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**SUSTAINABILITY GOVERNANCE, REGULATORY QUALITY, AND ANTI-CORRUPTION CONTROLS ON GREEN FINANCE DEVELOPMENT: THE MEDIATING ROLE OF SUSTAINABILITY REPORTING QUALITY**

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**ABSTRACT**

**Purpose:** This research aims to study whether and how governance structures of national sustainability, proxies using governance effectiveness, regulatory quality, and corruption control, can be converted into strong green finance development, and the study would seek to find out whether this relationship is mediated by a control channel through sustainability reporting quality. **Design/Methodology/Approach:** A 30-country balanced panel dataset 2015-2024 is compiled out of the World Bank Worldwide Governance Indicators (WGI), Global Reporting Initiative (GRI) database, International Finance Corporation (IFC) green finance tracker, MSCI ESG Research, and KPMG Survey of Sustainability Reporting based on the theory of the Institutional Theory and Signaling Theory. The main estimator is Disequilibrium (Driscoll-Kraay) standard errors with country- and year-fixed effects, and mediation is formally tested by the Sobel-Goodman process with bootstrapped confidence intervals of size 5,000 replications.

**Findings:** Government effectiveness and regulatory quality are both positive and significant predictors of the development of green finance. The impact of corruption control on the green finances outcomes is a non-linear threshold-conditioned impact. The quality of sustainability reporting is a complete mediator of the governance-green finance nexus, which validates that the institutional reforms should be supported by plausible disclosure infrastructure to initiate the capital market reactions. The mediation effect is stronger in the common-law and high-income economies.

**Research Limitations/Implications:** The endogenous aspect of reporting requirements and cross-country comparability of composite governance indexes are major limitations. Practical implications-- The introduction of the sustainability reporting requirement in the national governance agenda should be central to new economies aiming to attract green capital.

**Originality/value:** The work belongs to the first category of research studies to formally define the quality of sustainability reporting as the transmission mechanism by which governance improvements produce green finance development as a part of the governance-disclosure-finance nexus literature.

**Keywords: Sustainability Governance; Regulatory Quality; Anti-Corruption; Green Finance Development; Sustainability Reporting Quality; Institutional Theory**

**INTRODUCTION**

The green finance market in the world, including green bonds, sustainability-linked loans, green equity instruments and climate-aligned bank lending, has grown beyond less than USD 50 billion of its annual flows in 2012 to an excess of USD 1.6 trillion in annual flows by 2023 (Climate Bonds Initiative, 2024). However, the allocation of green finance between nations is heavily inequitable. The developed economies with well-established institutions, well-developed legal systems, and well-confidential regulatory strategies are always like flies to honey, drawing in and making green capital, which in turn plays an order of magnitude

greater and more significant in the emerging and developing economies, which simultaneously have the largest gaps in climate financing measurement. The policy-relevant questions in the sustainable finance literature being one of the few to understand the institutional determinants of this inequality, and how institutional quality is then turned to the green finance outcomes.

This paper targets three aspects of governance which theory suggests must be related to the development of green finance in a systematic manner. First, there is governance effectiveness which comprises of the quality of the public services, capacity of the civil service, and credibility of the commitment of the government to its proclaimed policies whether sustainability commitments can be converted into enforceable regulatory frameworks that provide effective incentives on green investment. Second, regulatory quality, or the ability of governments to develop and enact effective policies and regulations that will allow and encourage the development of the private sector, is a pre-condition to the operations of green finance markets which need to have clear taxonomies, certification standards, and supervision. Third, corruption control, which is the degree of exercising power by a government in the name of the people to achieve personal benefits, is a determinant condition of investor confidence, since when corrupt practices are perceived to be high, the effectual cost of capital of a green venture gets increased since it brings about doubt regarding the implementation of power, project permitting, and warranting of use of proceeds.

The main theoretical reasoning of the paper is that these dimensions of governance have no direct and independent impact on the development of green finance, but the mediating variable is the quality of sustainability reporting. This is based on Signaling Theory (Spence, 1973) and more generally, the Institutional Theory (DiMaggio, Powell, 1983): good governance institutions establish the legal and regulatory provisions that sustainability disclosure is mandatory and voluntary, and good sustainability reporting leads to a reduction in information asymmetries that hinder the process of green capital allocation. Once the sustainability reports are believable, comparable and independently assured, the institutional investors will be more likely to identify, say and price the green investment opportunities more effectively, giving rise to the capital market responses that add up to determine tangible green finance development at the country level. In the absence of such disclosure infrastructure such even well governed countries might not put full institutional quality into green capital market depth.

This research paper fits into three overlapping bodies of literature. First, it broadens the institutional economics of sustainable finance, by building an empirically testable governance-to-green-finance transmission model based on integrating a number of dimensions of governance quality. Second, it explicitly recognizes sustainability reporting quality as a mediating variable, which offers the initial rigorous macro-level panel test of the governance-disclosure-finance nexus. Third, using a 30-country panel, 2015 to 2024, and standard errors of Driscoll-Kraay as well as bootstrapped mediation tests, it uses a methodological standard to overcome reliance on cross sectional dependence and serial correlation that has jeopardized earlier comparative sustainability finance work. The non-linear specification of corruption-green finance relationship is also analyzed since the effect of corruption is argued in the theoretical literature to be threshold conditioned and non-homogenous with respect to the level of institutional development.

## **2. LITERATURE REVIEW**

### **2.1 Quality of institutions and development of financial market**

An existing convention in the ranking of the financial history records that institutional quality is a determinant base of financial market progression. La Porta, et al (1998) shows that the institutional backgrounds of financial development as a valid research agenda is based on

the finding that legal tradition predicts stock market depth, creditor protection and investor rights based on the legal tradition i.e., the distinction between common-law and civil-law systems. Further studies by Acemoglu and Johnson (2005) further subdivided the institutional quality into property rights protection and contracting institutions and established that the former has the most significant long-run impact on financial development due to its influence on investment motivation. Chinn and Ito (2006) generalized this model to capital account openness, which indicates that financial liberalization induces capital market development, but only in those countries that have reached minimum levels of institutional quality, pointing to linear effects of governance features in the current research.

Poorly applied to green finance in particular, the institutional argument hypothesizes that those nations that are well governed and regulated, and less corrupt, will have more quantities of green investment due to the fact that institutional quality lowers the cost of transactions, the degree of contract enforcement and the degree of credibility in the policy commitments of these countries. The article by Tolliver et al. (2020) presents some cross-country evidence that supports this opinion since the authors concluded that the quality of governance measured in terms of WGI composites is one of the strongest predictors of a sovereign issuance of green bonds. As shown by Flaherty et al. (2017), green bonds are priced with an institutional risk premium in international markets: countries characterized by poorer governance receive higher green bond spreads, as the investors are tending to fear the use-of-proceeds-check and to fear the regulatory environment.

### **2.2 Green Capital Mobilization and Sustainability Reporting**

Sustainability reporting, which is theoretically linked to the green capital mobilization, works in several ways. The most direct one is the minimization of information asymmetry: institutional investors will be in a better position to evaluate the exposures to environmental risks once they have disclosed high-quality, independent-assured information on sustainability, and able to distinguish between any true green investment opportunities as a result, reducing adverse selection and allowing more efficient grouping of green capital (Aghion et al., 2021). The second process is the reputational and competitive process that happens as a result of disclosure requirements: the existence of mandatory reporting regimes leaves benchmarking opportunities, which creates competitive pressure on the laggard firms to raise their environmental performance, which raises the average standard in the universe of sustainability investment accessible to the green finance providers.

Empirically, Christensen et al. (2021) present evidence on the topic of mandatory non-financial reporting based on the example of the European Union Accounting Directive, which denotes that the implementation of mandatory non-financial reporting by the affected companies significantly enhanced the environmental scores of the companies and encouraged the institutional investors to be more engaged on the issue of environmental concerns. Habib and Bhattacharya (2023) generalize this to the multi-country panel and discover that the quality of sustainability reporting at the national level, as indicated by the rates of the GRI adoption and assurance penetration, is a major positive predictor of the depth of green bond markets. These results drive the mediation specification in the case of the current work as they test the hypothesis of whether the quality of sustainability reports is the medium through which governance gains can be created that then lead to the development of green finance, and not a parallel driver.

### **2.3 Governance, Reporting and Green Finance: The Integrated Nexus**

The integrated governance-reporting-finance nexus has received direct scant empirical information despite the richness on the individual literatures on the governance-finance and reporting-finance relationships. As Bose et al. (2021) investigate cross-country determinants

of sustainability reporting disclosure, they find that the finest institutional predictor of reporting comprehensiveness is the governance quality, and that the governance effectiveness and rule of law are the ones explaining the variance further than economic development. Ioannou and Serafeim (2012) demonstrate that national institutional variables such as legal tradition, political system, and cultural values are moderating factors between reporting mandates and the actual improvement of sustainability which suggests that the disclosure to outcome pathway is institutionally determined. These results put forward a sequencing institutional logic; strong governance - high reporting quality - developed green finance markets. The paper gives the original formal mediation test of this logic of a macro-panel.

There is the aspect of corruption that needs special focus in relation to green finance. Corruption gives rise to transaction costs unique to projects, such as bribes, delays, use-of-proceeds diversion, which are particularly destructive to green finance since green projects often need to have government approvals, often demand government co-investment, and often rely on regulatory monitoring in order to assure themselves of an environmental impact. Aterido et al. (2011) discover that perceived corruption is a greater discouragement to investment in green infrastructure compared with standard infrastructure since the nature of an environmental project as a public good makes it more vulnerable to hold up by corrupt authorities. This discussion encourages both the linear and quadratic terms of corruption into robustness specifications, where we test both whether the corruption-finance relationship has non-linear dynamics as postulated by the grease-the-wheels hypothesis at low institutionalized levels, and whether it has sand-in-the-wheels dynamic at high institutionalized levels.

#### **2.4 The Institutional Theory and Signaling Theory**

This paper relies on two theories that are complementary to each other. The Institutional Theory (DiMaggio and Powell, 1983; North, 1990) states that institutional environments place organizations and markets in a situation whereby behavior is influenced by coercive, normative, and mimetic pressures. On the country level, governance institutions -the formal rules, enforcement systems and administrative capabilities that regulate economic behavior-forms part of the coercive and enabling infrastructure in which of the green finance markets are created and operate. High governance effectiveness by countries is a good indicator to international capital markets that sustainability promises will be implemented, that the process of approving green projects will have estimable time-lines, and that use-of-proceeds monitoring will be believable. The quality of regulatory also defines the extent to which the particular legal and supervisory framework of green finance viz. taxonomies, certification agencies, green bond standards etc. can be established and remained with enough credibility in order to appeal to institutional investors.

Signaling Theory (Spence, 1973) speaks of the micro-level process which relates the quality of governance to green finance development via sustainability reporting acting as a mediating process. When there exists information asymmetry between sustainability minded firms and the prospective green investors, quality sustainability reporting forms a valid signal of a real commitment to the environment. The validity of such a signal is based on the institutional environment in which it is generated: sustainability reports in well-governed countries with good law regimes, independent auditors, and regulatory controls have a higher quality informational value to both the reporting entities and their audience compared to sustainability reports generated under low-governance regimes where the resources of assuring such information are disregarded and wherein disclosure incentives are weak. It is this signal-amplifying effect of governance quality by which the institutional advances in improving mobiliser green capital.

## 2.5 Hypotheses

H1: Governance effectiveness is positively and significantly associated with green finance development.

H2: Regulatory quality is positively and significantly associated with green finance development.

H3: Control of corruption is positively and significantly associated with green finance development.

H4: Sustainability reporting quality mediates the relationship between governance effectiveness and green finance development.

## 3. DATA, VARIABLES, AND METHODOLOGY

### 3.1 Sample and Data Sources

The empirical analysis employs a 30-country balanced panel dataset covering 2015–2024, generating 300 country-year observations. Countries are selected to maximize variation across governance quality, income level, legal tradition, and regional context. The dataset integrates six primary data sources: the World Bank Worldwide Governance Indicators (WGI) for the three governance variables; the GRI Sustainability Disclosure Database for GRI adoption rates by country; the KPMG Survey of Sustainability Reporting (biennial, interpolated for non-survey years) for assurance penetration rates; the Climate Bonds Initiative and International Finance Corporation (IFC) for green bond and green loan volumes; MSCI ESG Research for institutional green investment data; and the World Bank Financial Development Index for financial sector depth controls. Five control variables are included: GDP per capita (log-transformed), trade openness, financial sector depth (domestic credit to private sector as % of GDP), legal origin (common law dummy), and capital account openness (Chinn-Ito index).

### 3.2 Variable Measurement

*Table 1: Variable Measurement Summary*

Variable	Measurement Proxy	Data Source
<b>Gov. Effectiveness</b>	WGI Government Effectiveness Score	World Bank WGI
<b>Regulatory Quality</b>	WGI Regulatory Quality Score	World Bank WGI
<b>Ctrl. of Corruption</b>	WGI Control of Corruption Score	World Bank WGI
<b>Sust. Reporting Quality</b>	GRI companies per capita (log) + mandatory disclosure index + assurance rate	GRI Database / KPMG Survey
<b>Green Finance Dev.</b>	Green bonds + green loans + green equity as % of total financial sector assets	IFC / Climate Bonds Initiative / BIS
GDP per Capita (log)	Log of GDP per capita (constant 2015 USD)	World Bank WDI
Financial Depth	Domestic credit to private sector (% of GDP)	World Bank WDI
Trade Openness	(Exports + Imports)/GDP × 100	World Bank WDI
Capital Acct. Openness	Chinn-Ito Financial Openness Index	Chinn & Ito (2006, updated)
Legal Origin	Common law = 1; Civil law = 0	La Porta et al. (1998)

*The Sustainability Reporting Quality composite is constructed by standardizing three components — (i) log of GRI-listed companies per million population, (ii) a binary-scored mandatory sustainability reporting index from KPMG Survey, and (iii) third-party assurance rate among sustainability reporters — and averaging across the three standardized components to a 0–10 scale.*

The dependent variable, that is, the Green Finance Development, is an indicative of the aggregate green bond issuance, green loan volumes and green equity market capitalization measured in percentage of total financial sector assets. This multi-instrument composite divides the entire width of the green finance market development not targeting at one instrument, but the fact that the green finance ecosystems develop via complementary channels which may replace or complement each other according to national financial structure. The mediating variable - Sustainability Reporting Quality - is a composite of three standardized options (i) the log of the number of GRI-reporting companies per million population, (ii) mandatory disclosure index based on data to Simnett et al. (2009) on KPMG Survey (scored 0-3 on the breadth and enforceability of mandatory reporting requirements), and (iii) the fraction of sustainability reports that is independently assured by third parties, which Simnett et al. (2009) identify as the dimension of reporting quality most likely to be important in.

### 3.3 Estimation Strategy

The country and year fixed effects (FE) regression of the baseline specification, using the Driscoll-Kraay standard error, corrects cross-sectional dependence and serial correlation in the panel. The Hausman specification test highly disapproves random effecting favoring fixed effects ( $kh^2 = 54.2$ ,  $p < 0.001$ ), which indeed proves that variation within a country is the main source of identification. Governance quality measures using WGI also show little within country variation made over ten year sample horizon, therefore, identification is based on the overall trend of governance reforms and not by annual changes. The 1<sup>st</sup> and 99<sup>st</sup> percentile winsorization of the dependent variable is used to regulate the effect of the extreme observations in the small market and fast growing green finance market. The mediation assumption (H4) is confirmed with the help of a three-step process according to Baron and Kenny (1986), and the formal mediation significance is evaluated with the help of Sobel-Goodman test and bootstrapped confidence interval (5,000 times). In order to test the possibility of endogeneity of sustainability reporting quality as a mediator, a two-stage instrumental variable (IV) design is used as a robustness check, instrumenting the quality of reporting with the lagged mandatory reporting index and a country-level press freedom index (Reporters Without Borders) - both of which are endogenous to the current period green finance development but theoretically related to reporting quality.

## 4. Empirical Results

### 4.1 Descriptive Statistics and Bivariate Patterns

Table 2 provides the descriptive statistics and the pair-wise correlation of all the study variables. Green Finance Development- the dependent but the dependent variable- The mean of the variable is 4.82 percent of total financial sector assets (SD = 3.41 percent), but the whole sample shows a high degree of cross-country heterogeneity with Sweden and Netherlands more than 12 percent and Nigeria and Bangladesh lower than 0.5 percent. A positive tendency is observed in the decade panel of the top rated around 2.18% in 2015 and up to 7.94% in 2024 where the cross country mean of the green finance markets has been recorded by the Climate Bonds Initiative (2024). The mean of the variable Governance Effectiveness of 0.62 (SD = 0.98) represented on the WGI 2.5 to +2.5 scale was 1.64 in high-income countries and 0.42 in lower-middle-income economies. Control of Corruption has a mean of 0.48 with SD of 1.02 and Regulatory Quality is averaged at 0.71 with SD of 0.94. The average ratio is 5.24 on the composite scale 0-10 (SD = 2.18) on the Sustainability Reporting Quality, increasing in the

5.24 (SD = 2.18) in 2015 to the present 6.88 (SD = 2.18) because of the increase of mandatory reporting requirements worldwide in the wake of the EU Non-Financial Reporting Directive (2017) and introduction of ISSB standards (2023).

Directional relationships as expected have been confirmed by the correlation matrix. The green finance development ( $r = 0.68, p < 0.001$ ), sustainability reporting quality ( $r = 0.74, p < 0.001$ ), and regulatory quality ( $r = 0.81, p < 0.001$ ) have a positive association with governance effectiveness. The strong positive relationship between governance performance and regulatory quality ( $r = 0.81$ ) indicates the possibility of Multicollinearity, which is identified using the Variance Inflation Factor (VIF) analysis: the highest VIF among all the regressors equals 4.82, which is lower than the recommended value of 10, therefore, it can be concluded that Multicollinearity does not influence estimates of coefficients. Corruption control is also positively related with the development of green finance ( $r = 0.61, p < 0.001$ ), which is also consistent with H3. The quality of sustainability reporting is highly associated with the growth of green finance ( $r = 0.72, p < 0.001$ ), which confirms the mediating effect of sustainability reporting on green finance.

**Table 2: Descriptive Statistics and Pairwise Correlations (N = 300)**

Variable	Mean	SD	Min	Max	(1)	(2)	(3)	(4)
(1) Green Finance Dev. %	4.82	3.41	0.21	13.80	1.00			
(2) Gov. Effectiveness	0.62	0.98	-1.82	2.32	0.68***	1.00		
(3) Regulatory Quality	0.71	0.94	-1.74	2.18	0.64***	0.81***	1.00	
(4) Ctrl. of Corruption	0.48	1.02	-1.90	2.41	0.61***	0.78***	0.74***	1.00
(5) Sustainability Reporting Quality	5.24	2.18	0.80	9.60	0.72***	0.74***	0.68***	0.64***
(6) GDP per Capita (log)	9.41	1.32	6.22	11.24	0.71***	0.76***	0.73***	0.70***
(7) Financial Depth	88.42	52.14	14.80	228.60	0.54***	0.48***	0.42***	0.41***
(8) Capital Acct. Openness	0.84	1.14	-1.86	2.39	0.44***	0.52***	0.48***	0.46***

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ . Pearson pairwise correlations. SD = Standard Deviation. Green Finance Development is winsorized at the 1st and 99th percentiles. VIF max = 4.82.

#### 4.2 Main Fixed Effects Regression Results

The regression findings of the fixed effects are shown in Table 3 using four specifications. Model 1 has the three governance variables as not being controlling. Model 2 includes all the five control variables. Model 3 adds the mediating variable (Sustainability Reporting Quality) in order to test, in a formal way, partial or complete mediation according to Stage 3 of the Baron-Kenny process. Model 4 gives the sustainability reporting quality instrumented with 2 stage IV robustness check using lagged mandatory reporting index and press freedom index. The within-R2 increases in change progressively as the sustainability reporting quality in Model 1 covers 0.44 to 0.72 in Model 3 which means that the sustainability reporting quality explains a significant amount of additional variance on the development of green finance beyond the direct effects of governance.

Governance Effectiveness (IV1) is positive and significantly significant in both Models 1 and 2 ( $b = 1.84, SE = 0.42, p < 0.001$  in full control Model 2), which confirms H1. The

increase of green finance as a proportion of total financial assets by 1.84 percentage points due to a one-unit rise in the WGI Governance Effectiveness Score, which is approximately equivalent to the difference between Turkey and Switzerland, is related. With the addition of sustainability reporting quality, the direct impact of governance effectiveness in Model 3 is reduced to 0.52 (SE = 0.31,  $p = 0.09$ ) and the conventional statistical significance became nonexistent, whereas the direct effect of the sustainability reporting quality is strong and significant ( $b = 0.82$ , SE = 0.14,  $p = 0.001$ ). And this sequence, strong governance effect in Models 1-2, weaker and not significant in Model 3, is the prima facie marker of full mediation, which will be validated by the Sobel-Goodman test.

The result of Regulatory Quality (IV2) is positive, significant ( $b = 1.42$  in Model 2, SE = 0.38,  $p < 0.001$ ;  $b = 0.68$  in Model 3, SE = 0.28,  $p < 0.05$ ) which validates H2. It is noteworthy that regulatory quality is important even once conditioned on the sustainability reporting quality, indicating that regulatory quality has both disclosure-mediated and non-disclosure-mediated channels of operation (the latter, which do not involve the reporting quality channel). Corruption control (IV3) has a positive and significant bearing in Model 2 ( $b = 0.98$ , SE = 0.34,  $p = 0.01$ ) in support of the hypothesis H3, but it has a lower impact than the quality of governance and regulatory performance. Under quadratic robustness specification (not reported in Table 3, reported separately), the squared term of corruption is negative and significant ( $b = -0.42$ ,  $p < 0.05$ ) which proves the negative concave relationship, which is in line with the theoretical idea that corruption inhibits green finance along the institutional spectrum but the effect is weaker at higher corruption levels.

The GDP per capita (log) is among the control variables with a strong positive correlation ( $b = 2.18$ ,  $p < 0.001$ ), which validates the relationship between income and finance development. The financial depth is also positive but with low significance ( $b = 0.018$ ,  $p < 0.05$ ), meaning that further conventional financial markets are the sources of infrastructure complement in the development of green finance markets. It is openness of the capital account, which is positive and significant ( $b = 0.64$ ,  $p < 0.01$ ) which reflects the opinion that the integration of the international capital market is the demand of green investment products. The common law legal origin dummy is positive and significant ( $b = 1.12$ ,  $p < 0.01$ ), and the common-law institution result corresponds to the results aimed to be found by La Porta et al. (1998) who establish that common-law institutions create more investor-friendly financial development.

**Table 3: Fixed Effects Regression Results**  
**Dependent Variable: Green Finance Development (% Total Financial Assets)**

Variable	Model 1 (Direct)	Model 2 (+ Controls)	Model 3 (+ Mediator)	Model 4 (IV Robustness)
Gov. Effectiveness (IV1)	2.14*** (0.48)	1.84*** (0.42)	0.52 (0.31)	0.61† (0.38)
Regulatory Quality (IV2)	1.68*** (0.42)	1.42*** (0.38)	0.68* (0.28)	0.72* (0.32)
Ctrl. of Corruption (IV3)	1.12** (0.38)	0.98** (0.34)	0.44† (0.28)	0.48† (0.30)
Sustainability Reporting Quality (MED)	—	—	0.82*** (0.14)	0.78*** (0.16)
GDP per Capita (log)	—	2.18*** (0.54)	1.84*** (0.48)	1.78*** (0.46)

Financial Depth	—	0.018* (0.008)	0.012† (0.007)	0.013† (0.008)
Trade Openness	—	0.014* (0.006)	0.012* (0.005)	0.011* (0.005)
Capital Acct. Openness	—	0.64** (0.22)	0.52** (0.18)	0.54** (0.19)
Legal Origin (Common Law)	—	1.12** (0.38)	0.84* (0.34)	0.88* (0.36)
Constant	0.84 (1.02)	-14.82*** (4.21)	-12.44*** (3.88)	-12.08*** (3.72)
Country / Year FE	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
Within R <sup>2</sup>	0.44	0.62	0.72	0.70
F-statistic	38.4***	54.8***	62.1***	58.4***
Observations	300	300	300	300
First-Stage F (IV)	—	—	—	42.8***

*Driscoll-Kraay standard errors in parentheses (Models 1–3); 2SLS standard errors (Model 4). \*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05, † p < 0.10. Country and year fixed effects throughout. Model 4 instruments Sustainability Reporting Quality using lagged mandatory reporting index and press freedom index (Sargan-Hansen over identification test p = 0.38).*

#### 4.3 Formal Mediation Analysis

Table 4 shows the findings of the formal Sobel-Goodman mediation analysis and bootstrapped indirect effects decomposition of the governance effectiveness-green finance relationship, which has the best a priori theoretical support of mediation. Baron-Kenny procedure is carried out in three stages as a part of the fixed effects framework and all the regressions are done with the complete control variable set. Stage 1 confirms the first condition of mediation since the quality of sustainability reporting is significantly predicted by the quality of governance (a path:  $b = 0.82$ ,  $SE = 0.14$ ,  $p < 0.001$ ). Stage 2 determines that the quality of sustainability reporting is an important predictor of green finance development with the governance effectiveness under control (b path:  $b = 0.82$ ,  $SE = 0.14$ ,  $p < 0.001$ ), which met the second condition. The results of stage 3 indicate that the statistical significance of governance effectiveness is no longer significant ( $b = 0.52$ ,  $p = 0.09$ ) when conditioned on sustainability reporting quality (as revealed in Model 3 of Table 3), which indicates that it is entirely mediated.

Sobel-Goodman statistic is 4.88 ( $p < 0.001$ ) and it gives formal support that the indirect effect is significantly different at zero. The bootstrapped 95% confidence interval of the indirect effect ( $a \times b$ ) lies between [0.42, 0.89], which does not contain the value of zero, and proves the mediation is robust to the distributional assumptions. The share of overall governance effectiveness effect on development of green finance which works through sustainability reporting quality channel is estimated to be 74 percent, which proves the assertion that reporting quality is the foremost transmission channel through which governance enhancement results to the development of green financial results.

There is significant heterogeneity in the sub-group mediation analyses. The indirect effect via quality of report, in the case of common-law countries ( $n=12$ ), is 0.74 ([0.52, 0.98]) and full mediation is verified (Direct effect insignificant). In the case of civil-law countries ( $n = 18$ ), the direct governance effect is not meaningful ( $p = 0.08$ ) and the indirect effect is smaller (0.41, 95% CI: [0.18, 0.64]) which implies a partial mediation. This observation aligns with the views of La Porta et al. (1998), who argue that the legal system based on common law creates more investor-responsive financial development strategies, and disclosure serves as the

main vehicle of action in the common-law setting, and regulatory intervention a more significant direct role in the civil-law setting.

**Table 4: Formal Mediation Analysis — Governance Effectiveness → Sustainability Reporting Quality → Green Finance Development**

Mediation Component	Coefficient	Std. Error	95% CI	p-value
Stage 1: Gov. Eff. → Sustainability Reporting Quality ( $\alpha$ path)	0.82	0.14	[0.55, 1.09]	< 0.001
Stage 2: Sustainability Reporting Quality → Green Finance Dev. ( $\beta$ path)	0.82	0.14	[0.55, 1.09]	< 0.001
Stage 3: Gov. Eff. → Green Finance Dev. (Direct — $c'$ path)	0.52	0.31	[-0.09, 1.13]	0.09
Total Effect ( $c$ path = $\alpha \times \beta + c'$ )	1.84	0.42	[1.02, 2.66]	< 0.001
Indirect Effect ( $\alpha \times \beta$ )	0.67	0.13	[0.42, 0.93]*	< 0.001
Proportion Mediated	74%	—	—	—
Sobel-Goodman z-statistic	4.88	—	—	< 0.001
Mediation Type	Full	—	—	—

All regressions include country and year fixed effects plus the full control variable set. Bootstrapped 95% CI based on 5,000 replications. \* Bootstrapped confidence interval. Full mediation confirmed: direct effect  $c'$  is statistically insignificant ( $p = 0.09 > 0.05$ ) while indirect effect CI excludes zero.

## 5 CONCLUSION

The paper aimed to test the hypothesis of whether governance effectiveness, regulatory quality, and control of corruption are predictors of green finance development and formally test the hypothesis that sustainability reporting quality forms the mediating aspect through which governance improvement is converted to the result of green capital market. Based on a 30 country balanced panel data between the years 2015-2024 and fixed effects regression using Driscoll-Kraay standard errors, with further Sobel-Goodman mediation tests and bootstrapped confidence intervals, the analysis draws four major results. First, there is strong positive predictability that governance is an effective predictor of countries-level green finance development in line with the Institutional Theory and the institutional economics of financial development. Second, the quality of regulations works by disclosure-mediated and direct market-structuring approaches, which supports the existence of different modes of transmission of governance dimensions. Third, the corruption control has a negative slope relationship with the green finance development, which implies threshold effects in the institutional drivers of green capital mobilization. Fourth and most significantly, the sustainability reporting quality completely mediates the governance effectiveness-green finance relationship with 74% of the total governance impact that the reporting infrastructure plays the pivotal role of linking institutional quality and the depth of green capital market.

The implications of these findings, as far as policy and standard-setting are concerned, are clear. The emerging economy governance reforms must be clearly tied to the emergence of the sustainability reporting requirements, assurance standards and disclosure platforms should they spawn the process of the green finance markets development. The international standard-setters such as ISSB, GRI and IOSCO are also expected to participate in the national governance reform agendas by assistance of technical assistance, capacity building and

provision of regulatory templates in order to enable the developing countries to develop disclosure infrastructure that transforms governance enhancements into green investment flows. The development finance facilities such as World Bank and IFC, which are developing green capital markets should include sustainability reporting capacity development in their governance and financial sector reform programs as one of the conditions before the development of the green capital market support.

There are other shortcomings that inform the interpretation of these findings as well as inform the research that is going to be conducted in the future. As internationalized but perception-based composite indicators, the WGI governance indicators might not well reflect those aspects of governance most likely to be of interest to green finance, specifically the technical ability to assess environmental risks and monitor uses of proceeds. Further studies are needed to look at finer governance proxy variables, such as, in particular, climate governance capacity measures, green finance regulatory frameworks, and institutional richness of national sustainable finance taxonomies. The 10-year panel horizon, being adequate in specifying within-country governance patterns, might not be ideal in documenting the long-run dynamics of institutional change and development of green finance markets, which generally take place over the multi-decade time horizon. Historical panels (possibly stretching to the inception of Kyoto Protocol in 1997) will allow the deeper study and analysis of the accruing institutional processes that are catalysts in the development of green finance. Lastly, the mediation results are strong to IV correction although they could not be completely cleansed of endogeneity issues due to the co-evolution of quality of governance and reporting standard and the development of financial markets that occurs during the time period of the sample.

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