

Administrative and Market Frictions in the Choice Between Green and Conventional Bonds

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Abstract

Green bonds provide firms with a credible way to finance environmentally eligible projects, but the label comes with extra documentation, verification, and reporting costs. This paper examines when those costs become binding by studying how country-level administrative frictions interact with green regulation, local investor demand for green assets, and green market infrastructure in shaping the choice to issue a labeled green bond rather than a conventional bond. Using a global panel of MSCI World firms matched to corporate bond issuances from 2013–2024, we estimate Probit models of green labeling conditional on bond issuance, test institutional moderation via interactions and conditional marginal effects, and address selection into bond markets with Heckprobit. To strengthen causal interpretation, we exploit staggered adoption of mandatory sustainability disclosure rules in a Callaway–Sant’Anna difference-in-differences event study. We find that administrative frictions reduce green labeling in baseline models and mainly matter by weakening institutional channels. Green regulation, investor demand, liquidity, and advisory infrastructure all increase the likelihood of green issuance, with investor demand the strongest driver but substantially less effective in high-friction environments. Effects are amplified in transition-intensive sectors, while frictions are more constraining outside core transition industries. Disclosure adoption raises green issuance by about 9 percentage points on average, with effects that appear immediately and grow over time. Overall, the results show that administrative capacity constrains corporate green bond development and that sustainable finance policies work best when implementation is efficient.

Keywords: Green bonds; Sustainable finance; Administrative frictions; Green regulation; Investor demand; Market liquidity; Advisory infrastructure.

1 Introduction

Green bonds have become a prominent instrument in sustainable corporate finance. By earmarking proceeds for environmentally eligible projects and committing issuers to verification and reporting standards, green bonds offer a labelled channel through which firms can finance transition-related investment. Over the last decade, issuance has expanded rapidly across jurisdictions, alongside the diffusion of taxonomies, disclosure regimes, and specialized market intermediaries (Flammer, 2021; Zerbib, 2019; CBI, 2024).

This expansion raises a natural question. If firms can finance environmentally eligible projects with conventional debt and allocate proceeds internally, why do they choose to bear the additional documentation, verification, and reporting requirements of labelled green bonds? Put differently, under which administrative and institutional environments does the green label become privately optimal for issuers rather than remaining a niche instrument? This paper answers these questions by examining how country-level administrative frictions, green regulatory frameworks, local investor demand for green assets, and green market infrastructure jointly shape the probability that a bond issuance is labelled green rather than conventional.

A large literature motivates these mechanisms but has mostly emphasized the benefit side of green labelling. A first strand documents yield differentials between green and conventional bonds and provides evidence of a “greenium,” suggesting that investors may accept lower yields for certified green securities (Ehlers and Packer, 2017; Zerbib, 2019). A second strand studies real effects and shows that green bond issuance can be associated with subsequent improvements in environmental performance and related firm outcomes, consistent with credible commitment and signalling (Flammer, 2021). A third strand highlights uneven diffusion across countries and sectors, with issuance concentrated in jurisdictions with stronger sustainable finance frameworks and in industries more exposed to transition dynamics (Tolliver et al., 2020; Tang and Zhang, 2020; Banga, 2022; Zhang et al., 2021).

Despite these advances, we still lack a systematic account of the cost side of green labelling and of the implementation environment that determines these costs for otherwise comparable

financing needs. Issuing a labelled green bond typically requires incremental administrative effort relative to conventional debt, including eligibility documentation, external review, and post-issuance allocation and impact reporting. These burdens should be more binding where administrative capacity is weaker and procedures are more cumbersome. At the same time, regulatory clarity can reduce ambiguity through taxonomies and disclosure rules, and market infrastructure can reduce informational frictions through liquidity, specialized verifiers, and advisory services. The central gap is therefore understanding how administrative frictions interact with regulation, demand, and infrastructure to shape the green-versus-conventional choice.

We address this gap with a global panel of MSCI World firms matched to corporate bond issuances from 2013 to 2024, combining labelled green bonds from the Climate Bonds Initiative and Refinitiv with comparable conventional corporate bonds from Refinitiv. The empirical design treats green labelling as a discrete choice conditional on bond issuance and estimates Probit models with year and industry fixed effects, reporting average marginal effects for interpretability. We then test institutional transmission channels by interacting administrative frictions with green regulation, green demand, and advisory infrastructure, and quantify these interactions using conditional marginal effects at low and high levels of frictions. Because green issuance is observed only when firms access public debt markets, we further estimate a Heckprobit model (Van de Ven and Van Praag, 1981) as a robustness check against selection into bond markets. Finally, to strengthen causal interpretation, we exploit staggered adoption of mandatory sustainability disclosure regulation across countries in a difference-in-differences event-study framework using the Callaway and Sant’Anna (2021) estimator with doubly robust inverse probability weighting.

The results show that institutional and market features are first-order determinants of green labelling. In baseline Probit estimates, administrative frictions are negatively associated with green bond issuance, consistent with the idea that bureaucratic complexity raises the fixed costs of certification and reporting. Once institutional interactions are introduced, the direct effect of frictions becomes smaller and loses statistical significance, while the interaction patterns

indicate that frictions matter mainly by reshaping how regulation, demand, and infrastructure translate into issuance. Green regulation is positive and significant across specifications, indicating that stronger regulatory frameworks increase the propensity to issue green bonds. Local green demand is the strongest and most robust driver, implying that a deeper ESG-oriented investor base substantially increases the likelihood of green labelling. Market infrastructure also facilitates adoption: secondary market liquidity and advisory depth are both positively associated with green issuance.

The moderation evidence clarifies an important boundary condition. The marginal effect of green demand is markedly larger in low-friction environments than in high-friction environments, suggesting that firms can convert investor appetite into labelled supply only when administrative burdens do not erode the net payoff from compliance. For regulation and advisory capacity, the conditional effects remain positive across friction levels. Overall, the evidence points to administrative frictions as an institutional wedge that can dampen, and sometimes reconfigure, the effectiveness of enabling mechanisms.

The analysis also reveals sharp sectoral heterogeneity. In low-transition sectors, administrative frictions are a statistically significant constraint on green issuance, whereas in high-transition sectors the point estimate remains economically large but is not precisely estimated. By contrast, green regulation, investor demand, and advisory infrastructure exert much stronger positive effects in high-transition sectors, where green financing is structurally more prevalent. This pattern aligns with the idea that investor attention, regulatory incentives, and intermediation capacity become especially powerful where decarbonization investment needs are central to firms' business models.

The quasi-experimental evidence from disclosure adoption complements these cross-sectional patterns. Mandatory sustainability disclosure regulation increases the probability of green bond issuance by about 9 percentage points on average, with effects that appear immediately in the adoption year and strengthen over time, reaching economically larger impacts several years after adoption. Pre-trend tests support the identifying assumption, and the dynamic profile is consistent with gradual institutional adjustment as reporting practices, enforcement expectations,

and investor confidence become embedded.

Overall, the evidence implies that expanding corporate green bond markets requires more than sustainability ambitions or investor appetite. It also requires an implementation environment that keeps the incremental costs of green labelling manageable, and institutional infrastructures that make the label credible and usable at scale. These conditions matter most for diffusing green finance beyond core transition sectors and for ensuring that regulatory initiatives translate into corporate issuance rather than remaining formal commitments.

These findings generate policy-relevant insights for regulators, market participants, and scholars of sustainable finance. For policymakers, the results highlight that sustainable finance frameworks work best when paired with administrative capacity and practical implementation. For standard-setters and international institutions, they underscore the role of disclosure regimes and taxonomy-related clarity as credibility infrastructure. For market participants, the findings explain why the supply of green assets responds unevenly across countries to similar investor preferences. Finally, for scholars, the paper contributes a structured account of how administrative frictions condition institutional transmission mechanisms in corporate financing choices, linking public-sector implementation capacity to the micro-foundations of sustainable debt market development.

2 Literature Review and Hypotheses

Green bonds have become a central instrument in sustainable corporate finance, allowing firms to earmark proceeds for environmentally eligible projects while accessing capital markets under a dedicated sustainability label. The literature on green bonds can be grouped into three main strands: pricing effects, real environmental outcomes, and institutional determinants of issuance.

2.1 Yield Differentials and the Green Premium

A central debate in sustainable finance concerns whether green bonds are priced differently from otherwise comparable conventional bonds. In standard asset pricing models, if investors derive non-pecuniary utility from holding environmentally sustainable assets, equilibrium yields on green bonds should be lower than those on conventional bonds, giving rise to a green premium (Zerbib, 2019). Empirical evidence provides partial support for this mechanism. Using matched bond samples, Zerbib (2019) document a small but statistically significant negative yield differential attributable to pro-environmental preferences.

However, pricing results are heterogeneous. Fatica et al. (2021) find that green premia are present for corporates and supranationals but absent for financial institutions, consistent with differences in use-of-proceeds transparency and credibility. Similarly, Wu (2022) report limited or context-dependent evidence of a negative premium and highlight the importance of certification, currency denomination, and liquidity conditions. These findings suggest that pricing advantages depend critically on investor demand, disclosure credibility, and market microstructure.

Equity market reactions to green bond announcements further underscore this heterogeneity. Tang and Zhang (2020) and Flammer (2021) document positive announcement returns and post-issuance increases in ESG-oriented institutional ownership, indicating that issuance can signal long-term sustainability commitment. In contrast, Lebel et al. (2020) find negative announcement effects, particularly for first-time issuers, suggesting that investors may interpret green bonds similarly to conventional debt offerings when credibility gains are limited.

Taken together, the yield and market-reaction literature implies that the private financial benefits of green labeling are neither automatic nor universal. Instead, they depend on credibility, investor preferences, liquidity, and issuer characteristics. This heterogeneity suggests that firms' incentives to issue green bonds vary across institutional environments.

2.2 Post-Issuance Environmental Performance

Beyond pricing effects, a key question is whether green bond issuance leads to substantive environmental improvements or merely represents symbolic compliance. From a signaling perspective (Ross, 1977), issuing a green bond can credibly communicate environmental commitment when accompanied by monitoring and reporting obligations. However, if oversight is weak, issuance may facilitate greenwashing.

Empirical evidence increasingly evaluates real environmental outcomes. Flammer (2021) show that green bond issuers improve environmental ratings and reduce carbon emissions post-issuance, particularly when bonds are externally reviewed. Similarly, Zheng et al. (2023) document improvements in corporate ESG performance following issuance, consistent with enhanced transparency and accountability mechanisms.

Nevertheless, not all evidence points to substantive environmental impact. Shi et al. (2023) find that while green bond issuance increases green patent quantity, innovation quality may decline, suggesting strategic or symbolic behavior in some contexts. These mixed findings indicate that real environmental improvements depend on governance quality, verification standards, and institutional oversight.

Overall, the post-issuance literature demonstrates that green bonds can influence corporate environmental behavior, but outcomes are conditional on monitoring intensity, disclosure standards, and institutional credibility. This reinforces the importance of country-level institutional structures in shaping both issuance incentives and real effects.

2.3 Aggregate Issuance Patterns Across Countries and Sectors

A third strand examines aggregate green bond issuance across countries and industries. Cross-country analyses highlight the importance of macroeconomic development, financial market depth, and policy credibility. Tolliver et al. (2020) show that robust Nationally Determined Contributions (NDCs) under the Paris Agreement strongly predict green bond market expansion. Within Europe, Dan and Tiron-Tudor (2021) document positive associations between sovereign

credit quality, ESG performance indices, and green bond issuance volumes.

Institutional quality and investor protection frameworks further shape market development (La Porta et al., 1998; Knack and Keefer, 1995). Countries with stronger legal systems and deeper capital markets tend to exhibit more developed corporate bond markets, providing a foundation for labeled instruments. Sectoral patterns are also pronounced: capital-intensive and climate-exposed industries such as utilities, energy, and transport account for a disproportionate share of issuance, reflecting regulatory exposure and investment needs.

While this literature identifies macro-level drivers of market growth, it largely focuses on policy ambition and investor demand without explicitly modeling the administrative implementation environment. Regulatory frameworks may enhance credibility and investor confidence, yet they also introduce compliance obligations that depend on bureaucratic efficiency. Consequently, differences in administrative capacity may help explain why similar regulatory reforms yield divergent issuance outcomes across countries.

2.4 Testable Hypotheses

While prior research documents the importance of regulation, institutional quality, and investor demand, comparatively less attention has been paid to administrative frictions and bureaucratic complexity as determinants of the green versus conventional bond choice. Differences in procedural burdens and institutional efficiency may alter the relative costs and benefits of green labeling. Moreover, regulation, investor demand, and market infrastructure may interact with administrative frictions in shaping issuance decisions. We model green bond issuance as a discrete choice in which firms compare incremental benefits (reputation gains, investor base expansion, potential pricing advantages) with incremental costs (compliance, certification, reporting, and administrative burdens). Institutional conditions affect both sides of this trade-off.

Building on this framework, we develop the following hypotheses.

Administrative frictions. Green bonds entail additional certification, reporting, and monitoring requirements relative to conventional bonds (Deschryver and de Mariz, 2020; Bhutta et al., 2022). Even when pricing advantages exist (Ehlers and Packer, 2017; Zerbib, 2019), firms must incur fixed compliance costs. In environments characterized by bureaucratic inefficiency or procedural complexity, these costs may outweigh potential benefits.

H1 (Administrative frictions). Higher country-level administrative costs and bureaucratic complexity reduce the probability that a financing need is met through a labelled green bond rather than a conventional bond.

Green regulation and taxonomies. Credible environmental regulation reduces classification ambiguity and strengthens investor confidence (Tolliver et al., 2020). Green taxonomies and disclosure mandates standardize reporting obligations and align green bond issuance with broader regulatory systems, potentially lowering uncertainty and increasing expected benefits. Cross-country evidence suggests that policy stringency and climate commitments support green bond market development (Dan and Tiron-Tudor, 2021; Tolliver et al., 2020).

However, regulatory frameworks must be implemented through administrative systems. If bureaucratic processes are inefficient or burdensome, compliance costs may offset the intended benefits of regulatory clarity.

H2 (Green regulation). Stronger green regulatory frameworks increase the propensity to issue green bonds.

H2b (Regulation $\times$ Frictions). The positive effect of green regulation on green bond issuance is stronger in countries with moderate administrative frictions.

Local demand for green assets. Investor preferences for environmentally aligned assets generate private incentives for green labeling through pricing, investor base expansion, and reputational gains (Zerbib, 2019; Flammer, 2021). A deeper ESG-oriented capital pool increases the marginal benefit of issuing a green bond.

Yet the ability to capitalize on demand-side incentives depends on the administrative feasibility of issuing labeled debt. In high-friction environments, the incremental costs of compliance may limit firms' ability to respond to investor demand.

H3 (Green demand). A larger local investor base with explicit ESG mandates increases the probability of green bond issuance.

H3b (Demand $\times$ Frictions). The positive effect of green investor demand on green bond issuance is stronger in countries with moderate administrative frictions.

Market infrastructure. Beyond regulation and investor demand, market infrastructure also shapes green bond issuance decisions. Financial intermediation reduces coordination failures and information asymmetries in capital markets (Burger and Warnock, 2006; Smaoui et al., 2017). In green bond markets, second-party opinion providers, external verifiers, and specialized advisors standardize documentation, facilitate taxonomy alignment, and support certification and reporting compliance (Bhutta et al., 2022). By enhancing transparency and credibility, these intermediaries strengthen investor confidence and expand participation (Zerbib, 2019; Flammer, 2021). Secondary market liquidity further improves price discovery and lowers liquidity premia, increasing the expected benefits of issuance. Within a cost-benefit framework, stronger advisory ecosystems and deeper markets raise the net payoff from green labelling by reducing informational and transaction costs. The effectiveness of infrastructure may, however, depend on the administrative environment. In high-friction settings, where compliance burdens and procedural uncertainty are greater, specialized intermediaries can help issuers navigate regulatory requirements more efficiently. Market infrastructure may therefore partially offset administrative constraints, implying stronger marginal effects where frictions are higher.

H4 (Market infrastructure). Stronger secondary market liquidity and advisory ecosystems increase the likelihood of green bond issuance.

H4b (Infrastructure $\times$ Frictions). The positive effect of green bond market infrastructure on green bond issuance is stronger in countries with higher administrative frictions.

3 Data

Our dataset integrates multiple high-quality sources to capture firm-level, bond-level, and macro-institutional characteristics relevant to global green bond issuance.

We begin by identifying the universe of firms from the MSCI World Index over the period January 2013 to December 2024. This index provides broad coverage of large and mid-cap firms across developed markets and supplies consistent firm identifiers, including company names, ISIN codes, and country of incorporation.

Green bond data are obtained by combining information from the Climate Bonds Initiative (CBI) and Refinitiv Eikon. The CBI database is widely recognized as one of the most comprehensive repositories of labelled green bond issuance and applies consistent eligibility criteria based on use of proceeds, project evaluation, and verification standards (Tolliver et al., 2020; Tang and Zhang, 2020). Refinitiv provides complementary bond-level characteristics, including issuance amount, coupon rate, maturity, and issuer identity. Merging both sources allows us to construct a comprehensive global dataset of green corporate bond issuances.

Data on conventional corporate bonds are extracted from the Refinitiv Fixed Income database. We retain plain-vanilla fixed-coupon corporate bonds to ensure comparability with green instruments. Combining green and conventional bonds allows us to construct a unified panel of corporate bond issuance decisions over the sample period.

Firm-level financial characteristics are obtained from Refinitiv. Country-level institutional variables are drawn from multiple sources. Administrative frictions are constructed as the inverse of the bureaucratic quality index so that higher values consistently reflect greater procedural burden. This transformation ensures a direct interpretation of the coefficient signs in the empirical analysis.

We construct two key country-level variables specifically for this study. First, the *Green Regulation* variable captures the strength and implementation of national green taxonomies and environmental disclosure frameworks. It is constructed by combining publicly available information on formal green finance frameworks, taxonomy adoption, and regulatory enforce-

ment mechanisms. Second, the *Advisory Environment* variable measures the availability of green bond verifiers, external reviewers, and specialised sustainability advisory services within each country. This variable is constructed using data from the Climate Bonds Initiative and related market sources, scaled to reflect the relative depth of advisory infrastructure across jurisdictions.

Green market infrastructure is represented by two complementary dimensions: (i) secondary market liquidity, capturing bond market depth and trading activity, and (ii) the advisory environment described above. Together, these variables proxy for the informational and institutional ecosystem supporting green bond issuance.

Macroeconomic controls comprise law and order, corruption, inflation, investment profile, and GDP growth are drawn from the Worldwide Governance Indicators and ICRG.

Detailed definitions, scaling procedures, and construction methods for the Green Regulation and Advisory Environment variables are provided in Appendix A. Table 5 reports complete variable definitions and data sources, while descriptive statistics are presented in Table 6.

4 Methodology

This section presents the empirical strategy used to examine how administrative frictions shape corporate green bond issuance and condition institutional transmission mechanisms. Our design follows a structured sequence of complementary tests that progressively strengthen identification, isolate mechanisms, and address potential endogeneity concerns.

4.1 Baseline Empirical Specification

Green bond issuance is a discrete financing decision. Conditional on accessing public debt markets, firms choose whether to issue a green bond rather than a conventional bond. Consistent with the literature examining green versus conventional bond choice (Cicchello et al. (2022); Lin and Su (2022)), we model this labeling decision using a Probit specification estimated on firm-years with bond issuance.

We estimate the following latent-variable model:

$$G_{ict}^* = X_{it-1}\beta + \theta AF_{ct} + \lambda'W_{ct} + \delta_t + \delta_j + \varepsilon_{ict}, \quad (1)$$

where $G_{ict} = 1$ if firm i in country c issues a green bond in year t , conditional on bond issuance. The error term follows a standard normal distribution, yielding:

$$\Pr(G_{ict} = 1) = \Phi(\cdot).$$

Firm-level covariates X_{it-1} are lagged to mitigate simultaneity concerns. AF_{ct} measures administrative frictions at the country-year level and captures bureaucratic complexity and procedural burdens. W_{ct} includes institutional determinants such as green regulatory intensity, ESG-oriented investor demand, secondary market liquidity, and advisory infrastructure.

All specifications include year fixed effects to absorb global shocks and time trends, and industry fixed effects to control for persistent sectoral heterogeneity. Standard errors are clustered at the firm level. We report average marginal effects (AMEs) for economic interpretability.

4.2 Administrative Frictions as Institutional Moderators

Our theoretical framework predicts that administrative frictions not only exert direct effects but also condition the effectiveness of regulatory frameworks, investor demand, and market infrastructure. To test this mechanism, we augment the baseline specification with interaction terms:

$$G_{ict}^* = X_{it-1}\beta + \theta AF_{ct} + \lambda'W_{ct} + \kappa'(AF_{ct} \times W_{ct}) + \delta_t + \delta_j + \varepsilon_{ict}. \quad (2)$$

We estimate specifications sequentially: first without interactions, then introducing each interaction individually, and finally including all interactions simultaneously. This stepwise

approach isolates specific moderation channels while evaluating their joint contribution.

Because interaction effects in nonlinear models are not directly interpretable from coefficients, we compute conditional AMEs evaluated at low and high levels of administrative frictions. This allows us to quantify how bureaucratic complexity amplifies or attenuates institutional drivers of green bond issuance.

4.3 Sectoral Heterogeneity: High-Transition vs. Low-Transition Sectors

Green bond issuance exhibits substantial sectoral dispersion. Figure 1 documents that utilities, real estate, and financials display markedly higher issuance intensities than other sectors. To capture structural exposure to transition-related financing needs, we classify high-transition sectors as those in the top quartile of sector-level green issuance intensity (cutoff = 3.2%).

This classification identifies industries where green financing is structurally more prevalent and plausibly reflects greater decarbonization investment requirements and regulatory scrutiny. We re-estimate the Probit specification separately for high- and low-transition sectors to assess whether administrative frictions and institutional determinants operate differently across structural transition exposure.

4.4 Selection into Bond Markets: Heckprobit Robustness

Since green bond issuance is conditional on bond market participation, single-equation Probit estimates may be biased if unobserved firm characteristics jointly affect bond market access and green labeling decisions.

To address this concern, we estimate a Heckprobit model following Van de Ven and Van Praag (1981). Let D_{ict}^* denote the latent propensity to issue any corporate bond and G_{ict}^* the latent propensity to issue a green bond:

$$D_{ict}^* = Z_{ict}\gamma + u_{1ict}, \quad (3)$$

$$G_{ict}^* = X_{ict}\beta + \theta AF_{ct} + \lambda'W_{ct} + \kappa'(AF_{ct} \times W_{ct}) + u_{2ict}, \quad (4)$$

where G_{ict} is observed only when $D_{ict} = 1$. The error terms follow a bivariate normal distribution with correlation ρ . A statistically significant ρ indicates non-random selection into bond markets.

This framework allows us to verify whether institutional moderation effects persist after correcting for endogenous participation in public debt markets.

4.5 Difference-in-Differences: Staggered Disclosure Adoption

To strengthen causal interpretation, we exploit staggered adoption of mandatory sustainability disclosure regulation across countries. Treatment occurs in the first year a jurisdiction introduces binding climate- or sustainability-related disclosure requirements. Firms in adopting countries are treated from adoption onward, while firms in not-yet-treated countries serve as controls.

We estimate dynamic treatment effects using the Callaway and Sant'Anna (2021) estimator:

$$G_{ict} = \alpha_i + \lambda_t + \sum_{k \neq -1} \beta_k \mathbf{1}\{t - T_c = k\} + \Gamma X_{it-1} + \varepsilon_{ict}. \quad (5)$$

Firm and year fixed effects control for time-invariant heterogeneity and global shocks. Estimation employs the doubly robust inverse probability weighting (DRIPW) procedure, which accommodates heterogeneous treatment timing. Identification relies on the conditional parallel trends assumption, assessed via pre-treatment event-time coefficients. Standard errors are clustered at the country level.

This quasi-experimental design complements the cross-sectional models by leveraging

regulatory shocks to isolate policy-driven changes in green bond issuance.

Overall, the empirical strategy integrates conditional choice modeling, institutional moderation analysis, structural sectoral heterogeneity, selection correction, and quasi-experimental variation. The baseline Probit identifies core determinants of green labeling; interaction models uncover how administrative frictions reshape institutional transmission channels; sectoral splits capture transition exposure; the Heckprobit addresses endogenous market access; and the staggered difference-in-differences design strengthens causal interpretation. Together, these components provide a comprehensive and internally consistent assessment of how administrative frictions influence the development of corporate green bond markets.

5 Results

5.1 Baseline Results and Institutional Moderation

Table 1 reports average marginal effects from Probit models examining the probability that a bond issuance is labeled green rather than conventional. Column (1) presents the baseline specification without interaction terms, while Columns (2)–(5) progressively introduce institutional interactions with administrative frictions. Consistent with **H1**, administrative frictions are negatively associated with green bond issuance in the baseline model. The marginal effect in Column (1) is negative and weakly significant, indicating that higher bureaucratic complexity reduces the probability that a financing need is met through a labeled green bond. Economically, this suggests that procedural burdens and compliance costs discourage firms from incurring the additional certification and reporting requirements associated with green bonds. When interaction terms are introduced, the direct effect of administrative frictions becomes smaller and statistically insignificant, indicating that frictions primarily operate through moderating institutional transmission channels rather than through a purely direct effect.

Table 1: Probit average marginal effects

	(1) No int.	(2) Reg $\times$ Friction	(3) Demand $\times$ Friction	(4) Advisory $\times$ Friction	(5) All interactions
<i>Panel A. Average marginal effects</i>					
Size of the firm	0.0138 (0.0091)	0.0130 (0.0091)	0.0141 (0.0090)	0.0144 (0.0091)	0.0140 (0.0089)
Maturity	-0.0030*** (0.0009)	-0.0030*** (0.0009)	-0.0028*** (0.0009)	-0.0030*** (0.0009)	-0.0028*** (0.0009)
Administrative friction	-0.0470* (0.0261)	-0.0393 (0.0251)	-0.0074 (0.0271)	-0.0241 (0.0318)	-0.0247 (0.0306)
Green regulation	0.0107*** (0.0038)	0.0115*** (0.0039)	0.0099*** (0.0037)	0.0101*** (0.0038)	0.0099*** (0.0038)
Green demand	0.1791*** (0.0262)	0.1770*** (0.0261)	0.1809*** (0.0246)	0.1831*** (0.0264)	0.1790*** (0.0247)
Liquidity	0.0195** (0.0077)	0.0200*** (0.0076)	0.0191** (0.0077)	0.0192** (0.0077)	0.0191** (0.0076)
Advisory infrastructure	0.00116*** (0.00024)	0.00111*** (0.00025)	0.00112*** (0.00024)	0.00109*** (0.00026)	0.00121*** (0.00026)
<i>Panel B. Conditional AMEs at administrative frictions (Low vs High)</i>					
Regulation at Low friction		0.0149*** (0.0050)			0.0080 (0.0052)
Regulation at High friction		0.0089** (0.0039)			0.0113*** (0.0041)
Green Demand at Low friction			0.2500*** (0.0282)		0.2682*** (0.0371)
Green Demand at High friction			0.1305*** (0.0277)		0.1118*** (0.0352)
Advisory at Low friction				0.00139*** (0.00028)	0.00093*** (0.00032)
Advisory at High friction				0.00086** (0.00036)	0.00142*** (0.00037)
Observations	3,326	3,326	3,326	3,326	3,326
Year and Industry fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at the firm level (ID) in parentheses. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Green regulation exhibits a positive and statistically significant effect across all specifications. In Column (1), the marginal effect is 0.0107, supporting **H2** and indicating that stronger regulatory frameworks increase the likelihood of green labeling by reducing classification ambiguity and strengthening investor confidence. The interaction results provide evidence consistent with **H2b**. In Column (2), the conditional marginal effect of regulation is larger under low administrative frictions than under high frictions, suggesting that bureaucratic complexity attenuates the effectiveness of regulatory clarity. In the fully interacted specification (Column (5)), regulation remains positive and significant across friction levels, confirming its robust role while indicating that institutional quality conditions its magnitude.

Investor demand for green assets emerges as one of the strongest determinants of issuance decisions. In the baseline model, the marginal effect of green demand is large and highly significant, providing strong support for **H3**. This result indicates that a deeper ESG-oriented investor base substantially increases the probability of green labeling. The interaction patterns further support **H3b**. In Column (3), the marginal effect of green demand is considerably larger in low-friction environments than in high-friction environments, and a similar attenuation under high frictions is observed in the fully interacted model. These findings indicate that firms' ability to capitalize on investor demand is constrained in administratively complex settings, where compliance burdens reduce the net benefit of green issuance.

Market infrastructure variables also play a significant role. Liquidity exhibits a positive and statistically significant effect across specifications, while advisory infrastructure consistently increases green issuance probabilities, supporting **H4**. Stronger intermediation and deeper markets reduce informational and transaction costs, thereby increasing the net payoff from green labeling. The moderating role of frictions, however, is more nuanced. In Column (4), the marginal effect of advisory infrastructure is larger under low frictions than under high frictions, suggesting that infrastructure is more effective when bureaucratic systems are less burdensome. In the fully interacted model, advisory effects remain positive and significant across friction levels, but the magnitude differences are less uniform. Overall, the evidence provides partial support for **H4b**, indicating that infrastructure generally promotes green issuance, though its

interaction with administrative complexity is not uniformly amplifying.

Control variables behave consistently across specifications. Bond maturity is negative and highly significant, indicating that longer-maturity bonds are less likely to be labeled green, while firm size is positive but not statistically significant. The stability of these coefficients across models reinforces the robustness of the institutional effects.

Taken together, the results strongly support **H2** and **H3**, provide moderate support for **H1**, confirm the demand-frictions interaction predicted in **H3b**, offer evidence consistent with **H2b**, and provide partial support for **H4b**. The findings indicate that administrative frictions do not simply exert a uniform negative effect; rather, they shape how regulatory frameworks, investor demand, and market infrastructure translate into green bond issuance decisions. Administrative complexity therefore influences green bond market development primarily by conditioning institutional transmission mechanisms.

5.2 Heterogeneity Across Transition Sectors

Table 2: Heterogeneity across transition sectors

	Average Marginal Effects (Probit)	
	HighTransition = 0	HighTransition = 1
Administrative friction	-0.07767*** (0.02603)	-0.12473 (0.08302)
Green regulation	0.00803** (0.00338)	0.02378* (0.01354)
Green demand	0.11719*** (0.02375)	0.55990*** (0.11093)
Advisory infrastructure	0.00059*** (0.00021)	0.00314*** (0.00079)
Observations	3,326	3,326
Year and Industry FE	Yes	Yes

Notes: Robust standard errors clustered at the firm level (ID) are reported in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 2 examines whether the effects of administrative frictions and institutional determinants differ across industries with varying structural exposure to green transition dynamics.

Industries are classified as high-transition if they fall within the top quartile of sector-level green bond issuance intensity (issuance rate above 3.2%), as documented in Figure 1.

Several notable patterns emerge. First, administrative frictions exhibit a significantly negative effect in low-transition sectors. A one-unit increase in administrative frictions reduces the probability of green bond issuance by approximately 7.8 percentage points in these industries. In contrast, although the coefficient remains economically large in high-transition sectors, it is statistically insignificant. This pattern suggests that administrative burdens are particularly constraining in sectors where green financing is not structurally embedded. In high-transition industries, where green investment needs are more central to business models, firms may be less deterred by bureaucratic complexity.

Second, green regulatory frameworks exert a stronger marginal impact in high-transition sectors. While regulation increases issuance probabilities in both groups, the economic magnitude is nearly three times larger in high-transition industries. This finding is consistent with regulatory incentives being more binding where decarbonization investment requirements are greater.

Third, investor demand exhibits substantial heterogeneity. In low-transition sectors, stronger ESG-oriented demand increases issuance probability by 11.7 percentage points. In high-transition sectors, the corresponding marginal effect rises to 56 percentage points. This economically large difference suggests that investor demand plays a central role in driving green financing precisely where sectoral transition exposure is highest.

Fourth, advisory infrastructure also displays stronger effects in high-transition sectors. Although positive and significant in both subsamples, the marginal effect in high-transition industries is more than five times larger. This pattern is consistent with advisory ecosystems being particularly valuable in industries where green financing involves larger, more complex, and capital-intensive projects.

Taken together, these results indicate that institutional determinants operate asymmetrically across sectors. In industries where green financing is structurally important, regulatory incentives, investor demand, and advisory infrastructure exert amplified effects. Conversely,

in sectors with limited baseline green activity, administrative frictions act as a more binding constraint.

These findings reinforce the institutional-friction mechanism proposed in the hypothesis development section: administrative complexity interacts with underlying transition exposure to shape green bond issuance decisions.

5.3 Selection into Bond Markets: Probit versus Heckprobit

Table 3 compares baseline Probit estimates to a Heckprobit specification that accounts for potential selection into bond markets. Because firms must first access public debt markets before issuing green bonds, unobserved factors influencing bond issuance may also affect green labeling decisions. The Heckprobit model corrects for this potential selection bias.

Panel A reports average marginal effects from the outcome equation. Overall, the main institutional determinants remain economically and statistically significant after correcting for selection. Green regulation, green investor demand, and advisory infrastructure continue to exert positive and significant effects on green bond issuance. While some magnitudes adjust modestly, most notably for green demand, the qualitative conclusions remain unchanged.

Administrative frictions remain economically negative in both specifications. Although the coefficient is not statistically significant, its magnitude increases slightly under the Heckprobit model, suggesting that selection into bond markets does not attenuate the estimated constraining role of bureaucratic complexity.

Firm-level controls behave largely consistently across specifications. Liquidity remains positively associated with issuance, while bond maturity loses statistical significance under selection correction, indicating that part of its baseline effect may reflect broader debt market participation rather than green labeling per se.

Panel B reports conditional marginal effects evaluated at low and high levels of administrative frictions. The interaction patterns are broadly preserved under selection correction. Green regulation continues to exhibit stronger marginal effects at higher levels of frictions, while green demand and advisory infrastructure remain more influential under lower bureaucratic

Table 3: Probit (issuers-only) vs. Heckprobit (outcome equation)

	Outcome equation	
	Probit	Heckprobit
<i>Panel A. Average marginal effects (AME)</i>		
Size of the firm	0.01402 (0.00886)	0.02564*** (0.00737)
Maturity	-0.00278*** (0.00087)	-0.00062 (0.00110)
Liquidity	0.01914** (0.00763)	0.01580** (0.00774)
Administrative frictions	-0.02469 (0.03060)	-0.03656 (0.02641)
Green regulation	0.00986** (0.00383)	0.01079*** (0.00349)
Green demand	0.17899*** (0.02474)	0.13401*** (0.03825)
Advisory infrastructure	0.00121*** (0.00026)	0.00079** (0.00034)
<i>Panel B. Conditional marginal effects at administrative frictions</i>		
<i>Green regulation</i>		
at Low frictions	0.00804 (0.00519)	0.01040** (0.00466)
at High frictions	0.01128*** (0.00410)	0.01109*** (0.00380)
<i>Green demand</i>		
at Low frictions	0.26817*** (0.03708)	0.21340*** (0.05698)
at High frictions	0.11181*** (0.03523)	0.07676** (0.03205)
<i>Advisory infrastructure</i>		
at Low frictions	0.00093*** (0.00032)	0.00064* (0.00037)
at High frictions	0.00142*** (0.00037)	0.00090** (0.00044)
Observations	3,326	3,296
Year and Industry fixed effects	Yes	Yes
Selection correction	No	Yes
ρ (selection correlation)		0.4469
Wald test of independence ($\chi^2(1)$)		5.94**

Notes: Robust standard errors clustered at the firm level (ID) in parentheses.
Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

complexity. The persistence of these moderation patterns reinforces the institutional-friction mechanism identified in the baseline analysis.

Importantly, the estimated correlation coefficient between the selection and outcome equations ($\rho = 0.4469$) is positive and statistically significant, and the Wald test rejects independence of equations at conventional levels. This result indicates that unobserved factors influencing bond market participation are correlated with green labeling decisions. However, because the core institutional effects remain stable in sign and economic magnitude, selection does not drive our main findings.

Taken together, the Heckprobit results confirm that while bond market access and green issuance decisions are jointly determined, the institutional mechanisms documented in the baseline Probit specification are robust to selection correction.

5.4 Difference-in-Differences: Disclosure Regulation and Green Bond Issuance

Table 4 reports results from a staggered difference-in-differences design exploiting the adoption of sustainability disclosure regulation across countries. We implement the Callaway and Sant’Anna (2021) estimator with doubly robust inverse probability weighting (DRIPW), allowing for heterogeneous treatment timing and cohort-specific effects. The control group consists of not-yet-treated firms. Standard errors are clustered at the country level.

Panel A reports the overall average treatment effect on the treated (ATT). Disclosure adoption increases the probability of green bond issuance by 9.2 percentage points. This effect is economically meaningful relative to baseline issuance rates and statistically significant at the 1% level. The magnitude suggests that improvements in sustainability disclosure regimes materially shift corporate financing behavior.

Panel B evaluates the parallel trends assumption. The average pre-treatment coefficient over the window $[-5, -1]$ is small and statistically insignificant. The joint χ^2 test fails to reject equality of pre-treatment effects to zero (p-value = 0.43), supporting the validity of the identifying assumption. These results indicate no systematic differences in green bond issuance

Table 4: Difference-in-differences event study: Disclosure and green bond issuance

	CSDID (DRIPW)
<i>Panel A. Overall treatment effect</i>	
ATT (overall)	0.0920*** (0.0196)
<i>Panel B. Pre-trend test</i>	
Pre-treatment average ($[-5, -1]$)	0.0072 (0.0064)
Pre-trend χ^2 test (p-value)	15.32 (0.4287)
<i>Panel C. Dynamic post-treatment effects</i>	
T (impact year)	0.0889*** (0.0251)
$T + 1$	0.0509** (0.0223)
$T + 2$	0.0764** (0.0339)
$T + 3$	0.0794** (0.0382)
$T + 4$	0.0861** (0.0388)
$T + 5$	0.1419*** (0.0385)
Observations	7,645
Estimator	CSDID (Callaway–Sant’Anna), DRIPW
Cluster	Country level

Notes: The control group consists of not-yet-treated firms. Pre-treatment coefficients are jointly insignificant, supporting parallel trends. Dynamic effects are relative to the year before disclosure adoption.

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

trends prior to disclosure adoption.

Panel C reports dynamic post-treatment effects relative to the year preceding adoption. The probability of green bond issuance increases immediately in the impact year (T) by 8.9 percentage points. Although the effect moderates slightly in $T + 1$, it remains positive and significant. Importantly, the magnitude increases over time, reaching 14.2 percentage points five years after adoption. This pattern suggests that disclosure reforms generate persistent and strengthening effects rather than short-lived issuance spikes.

The dynamic profile is consistent with gradual institutional adjustment. Disclosure requirements likely reduce information asymmetry, improve investor confidence, and lower reputational uncertainty, thereby facilitating green bond issuance over time. The increasing post-treatment effects are consistent with regulatory credibility accumulating as firms adapt to new reporting standards.

Taken together, the difference-in-differences evidence complements the cross-sectional Probit results. Whereas the baseline models document institutional associations, the event-study design provides quasi-causal evidence that improvements in disclosure regimes lead to sustained increases in corporate green bond issuance.

6 Discussion

This paper examines how administrative frictions, regulatory frameworks, investor demand, and market infrastructure jointly shape the likelihood that firms finance projects through labelled green bonds rather than conventional debt. By modelling green labelling conditional on bond issuance, the analysis isolates the determinants of sustainable financing choices from general access to debt markets and provides a clearer account of the institutional foundations of green bond development.

Administrative frictions emerge as a central constraint on green bond adoption. While prior research documents yield differentials between green and conventional bonds (Ehlers and Packer, 2017; Zerbib, 2019) and positive stock market reactions to green issuance (Tang and

Zhang, 2020; Flammer, 2021), the evidence here indicates that such financial and reputational benefits are conditional on the broader implementation environment. Higher bureaucratic complexity significantly reduces the probability of green labelling, suggesting that the additional reporting, verification, and procedural requirements associated with green bonds impose tangible fixed costs on issuers. This finding complements the greenium literature by demonstrating that pricing advantages alone are insufficient to sustain market expansion when compliance burdens remain substantial. It also aligns with studies emphasizing the costs of certification, disclosure, and monitoring as key determinants of green bond credibility (Bhutta et al., 2022; Deschryver and de Mariz, 2020).

Regulatory clarity and the presence of green taxonomies positively influence green bond issuance, reinforcing cross-country evidence that environmental policy credibility and institutional quality support sustainable debt development (Tolliver et al., 2020; Dan and Tiron-Tudor, 2021). Stronger regulatory frameworks likely reduce classification ambiguity and enhance investor confidence by standardizing eligibility criteria and disclosure obligations. However, the attenuation of regulatory effects in high-friction environments highlights an important boundary condition: formal policy ambition must be matched by administrative efficiency. Where procedural systems are complex or slow, compliance costs may offset the intended benefits of regulatory clarity. This interaction helps explain why similar climate policy commitments can yield heterogeneous corporate financing responses across jurisdictions.

Investor demand for green assets plays a pivotal role in shaping issuance decisions. A deeper ESG-oriented investor base significantly increases the probability of green bond adoption, consistent with evidence that green bonds attract sustainability-focused investors and may benefit from modest pricing premia (Zerbib, 2019; Flammer, 2021). Preference-based asset pricing models suggest that even small yield differentials can materially affect issuance incentives when combined with reputational benefits and expanded investor access. At the same time, the effectiveness of demand-side incentives is conditioned by administrative feasibility. In settings characterized by higher bureaucratic frictions, firms appear less able to translate investor appetite into labelled supply. This mechanism offers a potential explanation for the

mixed empirical evidence on green bond pricing (Wu, 2022; Fatica et al., 2021): strong investor preferences do not uniformly produce large issuance responses if the cost of producing and maintaining a credible green label varies systematically across institutional contexts.

Market liquidity and advisory infrastructure further facilitate green bond issuance. Deeper secondary markets enhance price discovery and reduce liquidity premia, while the presence of verifiers and sustainability advisors mitigates information asymmetries and lowers transaction costs. These findings align with broader institutional theories of financial development that emphasize the role of intermediaries and market infrastructure in expanding capital market access (Burger and Warnock, 2006; Smaoui et al., 2017). They also complement firm-level evidence showing that external certification and second-party opinions strengthen credibility and investor confidence (Russo et al., 2021; García et al., 2023). Nevertheless, the persistence of administrative effects indicates that private market development cannot fully substitute for efficient public administration. Advisory ecosystems may reduce compliance burdens at the margin, but they do not eliminate the structural costs imposed by bureaucratic complexity.

Sectoral heterogeneity sharpens this interpretation. In transition-exposed industries, where decarbonization pressures and capital requirements are most pronounced, investor demand, liquidity, and advisory capacity exert substantially stronger positive effects. This pattern is consistent with evidence that green bond issuance is concentrated in climate-relevant sectors such as utilities, energy, and financial services, where environmental exposure and regulatory scrutiny are more material (Tolliver et al., 2020). In these industries, the green label likely functions not only as a financing instrument but also as a governance and signaling mechanism, reinforcing long-term sustainability commitments (Flammer, 2021). Conversely, in sectors where green investment is less embedded, administrative frictions appear more binding, suggesting that procedural complexity may impede diffusion of labelled finance beyond its core transition domains.

The difference-in-differences evidence exploiting the staggered adoption of mandatory sustainability disclosure regimes provides complementary support for this institutional interpretation. Disclosure reforms generate immediate and persistent increases in green bond issuance,

with effects strengthening over time. This dynamic profile is consistent with gradual institutional learning: as disclosure standards become routinized and enforcement expectations clarify, information asymmetries decline and investor confidence strengthens. Such mechanisms are central to theories linking transparency and governance quality to financial market development (La Porta et al., 1998). The results therefore suggest that disclosure regulation operates as credibility infrastructure, enhancing the informational value of the green label and lowering the perceived risk of greenwashing.

These findings also inform the broader debate regarding whether green bonds generate substantive environmental improvements or merely represent symbolic compliance. Prior research shows that green bond issuance can be associated with reductions in carbon intensity and improvements in environmental performance (Flammer, 2021; Fatica et al., 2021), although other studies document evidence of strategic or low-quality innovation responses (Shi et al., 2023). The present results indicate that institutional context may be a key moderating factor. In environments characterized by regulatory clarity, strong investor oversight, and developed verification ecosystems, green labelling is more likely to reflect credible commitment and sustained environmental engagement. In contrast, where administrative burdens are high and monitoring capacity weaker, firms may either avoid issuance or face reduced incentives to maintain high-quality compliance, potentially limiting real environmental impact.

Methodologically, the rejection of independence between bond market participation and green labelling decisions confirms that these are sequential and interrelated choices. By explicitly modelling selection into bond markets, the analysis distinguishes the determinants of general debt access from those influencing sustainable labelling, avoiding potential conflation of firm-level financial strength with institutional and market conditions. This approach strengthens the interpretation that the documented effects operate primarily through the labelling margin rather than through differential bond market participation.

Overall, the evidence suggests that green bond issuance is an institutionally embedded outcome shaped by the interaction of administrative efficiency, regulatory credibility, investor demand, and market infrastructure. Sustainable finance policy aimed at expanding green bond

markets should therefore extend beyond the introduction of taxonomies or disclosure mandates. Streamlining administrative procedures, strengthening verification ecosystems, and deepening local capital markets are equally critical for translating sustainability objectives into effective financing outcomes (Ehlers et al., 2020; OECD, 2023). The development of green bond markets thus appears to depend not only on environmental ambition or investor preferences, but on the practical capacity of institutional systems to support credible and scalable sustainable finance.

7 Conclusion

This paper studies how administrative frictions shape corporate green bond adoption and condition the institutional channels through which regulation, investor demand, and market infrastructure translate into labelled issuance. Modelling green labelling as a discrete choice conditional on bond issuance allows us to isolate the determinants of the green-versus-conventional decision from general access to public debt markets. Using a global panel of MSCI World firms matched to green and conventional corporate bond issuances between 2013 and 2024, we combine Probit models with interaction-based moderation tests, sectoral heterogeneity analyses, selection correction via Heckprobit, and quasi-experimental evidence from staggered disclosure adoption.

Three core findings emerge. First, administrative frictions are a meaningful barrier to green labelling. In baseline estimates, greater bureaucratic complexity is associated with a lower probability that an issuance is labelled green. Once interaction terms are introduced, the direct effect of frictions weakens, indicating that administrative capacity matters mainly by shaping the effectiveness of other institutional drivers rather than operating as a purely additive constraint.

Second, regulation and demand are robust drivers of green bond issuance, but their effectiveness is conditional on the administrative environment. Stronger green regulatory frameworks are consistently associated with higher green issuance probabilities, supporting the view that taxonomies and disclosure regimes reduce classification uncertainty and strengthen credibil-

ity. Local green demand is the strongest determinant across specifications, consistent with ESG-oriented investor preferences generating private benefits from labelling. However, conditional marginal effects show that the demand channel is substantially weaker in high-friction environments, implying that administrative burdens limit firms' ability to respond to investor appetite. For advisory infrastructure, effects remain positive, but the interaction patterns are more nuanced than a uniform amplification mechanism, suggesting that intermediation facilitates issuance without fully offsetting administrative burdens.

Third, the institutional drivers of green issuance vary across sectors and over time. In transition-intensive sectors, regulation, demand, and advisory capacity exert markedly larger positive effects, consistent with stronger decarbonisation investment needs and greater investor attention. Conversely, administrative frictions appear more binding in low-transition sectors, where green finance is less structurally embedded. The difference-in-differences event study provides complementary quasi-causal evidence that mandatory sustainability disclosure adoption increases green bond issuance, with effects that appear immediately and strengthen over time. The absence of differential pre-trends supports the identifying assumption and suggests that disclosure reforms operate as credibility infrastructure that becomes more effective as firms adapt and reporting practices diffuse.

These results contribute to the sustainable finance literature by positioning administrative capacity as a core institutional mechanism rather than a background condition. They help reconcile heterogeneous cross-country responses to similar sustainable finance reforms and clarify why investor demand does not always translate into labelled supply. The findings also carry clear policy implications. Expanding corporate green bond markets requires more than announcing ambitious frameworks. It requires implementation capacity that keeps compliance costs manageable, alongside credible disclosure regimes and market infrastructures that support verification and reduce information frictions. Streamlining procedures and strengthening administrative effectiveness are therefore complementary to taxonomies and disclosure mandates if policymakers aim to broaden green bond adoption beyond the sectors and jurisdictions where it is already concentrated.

Future research could refine these insights by distinguishing specific components of administrative frictions (e.g., licensing delays, enforcement predictability, reporting burdens), exploring firm-level adjustment costs and learning dynamics in response to regulatory change, and linking the administrative environment more directly to post-issuance environmental outcomes to assess whether stronger administrative capacity also improves the environmental integrity of labelled finance.

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8 Appendix

A Variable Construction

A.1 Green Regulation Index

We construct a country-year Green Regulation Index to measure the regulatory intensity of sustainable finance frameworks. The index captures compliance obligations associated with environmental reporting, taxonomic classification, and green bond issuance requirements.

The index is built using a structured scoring grid applied consistently across countries and years. It aggregates three components:

(i) Reporting requirements (0–5) This component captures the strength and enforceability of mandatory climate and ESG disclosure obligations imposed on firms:

- 0 = No formal framework
- 1 = Soft guidance or voluntary framework
- 2 = “Comply or explain” regime
- 3 = Structured legal obligation
- 4 = Detailed mandatory disclosure with broad scope
- 5 = Highly stringent regime with standardization and mandatory assurance

This dimension reflects recurring administrative costs related to data collection, reporting systems, and verification.

(ii) Taxonomy framework (0–3) This component measures the existence and legal force of a sustainable finance taxonomy:

- 0 = No taxonomy

- 1 = Announced
- 2 = Under development
- 3 = Officially adopted and legally operational

Taxonomies impose classification and reporting obligations by requiring firms and financial institutions to assess and disclose alignment with sustainable activity definitions.

(iii) Green bond framework (0–2) This component captures the presence of a national or sovereign green bond framework:

- 0 = No official framework
- 1 = Voluntary national framework
- 2 = Structured and operational sovereign or national framework

This dimension reflects documentation, allocation reporting, and verification requirements imposed on green bond issuers.

Index construction. The overall Green Regulation Index is computed as the sum of the three components, yielding a country-year score ranging from 0 to 10. Higher values indicate stronger regulatory frameworks and greater compliance intensity.

Scoring decisions are based on official regulatory publications, stock exchange rules, and central bank guidance. Regulatory changes are coded from their effective implementation year.

A.2 Advisory Environment

The Advisory Environment variable captures the historical maturity of the second-party opinion (SPO) ecosystem within each country. The raw advisory dataset is obtained from the Climate Bonds Initiative, which provides bond-level information on the presence of second-party opinions.

The construction is motivated by the idea that SPO providers generate knowledge spillovers and institutional learning effects. Once advisory services operate in a country, they contribute to market standardization and credibility that persist over time. Accordingly, we construct a cumulative measure rather than relying on contemporaneous activity.

Construction steps. For each country-year, we compute:

1. Annual number of deals with SPO:

$$n_spo_{c,t}$$

2. Annual total number of bond deals:

$$n_total, c, t$$

3. Cumulative SPO deals:

$$cum_n_spo_{c,t} = \sum_{k \leq t} n_spo_{c,k}$$

4. Cumulative total deals:

$$cum_n_total_{c,t} = \sum_{k \leq t} n_total, c, k$$

5. Historical cumulative SPO share (main variable):

$$cum_share_spo_prev, c, t = 100 \times \frac{cum_n_spo_{c,t-1}}{cum_n_total_{c,t-1}}$$

We use the lagged cumulative ratio to ensure that only historical advisory development influences issuance decisions in year t .

B Figures

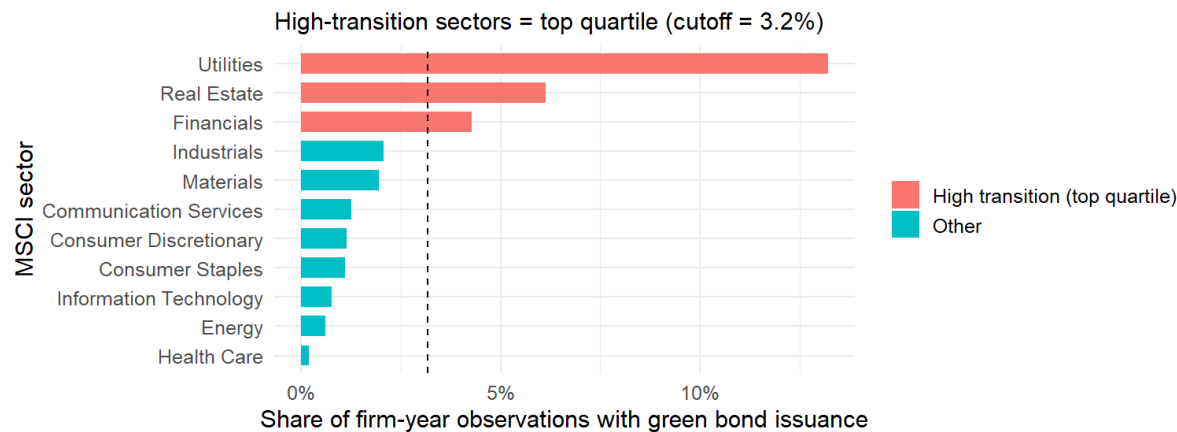


Figure 1: Share of firm-year observations with green bond issuance by MSCI sector. The dashed vertical line indicates the top-quartile cutoff (3.2%) used to classify high-transition sectors. Utilities, Real Estate, and Financials exceed this threshold and are classified as high-transition industries. The figure highlights the strong sectoral concentration of green bond issuance in transition-intensive sectors.

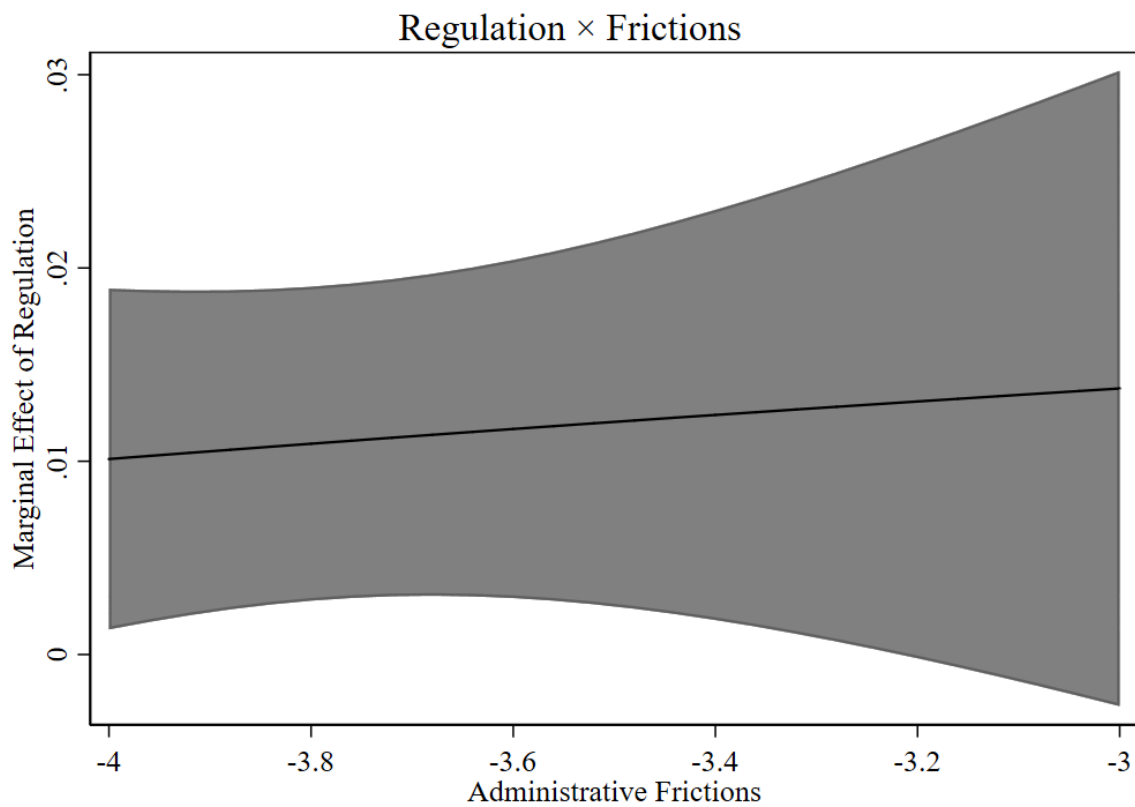


Figure 2: Marginal effect of green regulatory strength on the probability of green bond issuance across levels of administrative frictions. The solid line reports estimated average marginal effects, and the shaded area represents 95% confidence intervals. Regulatory effects remain positive across friction levels, with magnitude varying moderately with administrative complexity.

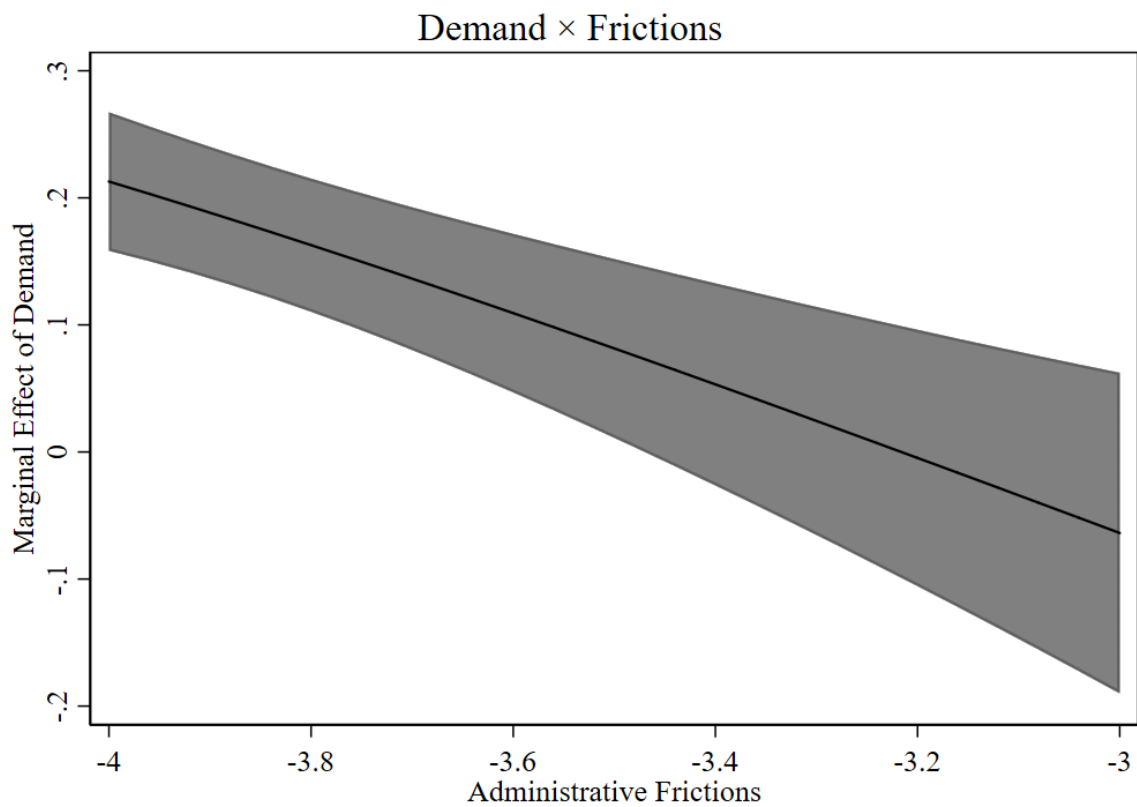


Figure 3: Marginal effect of local green investor demand on the probability of green bond issuance across levels of administrative frictions. The solid line reports estimated average marginal effects from the Probit model, and the shaded area represents 95% confidence intervals. The positive impact of green demand declines as administrative frictions increase, indicating that bureaucratic complexity attenuates the demand channel.

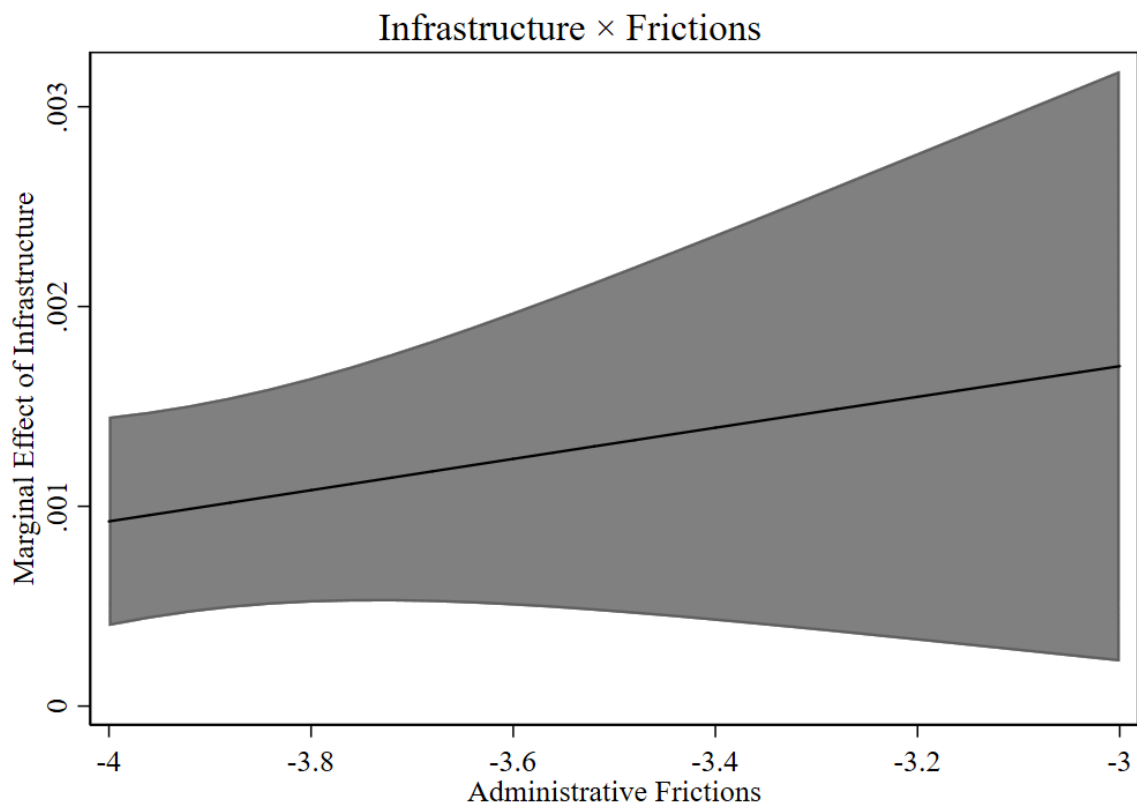


Figure 4: Marginal effect of green bond market infrastructure (advisory depth and liquidity) on green bond issuance across levels of administrative frictions. The solid line reports estimated average marginal effects, and the shaded area represents 95% confidence intervals. The positive effect of infrastructure strengthens as administrative frictions increase, suggesting that intermediation partially offsets bureaucratic constraints.

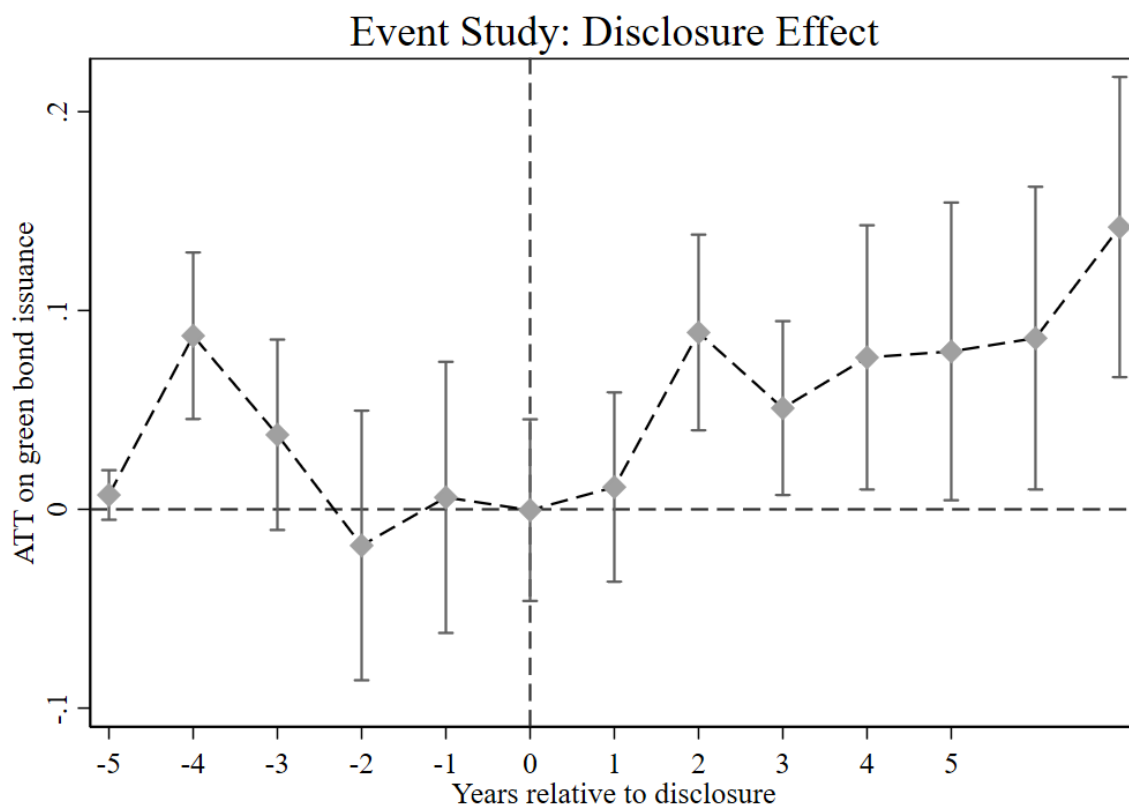


Figure 5: Dynamic treatment effects of mandatory sustainability disclosure adoption on the probability of green bond issuance. Estimates are relative to the year prior to adoption ($t = 1$). Points denote cohort-average ATT estimates from the Callaway–Sant’Anna (DRIPW) estimator, with 95% confidence intervals. Pre-treatment effects are statistically insignificant, supporting parallel trends, while post-adoption effects are positive and increase over time.

C Additional Tables

Table 5: Variable definitions and data sources

Variable	Description	Source
<i>Dependent variables</i>		
Green bond issuance	Dummy equal to 1 if the bond is labelled as green.	CBI, Refinitiv
Any bond issuance	Dummy equal to 1 if the firm issues any corporate bond (green or conventional).	Refinitiv
<i>Firm-level controls</i>		
Firm size	Natural logarithm of total assets.	Refinitiv
Credit rating	Long-term issuer credit rating, transformed so that higher values indicate worse credit quality.	Refinitiv
Maturity	The average of number of years for bond maturity.	Refinitiv
Profitability	Return on equity, measured as net income divided by shareholder equity.	Refinitiv
<i>Institutional and green market variables</i>		
Administrative frictions	Inverse of bureaucratic quality; higher values indicate greater bureaucratic complexity.	ICRG
Green demand	Proxy for local investor demand for green assets in the domestic bond market.	Refinitiv
Market liquidity	Measure of bond market depth and secondary market trading activity.	Refinitiv
Green regulation	Index capturing the strength and implementation of green taxonomies and disclosure frameworks.	OECD, Authors' construction
Advisory environment	Measure of availability of green bond verifiers and advisory services.	CBI, Authors' construction
<i>Macroeconomic controls</i>		
Law and order	Assessment of the strength and impartiality of the legal system.	ICRG
Corruption	Assessment of corruption within the political system.	ICRG
Investment Profile	Assessment of factors influencing the risk of investment	ICRG
Size of banking sector	Domestic credit to the private sector as a share of GDP.	World Development Indicators
GDP growth	Annual growth rate of gross domestic product.	World Development Indicators
Inflation	GDP deflator annual growth rate.	World Development Indicators

Table 6: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
GB issuance	3,521	0.161	0.368	0	1
Administrative frictions	3,326	-3.892	0.303	-4.000	-2.500
Green Regulation	3,521	1.811	1.903	0	9
Green demand	3,521	0.124	0.232	0	1
Liquidity	3,521	0.065	0.137	0.0001	1.420
Advisory infrastructure	3,521	30.704	35.249	0	100
Firm size	3,521	3.074	0.924	1	4
Moody's rating	3,521	8.508	6.974	0	21
Maturity	3,326	6.267	7.004	0	47
ROE	3,296	18.181	20.760	-57.29	136.80
Law and order	3,326	4.814	0.578	3.5	6
Corruption	3,326	4.302	0.503	2.5	6
Investment profile	3,326	11.608	0.810	7.5	12
Inflation	3,326	116.822	10.021	97.745	143.947
GDP	3,521	11.450	1.275	7.485	12.584

Table 7: Baseline: Selection equation (Any bond issuance)

	Selection equation
Firm size	0.0521*** (0.0037)
Profitability	0.000831*** (0.000165)
Moody's rating	0.0152*** (0.000640)
Law and order	0.0848*** (0.00993)
Corruption	-0.0147 (0.00987)
Investment profile	-0.00746 (0.00544)
Inflation	0.00411*** (0.000352)
GDP	0.0524*** (0.00509)
Year FE	Yes
Industry FE	Yes
Observations	19,701

Notes: Standard errors clustered at firm level.

*** p<0.01, ** p<0.05, * p<0.10.