



Climate-Related Financial Policy and Systemic Risk



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Abstract

We examine the relationship between climate-related financial policies (CRFPs) and banks’ systemic risk. Using a sample of 458 banks in 47 countries over the period 2000-2020, we document that more stringent CRFPs are detrimental to overall financial stability and contribute to increased system-wide distress. Measures that restrict banks' exposure to carbon-intensive counterparties may lead to less lending at higher lending rates, yet reduced bank profitability and systemic resilience. However, the implementation and ratification of the Paris Agreement, more robust adaptation strategies to cope with climate shocks and a higher incidence of natural disasters and a larger number of people affected by extreme climate events may counteract the amplifying effects of CRFPs on systemic risk. Moreover, banks with stronger environmental, social, and governance (ESG) commitments experience less systemic distress when exposed to green financial policies. Our findings have critical policy implications for public authorities formulating green financial policies.

Motivation

- Climate change has become a significant threat to both the financial system and the real economy (e.g. ESRB, 2016; Kahn et al., 2021; Bilal and Känzig, 2024).
- A major concern in the direction of green and sustainable development is the path in adopting policies aimed at addressing climate change, which is heterogeneous across countries.
- In the wake of the Paris Agreement, numerous authorities - both national and supranational - have come to acknowledge climate change as a potential source of financial risk (e.g., NGFS, 2019; ECB, 2019; FSB, 2020; BIS, 2021; BGFRS, FDIC, and OCC, 2023).
- These authorities have also recognized that climate-related financial risks (CRFRs) are systemic in nature (e.g., Bolton et al., 2020; Battiston et al., 2021; Hiebert and Monnin, 2023).
- The channels through which climate-related shocks propagate to the financial sector are usually referred to as **physical**, **transition**, and **liability risks** (Carney, 2015)
- Although numerous studies document a beneficial effect of macroprudential tools in curtailing system-wide financial fragility (see, e.g., Meuleman and Vander Vennet, 2020; Neill, 2024), **the nexus between green financial policies and systemic risk is not clear and may not necessarily limit its accumulation** (Coelho and Restoy, 2023).

Data

Our sample encompasses 458 banking institutions from 47 advanced markets and emerging market and developing economies, extending from 2000 to 2020.

Systemic risk indicator

To capture financial instability at the bank level, the marginal expected shortfall (MES) indicator is utilized. This indicator measures a bank's expected equity loss during extreme market downturns.

Climate-related financial policies

Climate-related financial policies are regulations introduced by central banks and financial regulators designed to reduce the impact of climate-related financial shocks and promote green finance (D'Orazio, 2023).

These measures fall into five categories: (i) green prudential regulations; (ii) green lending policies ; (iii) green financing guidelines; (iv) additional environmental disclosure requirements; (v) the taxonomy and issuance of green bonds.

Methodology

To account for the hierarchy feature of the data and to capture potential dependency due to nesting effects, we employ a hierarchical linear modeling (HLM). The empirical model takes the following form:

$$MES_{i,j,t} = \underbrace{\alpha_0 + \beta_1 \times CRFP_{j,t-1} + \beta_2 \times \Theta_{i,j,t-1} + \beta_3 \times \Omega_{j,t-1}}_{fixed\ components} + \underbrace{\vartheta_{i,j} + \mu_j + \varepsilon_{i,j,t}}_{random\ components}$$

- where
 - $MES_{i,j,t}$ is the systemic risk of bank i from country j at time t ,
 - $CRFP_{j,t-1}$ is the climate-related financial policy index corresponding to country j at time $t-1$,
 - $\Theta_{i,j,t-1}$ is a vector of bank-specific variables that reflect the cross-sectional variation in systemic risk as outlined in the literature at time $t-1$, including factors such as size, capitalization, lending activities, credit risk ratio, funding structure, income diversification, and profitability.
 - $\Omega_{j,t-1}$ represents a set of one-year lagged control variables at both the banking system and macroeconomic levels, such as bank concentration, the level of development of financial institutions, and economic growth and inflation.

We conduct a series of robustness checks to ensure that our results hold across different specifications:

- in addition to MES, we use two other widely used metrics of systemic risk, namely $\Delta CoVaR$ developed by Adrian and Brunnermeier (2016) and $SRISK$ by Brownlees and Engle (2017).
- we employ alternative indices to assess countries' commitment to green financial policies.
- we run the model using different static models.
- we assume an autoregressive structure of the marginal expected shortfall and employ two dynamic models: the bias-corrected least squares dummy variable (LSDVC) and the quasi-maximum likelihood (QML) linear dynamic panel data estimator (DPDQML).

Results

Table 2. Baseline model results.

| Dependent: MES | (1) | (2) | (3) |
|---------------------------------|-----------------------|-----------------------|-----------------------|
| <i>Fixed-effects parameters</i> | | | |
| CRFP index (t-1) | 0.1872*** (0.0332) | 0.1726*** (0.0355) | 0.1963*** (0.0358) |
| Observations | 7624 | 7004 | 6937 |
| Banks | 458 | 458 | 458 |
| Countries | 47 | 47 | 47 |
| LR test Chi-square p-value | 0.0000 | 0.0000 | 0.0000 |
| Year FE | Yes | Yes | Yes |

Note: Standard errors in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 3. Further analysis: the role of the Paris Agreement.

| Dependent: MES | (1) | (2) |
|--|------------------------|------------------------|
| <i>Fixed-effects parameters</i> | | |
| CRFP index (t-1) | 0.2811*** (0.0435) | 0.2745*** (0.0427) |
| After Paris Agreement | 0.3714*** (0.0327) | 0.1580*** (0.0239) |
| CRFP index (t-1) × After Paris Agreement | -0.1678*** (0.0489) | -0.1666*** (0.0484) |

Table 4. Further analysis: countries' adaptation to climate disruptions.

| Dependent: MES | (1) | (2) |
|---------------------------------------|------------------------|------------------------|
| <i>Fixed-effects parameters</i> | | |
| CRFP index (t-1) | 0.1964*** (0.0392) | 0.0103 (0.0441) |
| High ND-GAIN (t-1) | 0.1915*** (0.0178) | |
| CRFP index (t-1) × High ND-GAIN (t-1) | -0.1861*** (0.0402) | |
| Low ND-GAIN (t-1) | | -0.1915*** (0.0178) |
| CRFP index (t-1) × Low ND-GAIN (t-1) | | 0.1861*** (0.0402) |

Table 7. Further analysis: the role of ESG.

| Dependent: MES | (1) | (2) |
|--|------------------------|-----------------------|
| <i>Fixed-effects parameters</i> | | |
| CRFP index (t-1) | 0.2851*** (0.0646) | 0.1045* (0.0581) |
| High ESG Combined Score (t-1) | 0.0465** (0.0192) | |
| CRFP index (t-1) × High ESG Combined Score (t-1) | -0.1806*** (0.0547) | |
| Low ESG Combined Score (t-1) | | -0.0465** (0.0192) |
| CRFP index (t-1) × Low ESG Combined Score (t-1) | | 0.1806*** (0.0547) |

Discussion

Our analysis reveals that augmented public pledges to green policies exert a negative influence on financial stability, thereby contributing to escalated systemic risk. This suggests that excessively strict climate-related financial policies could lead to a disorderly transition. Furthermore, measures that restrict banks' exposure to carbon-intensive counterparties, both directly and indirectly, may result in fewer loans being granted to the real economy and higher lending rates. This, in turn, gives rise to substantial credit losses, diminished bank profitability, and spillover effects with the potential to undermine systemic resilience.

However, the implementation and ratification of the Paris Agreement, a more robust adaptation strategies to cope with climate shocks and a higher incidence of natural disasters and a larger number of people affected by extreme climate events act as negative moderators, counteracting the amplifying effects of climate-related financial policies on systemic risk. In addition, banks with stronger environmental, social and governance (ESG) performance experience less systemic distress when exposed to green financial policies.

The findings of this study have important policy implications, given the increasing involvement of public authorities in formulating green policy actions to meet the objectives of the Paris Agreement. The development and implementation of climate-related financial policies may inadvertently amplify transition risks and trigger systemic shocks, potentially undermining the mandate of central banks and supervisors to safeguard financial stability.

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