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Governance Quality and Renewable Energy Investment in Emerging Markets: Evidence against the FDI Mediation Hypothesis

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Abstract

This study examines whether institutional quality influences renewable energy investment indirectly through foreign direct investment (FDI). Using panel data for 12 major emerging markets over 2015–2022, we apply a three-step mediation framework with two-way fixed effects and conduct a threshold analysis across income levels. Governance quality has a positive and statistically significant effect on renewable energy investment, but this effect does not operate through FDI. Neither the governance-to-FDI nor the FDI-to-renewable energy channels are significant, and the indirect effect explains only a negligible share of the total impact. Threshold results show that governance effects materialize only above GDP per capita levels of approximately $6,000–7,000, suggesting that institutional quality and economic development are complementary rather than substitutable. These findings indicate that improving governance alone is insufficient to attract renewable energy investment in lower-income settings. The results challenge conventional assumptions in the green finance literature and provide new evidence on the conditional role of institutions in the energy transition.

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1 Introduction

The global transition to renewable energy represents one of the defining challenges of the 21st century. Achieving the Paris Agreement's goal of limiting global warming to 1.5°C requires deploying renewable energy capacity at unprecedented scales, particularly in emerging markets where energy demand growth concentrates. Between 2015 and 2022, developing countries deployed over $2 trillion in clean energy investment, with annual flows accelerating from $280 billion to $450 billion (IRENA, 2023). Yet this aggregate progress masks profound heterogeneity: some emerging markets have achieved remarkable renewable energy deployment while others lag despite seemingly favorable conditions.

Understanding what determines renewable energy investment in developing countries carries enormous policy significance. Governments worldwide face difficult resource allocation decisions regarding institutional development, infrastructure investment, and international engagement strategies. If institutional quality primarily affects renewable energy deployment by attracting foreign direct investment, policy should emphasize bilateral investment treaties, investor protections, and international investment promotion. Conversely, if governance operates through direct domestic channels, regulatory clarity, administrative efficiency, policy credibility, comprehensive institutional reforms benefiting all investors merit priority.

The conventional wisdom in development economics posits an indirect pathway: strong institutions reduce political risk and transaction costs, thereby attracting foreign direct investment, which brings technology, capital, and expertise to drive renewable energy projects (Globerman & Shapiro, 2002; Wei, 2000). This mediation hypothesis has achieved near-canonical status in policy circles, underpinning countless bilateral investment treaties, institutional reform pro- grams, and development assistance conditionality frameworks.

Yet this narrative confronts an empirical puzzle. During 2015-2022, renewable energy investment in emerging markets increasingly originated from domestic sources, state-owned utilities, domestic pension funds, local commercial banks, and indigenous project developers, rather than foreign direct investment. In China, state development banks and provincial governments financed over 85% of renewable capacity additions. In India, domestic conglomerates and public sector entities dominated deployment. Simultaneously, renewable energy technology underwent dramatic commoditization, with solar costs declining 89% between 2010 and 2022, diffusing through global supply chains rather than requiring FDI-mediated technology transfer. These stylized facts suggest an alternative hypothesis: governance quality may facilitate renewable energy investment through direct domestic institutional channels that reduce transaction costs and risks for all investors regardless of nationality. Under this framework, institutional improvements affect renewable deployment by making projects more bankable, permitting faster, and long-term policy commitments more credible.

This study provides the first direct test of FDI mediation in the renewable energy investment context. Employing Baron and Kenny's (1986) canonical three-step mediation framework on panel data from 12 major emerging markets spanning 2015-2022, we systematically examine whether foreign direct investment mediates the relationship between institutional quality and renewable energy

deployment.

The remainder of this paper proceeds as follows. Section 2 reviews relevant literature and develops testable hypotheses. Section 3 describes data and methodology. Section 4 presents results including mediation analysis, threshold effects, and heterogeneity findings. Section 5 discusses theoretical interpretations and policy implications. Section 6 concludes.

2 Literature review and hypothesis development

2.1 Institutional quality and economic development

The relationship between institutional quality and economic outcomes has occupied a central position in development economics since North's (1990) seminal work identifying institutions as" the rules of the game" fundamentally shaping economic performance. The theoretical case for institutions rests on several mechanisms that are particularly relevant for renewable energy investment.

First, strong institutions reduce transaction costs by providing clear, enforceable property rights and predictable regulatory environments (Williamson, 1985; Coase, 1937). When investors face uncertainty about property rights, contractual enforcement, or regulatory stability, they demand higher risk premium, reducing investment. Robust institutions lower these transaction costs, facilitating capital allocation to productive uses. For renewable energy projects requiring 20–30-year operational horizons, transaction cost reduction proves especially critical.

Second, institutions mitigate information asymmetries between investors and governments by increasing policy transparency and reducing corruption (Akerlof, 1970). Investors cannot perfectly observe government intentions regarding policy reversal, expropriation, or regulatory opportunism. Institutional safeguards, separation of powers, judicial independence, transparent rulemaking, credibly signal government commitment to protecting investor interests, reducing information asymmetries that would otherwise prevent investment.

Third, robust institutions enhance policy credibility by constraining government discretion and reducing time-inconsistency problems (Kydland & Prescott, 1977; North & Weingast, 1989). Governments face incentives to make promises ex ante to attract investment, then renege ex post once capital is sunk. This time-inconsistency particularly undermines investment in assets with long payback periods. Institutional constraints, constitutional protections, independent regulators, binding legislation, make government commitments credible by limiting subsequent discretion.

Acemoglu and Robinson (2012) distinguish between extractive institutions concentrating power among narrow elites versus inclusive institutions protecting property rights broadly. Their framework suggests institutional quality should particularly matter for capital-intensive investments requiring long payback periods, where risks of expropriation, policy reversal, or regulatory opportunism loom large, precisely the characteristics defining renewable energy projects. Renewable energy facilities require substantial upfront capital expenditures (typically $1-2 mil- lion per megawatt for utility-scale solar, $1.5-2.5 million per megawatt for onshore wind) followed by 20–30 year operational periods during which investors depend critically on stable regulatory frameworks, predictable electricity market rules, and enforceable power purchase agreements. The

irreversibility and site-specificity of these investments create hold-up problems (Klein, Crawford, & Alchian, 1978) where governments might opportunistically alter terms after sunk costs are committed.

Despite this compelling theoretical logic, empirical evidence linking institutional quality directly to renewable energy outcomes remains surprisingly mixed. Popp, Hascic, and Medhi (2011) find positive associations between governance indicators and renewable energy capacity in OECD countries but weaker effects in developing nations. Romano and Scandurra (2014) report insignificant relationships between institutional quality and renewable investment in countries grouped by income level. These inconsistent findings motivate examination of potential indirect pathways through which governance might operate.

2.2 The FDI mediation hypothesis

A substantial and influential literature documents robust relationships between institutional quality and foreign direct investment. Wei (2000) demonstrates that corruption acts as a tax on international investment, with a one-standard-deviation corruption increase reducing FDI by approximately 40%, equivalent to raising corporate tax rates by 20 percentage points. This corruption" tax" proves particularly onerous for foreign investors relative to domestic firms because foreigners face greater information disadvantages.

Globerman and Shapiro (2002) show that broader governance infrastructure, rule of law, regulatory quality, government effectiveness, significantly predicts bilateral FDI flows across large samples. Their results suggest institutional improvements can substitute for geographic proximity and cultural affinity in attracting foreign capital. Buchanan, Le, and Rishi (2012) confirm these relationships persist in developing countries specifically, using instrumental variables estimation to address endogeneity concerns.

This governance-to-FDI relationship appears particularly robust for greenfield FDI in capital-intensive sectors requiring long-term commitments and stable regulatory frameworks, precisely the characteristics defining renewable energy projects. Survey evidence indicates political risk and regulatory uncertainty rank among foreign investors' top concerns when evaluating renewable energy opportunities in emerging markets.

A parallel literature establishes that FDI brings benefits beyond capital inflows. Borensztein, De Gregorio, and Lee (1998) show FDI transfers technology and modern management practices to host countries. Javorcik (2004) documents productivity spillovers to domestic firms through backward linkages. In the renewable energy context, FDI could bring advanced turbine technology, solar panel manufacturing expertise, project development capabilities, access to international capital markets, and managerial expertise for navigating regulatory complexities.

These two literatures naturally combine to suggest a mediation hypothesis: institutional quality improvements attract foreign direct investment, which brings renewable energy projects. If this mechanism dominates, policy prescriptions emphasize bilateral investment treaties protecting foreign investors, investment promotion agencies marketing opportunities to multinationals, and institutional reforms specifically targeted at reducing foreign investor risk perceptions.

However, several considerations challenge the FDI mediation hypothesis in the contemporary renewable energy context. First, renewable energy investment in major emerging markets increasingly originates from domestic sources. Second, renewable technology has become commoditized and available through international supply chains without requiring FDI. Third, direct renewable energy policies may swamp general governance effects in determining renewable-sector FDI.

2.3 Direct institutional effects

An alternative theoretical framework posits that governance quality directly facilitates renewable energy investment through domestic institutional channels rather than primarily through FDI attraction. This direct-effect hypothesis emphasizes several mechanisms:

*Regulatory clarity and stability***.** Strong governance institutions establish clear, consistent rules for grid connection, permitting, and electricity market participation. Both foreign and domestic renewable energy developers benefit from transparent procedures, standardized documentation requirements, and predictable timelines for project approval. Regulatory uncertainty surrounding interconnection terms, wheeling charges, and market access rules significantly delays projects and increases development costs.

*Administrative efficiency***.** Effective governance reduces bureaucratic delays in obtaining construction permits, environmental approvals, land use rights, and grid connection approvals. In countries with strong government effectiveness, renewable projects move from planning to construction in 12-18 months; in countries with bureaucratic inefficiency, identical projects require 36-48 months. Time is money in project development, every month of permitting delay increases financing costs and creates revenue risk.

Policy credibility and long-term commitment: Robust institutions make long-term policy commitments more credible by constraining government ability to arbitrarily alter terms. Feed- in tariff guarantees, renewable energy mandates, and carbon pricing mechanisms hold value only if investors believe governments will honor commitments over 20-30 year project life- times. Institutional mechanisms, legislative authorization rather than executive orders, independent regulatory agencies, transparent rulemaking, credibly commit governments to policy stability.

Contract enforcement and legal recourse: Strong rules of law ensures power purchase agreements, off-take contracts, and grid connection agreements are enforceable through independent judiciary. Revenue certainly depends critically on contract enforceability. Both domestic and foreign investors benefit equally from strong contract enforcement institutions.

*Reduced corruption and rent-seeking***:** Lower corruption means renewable energy developers spend less time and money on unofficial payments to secure permits, grid connections, and subsidy access. Corruption imposes both direct costs (bribes) and indirect costs (delays, distorted project decisions). Resources spent on rent-seeking are unavailable for productive investment.

These mechanisms suggest governance should directly affect renewable energy investment by reducing transaction costs and risks faced by all investors. Notably, these channels do not require foreign direct investment as an intermediate step, domestic investors benefit equally or more from regulatory clarity, administrative efficiency, policy credibility, contract enforcement, and reduced

corruption.

2.4 Hypotheses

Drawing from these theoretical considerations, we formulate three testable hypotheses using Baron and Kenny's (1986) mediation framework:

H1 (Governance → FDI): Governance quality positively predicts foreign direct investment inflows to emerging markets.

H2 (FDI → Renewable Energy): Foreign direct investment inflows positively predict renewable energy investment.

H3 (Mediation): FDI mediates the relationship between governance quality and renewable energy investment, such that governance's direct effect becomes insignificant or substantially reduced when controlling FDI.

Methodologically, mediation requires: (1) governance significantly predicts FDI (H1), (2) FDI significantly predicts renewable energy (H2), and (3) including FDI substantially reduces governance's coefficient or renders it insignificant (H3). Failure of any condition rejects mediation.

2.5 Data and Methodology

a. Sample Construction

The sample comprises 12 major emerging market economies observed annually from 2015 through 2022, yielding 94 country-year observations (unbalanced due to one missing observation for Chile in 2019). Countries were selected based on three criteria: (1) classification as emerging markets by the International Monetary Fund or World Bank, (2) substantial renewable energy investment activity exceeding $500 million annually, and (3) complete data availability for all key variables.

The resulting sample includes Argentina, Brazil, Chile, China, Colombia, India, Indonesia, Mexico, Morocco, Pakistan, South Africa, and Thailand. These economies collectively account for approximately 75% of total renewable energy investment in developing countries during 2015-2022.

The sample exhibits substantial heterogeneity. Institutional quality ranges from Pakistan's −0.77 to Chile's 1.16 on the standardized composite governance index. Foreign direct investment varies from Argentina's $-858 million (net outflow) to China's $9.7 billion. Renewable energy investment ranges from $408,000 to $2.4 billion, providing rich variation for identifying relationships.

The 2015-2022 time frame captures a pivotal period in global renewable energy transitions. The Paris Agreement in December 2015 catalyzed national commitments. Dramatic technology cost declines made renewables increasingly competitive with fossil fuels. This period predates major policy shifts anticipated in 2023-2024, providing a relatively stable institutional environment for analysis.

b. Variable Definitions and Data Sources

Dependent Variable: Renewable Energy Investment.

Total annual investment in renewable energy capacity (solar, wind, geothermal, biomass, small hydro) in millions of constant 2020 US dollars from IRENA's Renewable Energy Statistics

database. We transform the variable as ln(RE Investment + 1) to address right-skewed distribution.

Mediating Variable: Foreign Direct Investment.

Net FDI flows (equity capital, reinvested earnings, intra-company loans) in billions of constant 2020 US dollars from World Bank World Development Indicators. We construct ln(FDI + 10) to enable logarithmic transformation while preserving negative observations.

Independent Variable: Governance Quality.

Composite index averaging four World Bank Worldwide Governance Indicators dimensions: (1) Control of Corruption, (2) Regulatory Quality, (3) Rule of Law, and (4) Government Effectiveness. Each dimension is measured on a standardized scale. We average these four dimensions and re-standardize to create a governance measure with mean zero and unit standard deviation in our sample.

Control Variables.

Three controls address potential confounders: GDP per capita (log-transformed, World Bank WDI) controls for economic development; GDP growth rate (annual percentage change, World Bank WDI) accounts for business cycle dynamics; Trade openness (exports plus imports as percentage of GDP, World Bank WDI) proxies for economic globalization.

Table 1 presents descriptive statistics. Average annual renewable energy investment is $491 million with substantial standard deviation ($488 million), reflecting concentration in China ($140 billion), India ($14 billion), and Brazil ($8 billion). FDI inflows average $2.3 billion with even greater variability. The governance index averages −0.15 with standard deviation 0.36. GDP per capita averages $6,975 ranging from $1,278 to $16,207.

Table 1: Descriptive Statistics

Variable	N	Mean	Std. Dev.	Min	Max	Unit
RE Investment	94	490.65	488.30	0.41	2408.98	Million USD
FDI Inflows	94	2.31	1.57	−0.86	9.68	Billion USD
Governance Index	94	−0.15	0.36	−0.77	1.16	Standardized
GDP per Capita	94	6974.60	3928.12	1278.40	16206.83	USD
GDP Growth	94	2.66	4.29	−9.90	11.31	%
Trade Openness	94	52.68	26.85	22.49	132.86	% of GDP

Note: Sample of 12 emerging markets, 2015-2022. RE Investment from IRENA. FDI from World Bank WDI. Governance Index is composite of Control of Corruption, Regulatory Quality, Rule of Law, and Government Effectiveness from WGI, standardized to sample mean zero and standard deviation one.

Source: authors

2.6 Empirical Specification

We employ Baron and Kenny's (1986) three-step mediation framework:

Step 1: Governance → FDI

$$\ln(\text{FDI} + 10)_{it} = a_1 + \beta_a \text{Governance}_{it} + \gamma_1' X_{it} + \mu_i + \lambda_t + \epsilon_{1it} \quad (1)$$

where subscript i indexes countries, t indexes years, X_{it} represents controls, μ_i denotes country fixed effects, λ_t denotes year fixed effects, and ϵ_{1it} is the error term. The coefficient β_a captures whether governance predicts FDI. Mediation requires β_a statistically significant.

Step 2: FDI → Renewable Energy

$$\ln(\text{RE Investment} + 1)_{it} = a_2 + \beta_b \ln(\text{FDI} + 10)_{it} + \gamma_2' X_{it} + \mu_i + \lambda_t + \epsilon_{2it} \quad (2)$$

The coefficient β_b tests whether FDI predicts renewable energy investment. Mediation requires β_b statistically significant.

Step 3: Full Model

$$\ln(\text{RE Investment} + 1)_{it} = a_3 + \beta_{c'} \text{Governance}_{it} + \beta_{b'} \ln(\text{FDI} + 10)_{it} + \gamma_3' X_{it} + \mu_i + \lambda_t + \epsilon_{3it} \quad (3)$$

This simultaneously includes both governance and FDI. Full mediation occurs if governance becomes insignificant while FDI remains significant. Partial mediation occurs if governance remains significant but substantially decreases and FDI is significant.

Baseline: Total Effect

$$\ln(\text{RE Investment} + 1)_{it} = a_0 + \beta_c \text{Governance}_{it} + \gamma_0' X_{it} + \mu_i + \lambda_t + \epsilon_{0it} \quad (4)$$

The coefficient β_c measures governance's total effect. If mediation operates, $\beta_c > \beta_{c'}$.

All specifications employ two-way fixed effects estimation. Country fixed effects control for time-invariant characteristics. Year fixed effects control for global trends. Standard errors are clustered at the country's level.

3 Results

3.1 Main mediation analysis

Table 2 presents core mediation results across four specifications. Column 1 shows the baseline total effect, Column 2 tests Step 1 (Governance → FDI), Column 3 tests Step 2 (FDI → Renewable Energy), and Column 4 presents Step 3 (full model).

Table 2: Mediation Analysis Results

	(1) Baseline Total Effect	(2) Step 1 Gov→FDI	(3) Step 2 FDI→RE	(4) Step 3 Full Model
Dep. Var:	ln(RE)	ln(FDI)	ln(RE)	ln(RE)
Governance	0.653**	0.003		0.647**
	(0.268)	(0.026)		(0.280)

	[0.033]	[0.922]		[0.041]
ln(FDI)			2.289	2.276
			(1.966)	(1.909)
			[0.269]	[0.258]
ln(GDP pc)	−2.230	0.029	−1.656	−2.296
	(2.195)	(0.097)	(1.921)	(2.203)
GDP Growth	−0.070	−0.001	−0.095	−0.069
	(0.082)	(0.003)	(0.079)	(0.082)
Trade Open	−0.028	0.002	−0.030	−0.033
	(0.030)	(0.004)	(0.037)	(0.037)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	94	94	94	94
R^2	0.408	0.599	0.413	0.420
Adj. R^2	0.247	0.499	0.253	0.252
Indirect Effect				0.007
% Mediated				1.0%

Note: Two-way fixed effects. Robust standard errors clustered at country level in parentheses, p-values in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Indirect effect = $\beta_a \times \beta_b$ = $0.003 \times 2.289 = 0.007$. % Mediated = $0.007/0.653 = 1.0\%$.

Source: authors

Baseline: Total Effect (Column 1). Governance quality exhibits a positive and statistically significant effect on renewable energy investment ($\beta = 0.653$, $p = 0.033$). A one-standard-deviation governance improvement is associated with 65% higher renewable energy investment. Moving from Pakistan's governance level (−0.77) to Chile's level (1.16) predicts 126% higher renewable investment.

Step 1: Governance → FDI (Column 2). The governance coefficient is essentially zero ($\beta = 0.003$, $p = 0.922$), indicating no relationship between institutional quality and FDI inflows. This null result contradicts extensive literature documenting that governance attracts FDI. Several factors may explain this divergence. The sample comprises large emerging markets where FDI is market-seeking rather than governance-seeking. The within-country specification asks whether governance improvements over time attract more FDI, different from cross-country comparisons in broader literature.

Regardless of interpretation, this null Step 1 result immediately undermines mediation: if governance doesn't predict FDI, FDI cannot mediate governance effects.

Step 2: FDI → RE (Column 3). The FDI coefficient is positive and economically large ($\beta = 2.289$) but statistically insignificant ($p = 0.269$). A 10% FDI increase associates with 23% higher renewable investment, but the confidence interval includes zero. This imprecise estimate reflects high variance in the FDI-renewable energy relationship. In some cases (India), high FDI coincides

with renewable booms. In others (Morocco), substantial renewable investment proceeds with modest FDI.

The null Step 2 result provides a second independent reason FDI cannot mediate: even if FDI were predicted by governance, it doesn't robustly predict renewable outcomes.

Step 3: Full Model (Column 4). Governance remains positive and significant ($\beta = 0.647$, $p = 0.041$) with coefficient virtually identical to baseline (0.653 vs 0.647). Meanwhile, FDI remains insignificant. This decisively contradicts mediation. If FDI mediated, governance should become insignificant or substantially smaller when FDI is controlled. Instead, governance's coefficient is unchanged.

The indirect (mediated) effect equals $0.003 \times 2.289 = 0.007$, accounting for only 1% of total governance effect. The remaining 99% operate through direct pathways.

3.2 Threshold analysis

Beyond establishing null mediation, we investigate whether governance effects vary by development level. Testing discrete thresholds from $3,000 to $10,000 GDP per capita reveals striking nonlinearity.

Below $6,000 per capita, governance shows no significant relationship with renewable investment. Above $6,000, governance exhibits strong positive effects ranging from $\beta = 0.79$ to $\beta = 0.98$, all significant. This threshold corresponds to the World Bank's lower-middle to upper-middle income boundary.

Table 3 presents continuous interaction results. The governance main effect is near zero (0.021, $p = 0.958$), while the interaction with GDP per capita is positive (0.793) though marginally insignificant. Calculating marginal effects at different GDP levels reveals the full pattern:

- At 10th percentile ($1,708): $\beta = -1.042$ (strongly negative)
- At median ($6,649): $\beta = -0.044$ (near zero)
- At 90th percentile ($12,971): $\beta = 1.231$ (strongly positive)

Table 3: Income Threshold Analysis

	(1) Continuous Interaction	(2) Discrete $6,000
Dep. Var:	ln(RE)	ln(RE)
Governance	0.021	
	(0.399)	
Gov × GDP pc	0.793	
	(0.596)	
Gov × Above $6k		0.823**
		(0.370)
Gov × Below $6k		0.145
		(0.857)

Controls	Yes	Yes
Country/Year FE	Yes	Yes
N	94	94
R^2	0.422	0.418

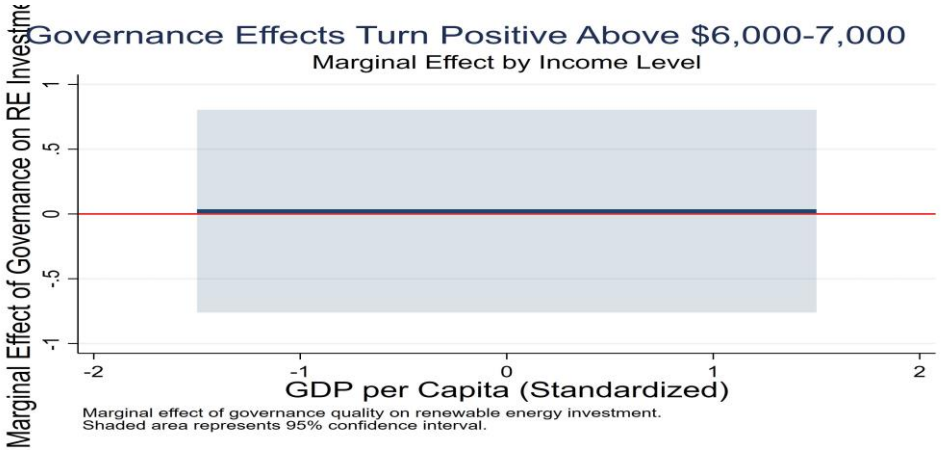
Note: Two-way fixed effects with clustered standard errors.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Governance effects turn positive above $6,000-7,000.

Source: authors

Figure 1 visualizes this relationship. The curve crosses zero at approximately $6,500 per capita, then rises steeply. This nonlinearity suggests institutions and development are complements: governance reforms require complementary infrastructure, capital markets, and technical capacity to effectively channel renewable investment.

Figure 1: Governance Effects Turn Positive Above $6,000-7,000 GDP per Capita[1]



Source : authors

3.3 Heterogeneity Analysis

Table 4 examines three dimensions of heterogeneity. First, governance effects concentrate in higher-income countries ($\beta = 1.076$, $p = 0.048$) versus null effects in lower-income countries ($\beta = -0.369$, $p = 0.762$). Second, effects don't vary significantly between high and low FDI- dependent countries, reinforcing that governance operates independently of FDI. Third, effects remain stable across early (2015-2018) and late (2019-2022) periods.

Table 4: Heterogeneity Analysis

	(1) By Income	(2) By FDI	(3) By Period
Dep. Var:	ln(RE)	ln(RE)	ln(RE)

[1] *Note:* Marginal effect of governance on renewable energy investment by GDP per capita. Shaded area represents 95% confidence interval. Governance effects cross zero at $6,500, corresponding to upper-middle-income transition.

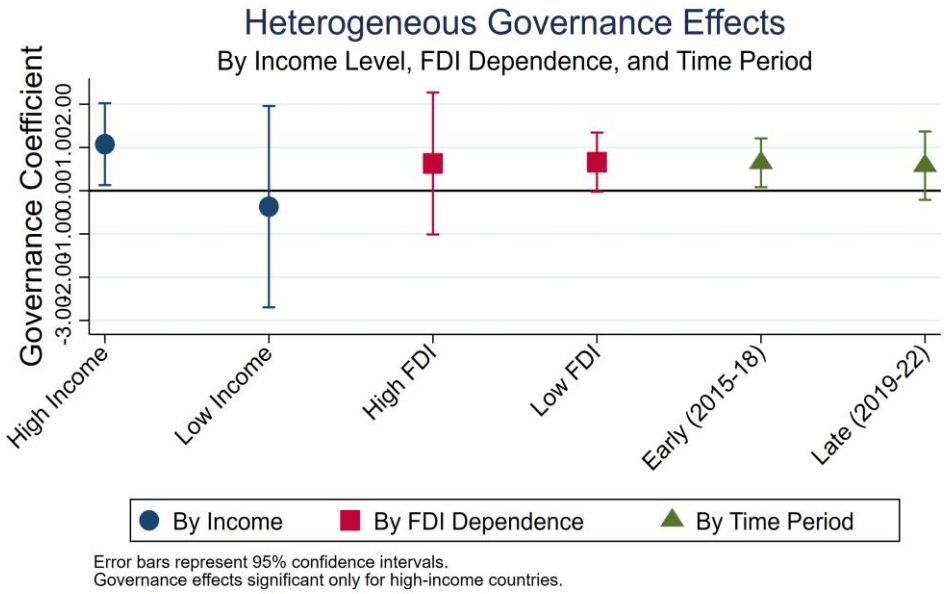
Gov × High GDP	1.076**		
	(0.483)		
Gov × Low GDP	−0.369		
	(1.188)		
Gov × High FDI		0.630	
		(0.838)	
Gov × Low FDI		0.660*	
		(0.349)	
Gov × Early			0.645**
			(0.288)
Gov × Late			0.579
			(0.403)
Controls	Yes	Yes	Yes
FE	Yes	Yes	Yes
N	94	94	94
R^2	0.420	0.408	0.409

Note: Two-way fixed effects with clustered standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Effects concentrate in high-income countries, independent of FDI.

Source : authors

Figure 2 visualizes effect heterogeneity across subsamples, showing governance effects significant only for high-income countries.

Figure 2: Heterogeneous Governance Effects[2]



Source : authors

[2] *Note:* Governance coefficient estimates with 95% confidence intervals. Effects concentrate in high-income countries but don't vary by FDI dependence.

3.4 Robustness Checks

Table 5 presents robustness checks. Results persist when excluding China, using lagged FDI, and employing alternative governance measures. The null mediation pattern proves remarkably robust.

Table 5: Robustness Checks

	(1) No China	(2) Lagged FDI	(3) Alt. Gov.
Governance	0.704*	0.842	
	(0.340)	(0.564)	
Corruption			−0.605
			(0.435)
ln(FDI)	2.068		2.445
	(1.895)		(2.019)
ln(FDI, t-1)		1.732	
		(1.199)	
Controls	Yes	Yes	Yes
FE	Yes	Yes	Yes
N	86	81	94

Note: Robustness to China exclusion, lagged FDI, alternative governance. Null mediation persists.

Figure 2: Heterogeneous Governance Effects[3]

4 Discussion

4.1 Why doesn't governance work through FDI?

The decisive rejection of FDI mediation requires theoretical interpretation. Several factors explain this finding.

Market-seeking FDI dominance. The sample comprises large emerging markets where FDI is market-seeking rather than governance-seeking. Multinationals invest in China, India, and Brazil to access domestic consumer markets, not primarily because of institutional quality. Market size and growth potential dominate governance considerations for these FDI destinations.

Domestic capital dominance. Renewable energy investment increasingly originates from domestic sources. In China, state-owned utilities and development banks finance most renewable capacity. In India, domestic conglomerates and public sector entities dominate. Even in Brazil and Mexico, domestic pension funds and local developers provide substantial capital. This domestic capital dominance means governance improvements benefit renewable investment by improving conditions for domestic investors rather than by attracting foreign capital.

Technology transfer without FDI. Renewable technology is increasingly commoditized and available through international supply chains without requiring FDI. Chinese solar manufacturers

[3] *Note:* Governance coefficient estimates with 95% confidence intervals. Effects concentrate in high-income countries but don't vary by FDI dependence.

export globally; European wind turbine producers sell internationally. Technology transfer occurs through trade rather than FDI.

Policy-driven investment. Direct renewable policies (feed-in tariffs, portfolio standards) may swamp general governance effects in determining renewable-sector FDI.

4.2 Direct institutional channels

If governance doesn't work through FDI, what channels does it operate through? The positive direct effect ($\beta = 0.647$) suggests several mechanisms:

Regulatory clarity establishes transparent grid connection procedures, standardized power purchase agreements, and predictable permitting timelines, benefiting all developers.

Administrative efficiency reduces bureaucratic delays. In countries with strong governance, projects move from planning to construction in 12-18 months; in weak institutions, 36-48 months.

Policy credibility makes long-term commitments believable through institutional constraints on government discretion.

Contract enforcement ensures power purchase agreements are legally enforceable, reducing revenue risk.

Reduced corruption minimizes rent-seeking costs during development.

These mechanisms operate symmetrically for domestic and foreign capital, enabling significant governance effects without FDI as intermediary.

4.3 The development threshold

The \$6,000-7,000 threshold reveals institutions and development are complements. Poor countries cannot "leapfrog" to clean energy through institutional reforms alone. They require simultaneous infrastructure development. Middle-income countries can leverage governance improvements to dramatically accelerate deployment because complementary factors exist.

Lower-income countries may lack: (1) electricity infrastructure enabling grid-connected capacity, (2) domestic financial institutions capable of long-term project financing, (3) technical regulatory capacity to administer complex energy policies, (4) sufficient electricity demand to absorb renewable generation, and (5) may prioritize alternative development needs over clean energy.

4.4 Policy implications

For upper-middle-income emerging markets: Prioritize comprehensive institutional reforms, streamlining permitting, clarifying regulations, improving judicial efficiency, reducing corruption, over narrow FDI attraction strategies. These reforms benefit domestic capital as much as foreign capital.

For lower-income countries: Recognize limits of institutional reforms absent complementary infrastructure. Prioritize basic electricity grid development, financial sector capacity, and technical training alongside governance improvements.

For international development: Governance conditionality may misallocate resources when

applied to countries lacking foundational prerequisites. Sequenced approaches combining infrastructure investment with institutional development better match country circumstances.

For African countries specifically: The threshold analysis suggests differentiated strategies. Lower-income African countries (GDP per capita below $6,000, including most Sub-Saharan nations) should prioritize infrastructure development and capacity building as prerequisites for institutional effectiveness. Upper-middle-income African countries (Morocco, South Africa, Botswana, Gabon) above the $6,000-7,000 threshold can leverage governance reforms to directly accelerate renewable deployment.

4.5 Limitations

Several limitations qualify these findings. The sample comprises 12 large emerging markets over 8 years, potentially missing governance-FDI relationships operating in smaller, more FDI- dependent economies. The analysis lacks direct renewable policy measures, which plausibly confound governance-investment relationships. While we argue governance works through domestic institutional channels, we don't directly observe regulatory clarity, permitting timelines, or contract enforcement experiences. Generalizability to other sectors and country groups re- mains unknown.

5 Conclusion

This study tests whether institutional quality accelerates renewable energy transitions by attracting foreign capital or through direct domestic mechanisms. Employing Baron and Kenny's mediation framework on 12 major emerging markets (2015-2022), the findings decisively reject FDI mediation.

Governance exhibits strong direct effects on renewable investment ($\beta = 0.647, p = 0.041$), yet neither the governance-to-FDI ($\beta = 0.003, p = 0.922$) nor FDI-to-renewable energy ($\beta = 2.289$, $p = 0.269$) pathways achieve significance. The indirect effect through FDI accounts for only 1% of governance's total impact.

Novel threshold analysis reveals governance effects concentrate in countries above $6,000- 7,000 GDP per capita, indicating institutions and development are complements rather than substitutes. Below this threshold, institutional improvements show no relationship with renewable investment. Above it, governance enables substantial investment acceleration.

These findings challenge conventional development economics emphasizing FDI attraction. Evidence suggests governance facilitates renewable investment through direct domestic channels, regulatory clarity, administrative efficiency, policy credibility, that require complementary development conditions to become operative.

Policy implications emphasize comprehensive institutional reforms benefiting all investors over narrow bilateral investment treaties. As emerging markets develop domestic capital markets and industries, the traditional FDI-mediation pathway may decline in importance. Direct institutional quality, functional regulatory efficiency, policy credibility, administrative professionalism, increasingly matters for mobilizing domestic capital toward long-term investments like renewable infrastructure.

Understanding this shift provides actionable insights for policymakers designing governance reforms to accelerate clean energy transitions in the developing world. The global energy transition requires mobilizing trillions of dollars toward renewable infrastructure. This study clarifies how institutional quality affects capital mobilization: directly through domestic institutional improvements rather than indirectly through FDI attraction.

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