling management myopia. Second, another line of research focuses on the notion that corporate diversification may increase managerial myopia, "or short-termism," as corporate directors of diversified firms may discourage long-term profitable investments initiated by divisional managers in order to preserve their managerial discretion and control over corporate resources (Klein and Wuebker, 2020). As a result, we anticipate that company diversification will have a major impact on the relationship between FMP and GHG emissions, but we cannot predict which direction this relationship will take.

To study the moderating influence of corporate diversification, we create a dummy that equals one if a company has many divisions and zero otherwise (Subramaniam et al., 2011; Ang et al., 2014). The first column of Table 13 shows a negative and statistically significant interaction term (FMP × business diversification) at the 5 % level (coefficient = −0.208). Thus, corporate diversification weakens the link between FMP and GHG emissions, supporting our hypothesis that corporate diversification can reduce managerial myopia by creating an internal capital market that provides diversified firms with more internal resources than focused firms. This suggests that diversified enterprises in FMP states have lower GHG emissions than concentrated firms.

7.2. Cultural tightness -looseness

Cultural tightness-looseness is described as the level of sanctioning in society and the strength of norms (Gelfand et al., 2006). Individuals and organizations are exposed to significant societal consequences in the communities where they live. The local culture facilitates economic transactions, trust, and cooperation, and may either favor or discourage opportunistic managerial behavior. Furthermore, it may have some influence on business behavior (Hoi et al., 2019). Previous research indicates that culture tightness-looseness has a significant impact on M&A decisions, cross-border acquisition, tax avoidance policy, venture profitability, and accounting conservatism (Ben Othman, Hussainey and Moumen, 2024; Liu et al., 2024; Pidduck et al., 2024; Noh and Cho, 2022; Li and Gelfand, 2022). Hu et al. (2024) and Gu et al. (2022) show that increased tightness is linked with successful communication and acceptance of new social norms, which promotes social trust and increases perceived job stability. This leads to a lower level of managerial myopia. Thus, we hypothesize that cultural tightness has a detrimental impact on the connection between FMP and GHG emissions.

To examine the moderating role of cultural tightness-looseness in the link between FMP and GHG emissions, we first get the state-level cultural tightness-looseness index from Harrington and Gelfand (2014).[5] Then, we create a dummy variable that equals one if a firm's headquarters are in a state with a cultural tightness-looseness score higher than the median, and zero otherwise. Next, we employ the interaction term (FMP × cultural tightness). The estimated results in Table 13's second column demonstrate a statistically significant and negative interaction term at the 1 % level (coefficient = −0.015), implying that cultural tightness reduces the link between FMP and GHG emissions. This data backs up our hypothesis that high cultural tightness reduces managerial myopia by encouraging effective communication and social trust. Thus, enterprises in FMP with high cultural.

7.3. Right-to-work laws (RTW)

The Taft-Hartley Act, passed by the United States Congress in 1947, authorizes US states to recognize RTW laws. This means that employees might receive similar benefits as those linked with labor unions without becoming members or paying union dues. Appendix B shows the

[4] This bias suggests that the results may be altered by excluding variables that can impact both the introduction of FMP and GHG emissions. (Chapman et al., 2019).

[5] higher score implies greater cultural tightness.

Table 10
Endogeneity: Using CEO characteristics as new controls.

Variable	CEO age	CEO gender	CEO education (MBA)	External CEO	CEO tenure	All
Constant	16.796*** (2.227)	17.139*** (2.140)	15.840*** (2.072)	16.706*** (2.161)	16.526*** (2.091)	15.102*** (2.043)
FMP	0.212*** (0.057)	0.182*** (0.050)	0.190*** (0.048)	0.222*** (0.051)	0.182*** (0.048)	0.222*** (0.049)
CEO age	−0.001*** (0.001)					−0.001*** (0.001)
CEO gender		0.188** (0.087)				0.215** (0.091)
CEO education (MBA)			−0.151*** (0.052)			−0.177*** (0.048)
External CEO				0.136*** (0.056)		0.150*** (0.054)
CEO tenure					−0.008*** (0 0.003)	−0.007** (0.003)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (%)	38.20	43.45	43.97	43.92	45.09	46.83
F-statistics P-value	98.55 (0.000)	96.37 (0.000)	97.01 (0.000)	102.10 (0.000)	97.81 (0.000)	79.01 (0.000)
Obs	6499	6485	6487	6470	6471	6483

This table demonstrates the regressions results after involving several CEO characteristics, CEO ages, CEO gender, CEO education measured as whether the CEO holds an MBA degree or not, external CEO who was appointed from the outside the firm, CEO tenure and all of them as new controls. The parentheses report the standard errors. ***, **, and * refer to 1 %, 5 %, and 10 % significance levels, respectively. Definitions of variables are presented in Table 2.

Table 11
Endogeneity: Impact threshold for an omitted confounding variable (ITCV).

Variables	GHG	
	Raw	Partial
Size	0.0020	−0.0015
MB	−0.0032	0.0022
Leverage	0.0002	0.0037
Growth	0.0033	0.0049
Asset new	−0.0010	−0.0229
CAPEX	−0.0010	−0.0006
Firm age	0.0053	0.0014
Institutional ownership	−0.0031	−0.0080
State income	0.0337	0.0139
State per capita	−0.0805	−0.1171
State income growth	−0.0053	−0.0002
ITCV	0.0328	
Correlation	0.181	

The table provides the ITCV estimates used to assess the influence of FMP adoption on GHG emissions. Definitions of variables are presented in Table 2.

Table 12
Endogeneity: Propensity score matching.

	Observations	Mean	Difference	SE and P-Value of differences
GHG				
Firms in FMP states	1181	13.306	0.341	0.133*** (0.009)
Firms in non-FMP states	860	12.964		

The table demonstrates the of propensity score matching estimates. Figures in parentheses are standard errors. ***, **, and * refer to 1 %, 5 %, and 10 % significance levels, respectively.

schedule for US states adopting the RTW. Despite labor unions' strong objections, up to 27 states have already passed RTW laws. Labor unions opposed the implementation of the RTW because it results in a significant decline in labor union memberships, activities, financial resources, and, as a result, bargaining power and existence (Chava et al., 2020; Nguyen and Qiu, 2022; Marciukaityte, 2015). The extant literature suggests that employee pay and fringe benefits have a significant impact on organizations' financial resources and operations. As a result, corporate directors take a variety of defensive measures to protect corporate resources and gain bargaining power in the face of labor unions (Klasa et al., 2009; Chen and Chen, 2013; Arslan-Ayaydin et al., 2021; Marciukaityte, 2015). Chen et al. (2015) demonstrate that external factors (such as capital markets and labor unions) are the primary causes of management myopia and short-termism. Thus, we predict firms in FMP and RTW states to create fewer GHG emissions, or to be a negative moderator of the relationship under study, when compared to those in non-RTW states, because the adoption of RTW reduces the pressures of labor unions on corporate directors.

To examine how RTW adoption affects the link between FMP and GHG emissions, we create a dummy variable that is one if a firm is headquartered in an RTW state and zero otherwise and then estimate the interaction term (FMP × RTW adoption). The third column of Table 13 shows a negative interaction term that is significant at the 1 % level (coefficient = −0.395). This shows that RTW adoption reduces short-termism while weakening the link between FMP and GHG emissions. This result confirms our hypothesis that enterprises in RTW states have weak labor unions, which decreases external demands on corporate managers and, as a result, alleviates management myopia or short-termism. As a result, enterprises in FMP and RTW states emit fewer GHGs than those in non-RTW legislations.

7.4. Inevitable disclosure doctrine (IDD) adoption

IDD laws prevent important personnel from being appointed by key competitors to protect trade secrets (Colak and Korkeamäki, 2021; Canil et al., 2023). Appendix C shows the timeline of court cases that established precedent for implementing or not implementing the IDD. According to the available literature, implementing IDD protects both the firm's knowledge base and its human capital (Ee et al., 2023; Dey and White, 2021). As a result, adopting IDD trivializes competitive threats and encourages long-term investments (e.g., R&D), reducing management myopia and short-termism (Klasa et al., 2018; Boubaker et al., 2022). Thus, we predict firms in FMP and IDD states to have lower GHG emissions (negative moderator) than those in non-IDD states because IDD adoption safeguards human capital and knowledge base, which supports long-term R&D investments and minimizes managerial myopia.

To investigate the moderating effect of IDD adoption on the link between FMP adoption and GHG emissions, we create a dummy variable that equals one if a firm is located in an IDD state and zero otherwise. The last column of Table 13 demonstrates that the interaction term (FMP × IDD adoption) is negative and statistically significant at the 1 % level (coefficient = −0.306). This finding supports our hypothesis that IDD adoption serves as a negative moderator of the connection between FMP adoption and GHG emissions. Thus, firms in FMP and IDD states emit fewer GHGs than those in non-IDD states.

Table 13
Moderating factors.

Variable	Diversification	Cultural tightness	Right-to-work law (RTW)	IDD adoption
Constant	17.113*** (2.727)	2.363 (3.005)	16.539*** (2.306)	17.113*** (2.808)
FMP	0.217*** (0.062)	0.892*** (0.262)	0.272*** (0.060)	0.320*** (0.081)
Diversification	−0.189*** (0.049)			
FMP × Diversification	−0.208** (0.102)			
Cultural tightness		0.026*** (0.003)		
FMP × tightness		−0.015*** (0.005)		
RTW			0.179** (0.088)	
FMP × RTW			−0.395*** (0.108)	
IDD adoption				0.302*** (0.069)
FMP × IDD				−0.306*** (0.108)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2 (%)	42.61	45.73	43.86	43.90
F-statistics P-value	116.52 (0.000)	133.59 (0.000)	115.54 (0.000)	79.45 (0.000)
Obs	6455	6482	6460	6462

The table demonstrates the regressions estimates of the moderating effects corporate diversification, cultural tightness-looseness index, the state-adoption of RTW laws, and the adoption of IDD. Figures in parentheses are standard errors. ***, **, and * refer to 1 %, 5 %, and 10 % significance levels, respectively. Definitions of variables are presented in Table 2.

8. Concluding remarks

The adoption of FMP is a new subject of research, but its influence on corporate GHG emissions remains unexplored. This paper addresses this void in the academic literature using various regression methods and a sample of firms belonging to the S&P 500 index. The results show evidence of a positive and significant impact of adoption of FMP on corporate GHG emissions. This suggests that the adoption of FMP increases firm-level GHG emissions, and therefore impairs corporate environmental performance. Economically, the adoption of FMP results in 23.12 % increase in GHG emissions on average. Several sensitivity analyses the robustness of the positive impact of FMP adoption on corporate GHG emissions to the use of various measures of GHG emissions and alternatives estimators. Our additional analyses show that that corporate diversification, cultural tightness-looseness, Right-to-Work laws (RTW), and Inevitable Disclosure Doctrine (IDD) negatively moderate the relationship between the adoption of FMP and corporate environmental performance.

Our findings carry important implications. To begin, given the importance of deciding where to locate a corporate headquarters, our findings should assist incorporators in making educated decisions about potential corporate locations and, as a result, the potential implications for corporate environmental policy. Furthermore, the findings assist lawmakers and policymakers in developing informed laws and legislation regarding the potential consequences of FMP adoption on corporate behavior in general, and corporate environmental performance in particular. Second, our findings may help to highlight the potential downsides of FMP implementation. Furthermore, as a result of increasing state surveillance of local governments, local governments, and by extension, firms, may prioritize short-term economic growth above long-term sustainability goals. This may lead to corporations implementing poor environmental strategies to minimize carbon emissions and responding negatively to global initiatives aimed at achieving a low-carbon economy.

Our study is not without limitations. The study's findings are based exclusively on S&P 500 firms, which are typically large, visible, and subject to strong institutional and investor pressures regarding ESG practices. These firms may respond to environmental regulation differently from small or mid-sized enterprises that lack stakeholder scrutiny or resources for sustainability initiatives. Moreover, the institutional setting—state-level governance in the U.S.—can limit the generalizability of the findings to other countries with different political, regulatory, and fiscal systems.

Future researchers could consider the impact of FMP adoption on other corporate policies, such as corporate diversification, corporate social responsibility, corporate hedging, employee treatment policies, and financial and investment policies, to gain a better understanding of the overall implications of FMP implementation.

CRediT authorship contribution statement

Mohamed Shaker Ahmed: Writing – original draft, Methodology. **Elie Bouri:** Writing – review & editing, Writing – original draft. **Charilaos Mertzanis:** Writing – review & editing, Software, Data curation, Conceptualization. **Mohamad Husam Helmi:** Writing – original draft, Software, Methodology.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. reports the PSM statistics of matched samples

Variable	Unmatched sample Treat	Control	Difference	t-statistics
Size	24.074	23.961	0.113	2.39**
M-B	1.530	1.847	−0.317	−3.31***
Leverage	0.726	0.616	0.109	8.41***
Sales growth	0.375	1.119	−0.743	−1.76*
Asset newness	0.642	0.656	−0.013	−1.85*
CAPEX	0.046	−0.046	0.092	4.18***

(*continued on next page*)

(*continued*)

Variable	Treat	Control	Difference	t-statistics
Firm age (log)	3.256	3.112	0.144	5.05***
Institutional ownership	71.225	74.616	−3.391	5.77***
Variable	Matched sample			
	Treat	Control	Difference	t-statistics
Size	24.074	24.118	−0.043	−0.66
M-B	1.530	1.561	−0.031	−0.49
Leverage	0.726	0.632	0.093	1.48
Sales growth	0.375	0.635	−0.260	−1.24
Asset newness	0.642	0.647	−0.005	−0.42
CAPEX	0.046	0.056	−0.010	−0.32
Firm age (log)	3.256	3.098	0.157	1.57
Institutional ownership	71.225	70.332	0.893	1.36

Appendix B. Timetable of states adopting the RTW in the US

State	State name	Year RTW	State	State name	Year RTW
AL	Alabama	1953	MT	Montana	
AK	Alaska		NE	Nebraska	1947
AZ	Arizona	1947	NV	Nevada	1952
AR	Arkansas	1947	NH	New Hampshire	
CA	California		NJ	New Jersey	
CO	Colorado		NM	New Mexico	
CT	Connecticut		NY	New York	
DE	Delaware		NC	North Carolina	1947
DC	District of Columbia		ND	North Dakota	1948
FL	Florida	1943	OH	Ohio	
GA	Georgia	1947	OK	Oklahoma	2001
HI	Hawaii		OR	Oregon	
ID	Idaho	1986	PA	Pennsylvania	
IL	Illinois		RI	Rhode Island	
IN	Indiana	2012	SC	South Carolina	1954
IA	Iowa	1947	SD	South Dakota	1947
KS	Kansas	1958	TN	Tennessee	1947
KY	Kentucky	2017	TX	Texas	1947
LA	Louisiana	1976	UT	Utah	1955
ME	Maine		VT	Vermont	
MD	Maryland		VA	Virginia	1947
MA	Massachusetts		WA	Washington	
MI	Michigan	2013	WV	West Virginia	2016
MN	Minnesota		WI	Wisconsin	2015
MS	Mississippi	1960	WY	Wyoming	1963
MO	Missouri				

Source: Chava, Danis, & Hsu (2020); Nguyen & Qiu (2022).

Appendix C. Legal cases of Precedent-setting adopting or rejecting the inevitable disclosure doctrine (IDD)

State	Precedent-setting case(s)	Date	Decision
AR	Southwestern Energy Co. v. Eickenhorst, 955 F. Supp. 1078 (W.D. Ark. 1997)	March 18, 1997	Adopt
	Cellco Partnership v Langston, No. 4:09CV00928JMM (W.D. Ark. 2009)	December 11, 2009	Reject
CA	Whyte v Schlage Lock Co., 101 Cal. App. 4th 1443 (2002)	September 12, 2002	Reject
CT	Branson Ultrasonics Corp. v. Stratman, 921 F. Supp. 909 (D. Conn. 1996)	February 28, 1996	Adopt
DE	E.I. duPont de Nemours & Co. v. American Potash & Chem. Corp., 200 A.2d 428 (Del. Ch. 1964)	May 5, 1964	Adopt
FL	Fountain v. Hudson Cush-N-Foam Corp., 122 So. 2d 232 (Fla. Dist. Ct. App. 1960)	July 11, 1960	Adopt
	Del Monte Fresh Produce Co. v. Dole Food Co. Inc., 148 F. Supp. 2d 1326 (S.D. Fla. 2001)	May 21, 2001	Reject
GA	Essex Group Inc. v. Southwire Co., 501 S.E.2d 501 (Ga. 1998)	June 29, 1998	Adopt
	Holton v. Physician Oncology Servs., LP. No. S13A0012, 2013WL 1859294 (Ga. 2013)	May 20, 2013	Reject
IL	Teradyne Inc. v. Clear Communications Corp., 707 F. Supp. 353 (N.D. 111. 1989)	February 9, 1989	Adopt
IN	Ackerman v. Kimball Int'l Inc., 652 N.E.2d 507 (Ind. 1995)	July 12, 1995	Adopt
IA	Uncle B's Bakery v. O'Rourke, 920 F. Supp. 1405 (N.D. Iowa, 1996)	April 1, 1996	Adopt
KS	Bradbury Co. v. Teissier-duCros, 413 F. Supp. 2d 1203 (D. Kans. 2006)	February 2, 2006	Adopt
MA	Bard v. Intoccia, 1994 U.S. Dist. LEXIS 15,368 (D. Mass. 1994)	October 13, 1994	Adopt
	US Elec. Servs.V. Schmidt, Civil Action No. 12-10845-DJC (U.S. Dist. CT. for the Dist. of Mass. 2012)	May 14, 2012	Reject
MD	LeJeune v. Coin Acceptors, Inc., 381 Md. 288 (Md. 2004)	May 13, 2004	Reject
MI	Allis-ChalmersManuf. Co. v. Continental Aviation & Eng. Corp., 255 F. Supp. 645 (E.D.Mich. 1966)	February 17, 1966	Adopt
	CMI Int'l, Inc. v. Intermet Int'l Corp., 649 N.W.2d 808 (Mich. Ct. App. 2002)	April 30, 2002	Reject
MN	Surgidev Corp. v. Eye Technology Inc., 648 F. Supp. 661 (D.Minn. 1986)	October 10, 1986	Adopt
MO	H&R Block Eastern Tax Servs. Inc. v. Enchura, 122 F. Supp. 2d 1067 (W.D. Mo. 20 0 0)	November 2, 2002	Adopt
NC	Travenol Laboratories Inc. v. Turner, 228 S.E.2d 478 (N.C. Ct. App. 1976)	June 17, 1976	Adopt
	RCR Enterprises, LLC v. McCall, 2014 WL 7591977 (N.C. Super Ct. Dec. 19, 2014)	October 2, 2014	Reject

Source: Ahmed, Kumar, Gupta and Bamel (2024, P.6) and Canil et al. (2023, P.8).

Data availability

Data will be made available on request.

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