EfilJournal ISSN : 2619-9580 | VOLUME: 9 | Date of Submission: 24.02.2026
e-ISSN : 2667-8012 | ISSUE: 1 | Date of Acceptance: 28.03.2026

Research Article

Institutional Quality as a Structural Determinant of Investment

Alper Duman, *Corresponding author*. Department of Economics, Izmir University of Economics, alper.duman@ieu.edu.tr, ORC-ID: 0000-0001-9928-6501.

Ece Tahminci, Department of Economics, Izmir University of Economics, ece.tahminci@ieu.edu.tr, ORC-ID: 0009-0002-9758-9626.

Abstract

This study examines the effect of institutional quality on gross capital formation independently of income, using a balanced panel of 118 countries over the period 2002–2022. A composite governance index is constructed from the six Worldwide Governance Indicators via principal component analysis and residualized on GDP per capita, yielding a measure of institutional performance that is orthogonal to income by construction and captures whether each country governs better or worse than its level of development would predict. Fixed-effects panel regressions with Driscoll–Kraay standard errors show that this income-adjusted institutional quality index exerts a positive and statistically significant effect on investment whether measured in absolute terms or as a share of GDP, with near-identical coefficient magnitudes across both specifications. A panel threshold regression does not separate rich from poor countries but distinguishes countries whose institutional performance falls short of income-level expectations from those that meet or exceed them, implying that marginal governance improvements yield the strongest investment response precisely where institutional capacity is weakest relative to development level. The findings carry direct implications for the targeting of institutional reform support: income-adjusted governance benchmarks, rather than absolute rankings, should guide the prioritisation of reform assistance.

Keywords: *Institutional Quality, Gross Capital Formation, Panel Data, Threshold Regression, Governance, Income-Adjusted Institutions*

JEL Codes*: O43, E22, C33, P48*

EfilJournal ISSN : 2619-9580 | CİLT: 9 | Başvuru Tarihi: 24.02.2026
e-ISSN : 2667-8012 | SAYI: 1 | Kabul Tarihi: 28.03.2026

Araştırma Makalesi

Yatırımın Yapısal Belirleyicisi Olarak Kurumsal Kalite

Alper Duman, *Sorumlu yazar*. Department of Economics, Izmir University of Economics, alper.duman@ieu.edu.tr ORCID: 0000-0001-9928-6501.

Ece Tahminci, Department of Economics, Izmir University of Economics, ece.tahminci@ieu.edu.tr, ORCID: 0009-0002-9758-9626.

Öz

Bu çalışma, kurumsal kalitenin brüt sermaye oluşumu üzerindeki etkisini gelir düzeyinden bağımsız olarak incelemekte; 2002–2022 dönemini kapsayan 118 ülkeli dengeli bir panel veri seti kullanmaktadır. Dünya Bankası'nın altı Dünya Çapında Yönetişim Göstergesinden temel bileşenler analizi aracılığıyla oluşturulan bileşik bir yönetişim endeksi, kişi başına GSYİH'ya göre artık değer alınarak, yapısal olarak gelirden bağımsız hale getirilmektedir. Bu sayede elde edilen ölçüt, her ülkenin kendi gelişmişlik düzeyinin öngördüğünden daha iyi ya da daha kötü yönetilip yönetilmediğini ortaya koymaktadır. Driscoll–Kraay standart hataları ile tahmin edilen sabit etkiler panel regresyonları, gelir ayarlamalı kurumsal kalite endeksinin yatırım üzerinde ister mutlak düzeyde ister GSYİH'ya oran olarak ölçülsün istatistiksel açıdan anlamlı ve pozitif bir etkiye sahip olduğunu; üstelik her iki tanımlama biçiminde de katsayı büyüklüklerinin birbirine çok yakın kaldığını göstermektedir. Panel eşik regresyonu, zengin ve yoksul ülkeleri birbirinden ayırmamakta; bunun yerine kurumsal performansı gelir düzeyi beklentisinin altında kalan ülkeleri, bu beklentiyi karşılayan ya da aşan ülkelerden ayırt etmektedir. Bu bulgu, kurumsal kapasitenin gelişmişlik düzeyine kıyasla en zayıf kaldığı yerlerde marjinal yönetişim iyileştirmelerinin en güçlü yatırım tepkisini ortaya çıkardığını göstermektedir. Elde edilen bulgular, kurumsal reform desteğinin hedeflenmesi açısından doğrudan sonuçlar doğurmaktadır: reform desteğinin önceliklendirilmesinde mutlak sıralamalar değil, gelire göre ayarlanmış yönetişim kıyaslamaları esas alınmalıdır.

Anahtar Kelimeler*: Kurumsal Kalite, Brüt Sermaye Oluşumu, Panel Veri, Eşik Regresyonu, Yönetişim, Gelir Ayarlamalı Kurumsal Kalite*

JEL Kodları*: O43, E22, C33, P48*

1. Introduction

Investment is widely recognized as a fundamental driver of economic growth. Conventional analyses focus on financial and macroeconomic determinants: interest rates, government spending, and volatility, yet this framing omits a structural layer that shapes how investors behave before financial signals even register: institutions. When property rights are weak or contracts are unenforceable, investors respond not to price signals but to the underlying credibility of the institutional environment.

North (1990) and Acemoglu et al. (2005) define institutions not as legal rules but as the incentive structures that shape how economic actors behave. Property rights protection, administrative capacity, the enforceability of law, and corruption control are among the institutional dimensions that directly affect the investment climate.

A central identification challenge is that governance tracks income. Glaeser et al. (2004) demonstrated that standard governance indices are largely explained by GDP per capita and education levels, raising the question of whether observed associations between governance and investment reflect institutional quality or simply the broader advantages of wealth. Standard governance indices largely track income and including them alongside income controls risks conflating two distinct sources of variation. Addressing this requires a measurement strategy that isolates the income-independent component of institutional quality.

This study does so by constructing a composite institutional index via principal component analysis and purging it of its income component by regressing the index on GDP per capita. The resulting residualized measure captures each country's institutional performance relative to what its income level would predict. Rather than testing a simplistic 'better governance equals more investment' relationship, the study asks whether countries that govern better than expected, given their income, also invest more than expected. The analysis covers 118 countries over the period 2002-2022 and employs fixed effects panel regression with Driscoll-Kraay standard errors.

2. Literature Review and Theoretical Framework

2.1. Gross Capital Formation in Economic Theory

Gross capital formation (GCF) refers to the total value of fixed asset acquisition and inventory accumulation within an economy over a given period. As a broad indicator, GCF captures the overall volume of capital deployed toward productive capacity, regardless of funding source or sectoral origin.

In classical growth theory, investment is understood as a mechanism of capital deepening and accumulation. Neoclassical models treat it as a function of expected returns and intertemporal optimization (Solow, 1956), while Keynesian frameworks emphasize expectations, uncertainty, and macroeconomic coordination (Keynes, 1936). More recent institutional approaches also consider the structural and political foundations of investment decisions (Aron, 2000; Rodrik et al., 2004).

While many empirical studies rely on disaggregated indicators such as FDI or private fixed capital formation, this study adopts GCF as a more comprehensive measure. GCF encompasses total capital formation across the entire economy, allowing for a unified analysis of aggregate investment behavior and its structural determinants.

2.2. The Role of Institutions in Shaping Investment

Institutions are a set of formal and informal rules that govern economic interaction. North (1990) defines institutions as the rules of the game, emphasizing their role in reducing uncertainty and stabilizing expectations. Williamson (1989) conceptualizes them as mechanisms that reduce transaction costs, particularly under incomplete information and weak enforcement. The transmission from institutional quality to investment operates through several distinct channels. First, secure property rights reduce the risk of expropriation, lowering the effective cost of long-term capital commitments and enabling investors to plan beyond short-term horizons (Knack & Keefer, 1995). Second, effective contract enforcement reduces counterparty risk in investment relationships; without it, firms substitute away from relationship-specific assets toward more liquid, reversible forms of capital (Williamson, 1989). Third, regulatory quality and government effectiveness reduce administrative uncertainty: when firms cannot predict how rules will be applied, the option value of waiting dominates the value of investing, depressing capital formation even in the presence of profitable opportunities (Aron, 2000). Fourth, control of corruption reduces the implicit tax on returns, where public officials extract rents from investment projects and the risk-adjusted return falls below the threshold required to trigger commitment (Mauro, 1995). Taken together, these channels suggest that institutional quality does not merely accompany investment; it constitutes a precondition for it, particularly for long-term, irreversible capital formation of the kind captured by gross capital formation data. Within this framework, institutions shape not only the quantity of investment but also its direction, quality, and time horizon.

Acemoglu et al. (2005) identify institutions as the fundamental cause of long-run economic growth and capital formation. Inclusive institutions protect property rights and enable long-term planning for investors; extractive institutions generate uncertainty and divert capital toward unproductive uses. The historical origins of these institutional differences are documented through colonial settlement patterns (Acemoglu et al., 2001) and pre-colonial economic structures (Nunn, 2009). They confirm that institutions are not merely contemporary constructs but historically embedded structures with persistent effects.

2.3. Empirical Evidence on Institutional Quality and Investment

Early empirical work established the foundational relationships in this literature. Mauro (1995) demonstrated that corruption significantly reduces investment; Knack and Keefer (1995) showed that property rights protections have a measurable positive effect on capital formation; and Chakrabarti (2001) confirmed that FDI flows are sensitive to institutional quality. These cross-sectional studies established the basic associations but could not resolve questions of causality or account for country-specific heterogeneity. Panel methods addressed these limitations.

Panel data studies have addressed these limitations through fixed effects (FE), system GMM, and quantile regression methods. Panel data improved things. Chen et al. (2022) used fixed effects to study governance and private investment in 100 countries. Barra & Ruggiero (2023) tried quantile regression on governance and public spending in Europe. Akobeng (2017) was closer to our question: he looked at governance and GCF specifically in Africa. Emara and Chiu (2016) used a GMM approach to measure governance effects on growth in MENA countries, constructing a composite WGI index via PCA. Bhujabal et al. (2024) similarly applied PCA to WGI dimensions to study the FDI–institutional quality nexus in South and Southeast Asian economies. Saha et al. (2022) investigated institutional quality and FDI in lower-middle income countries, applying sample stratification by income group to address the income-institution collinearity.

More recent work has examined nonlinear and threshold dynamics in the institutions-growth relationship. Ochi et al. (2023, 2024) find, using panel smooth transition regression, that governance quality affects economic growth and poverty reduction only above a critical institutional threshold in African and South Asian samples. Chuku et al. (2017) document that institutional quality is a robust determinant of the absolute level of investment in Africa but loses significance when investment is expressed as a share of GDP, attributing this to the dominance of macroeconomic scale effects.

2.4. Critical Perspectives and Heterogeneity

A recurring challenge in the institutional quality literature is the direction of causality. Glaeser et al. (2004) argue that most governance indicators are largely explained by income and education levels, raising the possibility that institutions are an outcome of development rather than a cause. Przeworski and Limongi (1993) similarly suggest that economic growth can shape political regimes. These critiques do not invalidate the institutional pers-

pective, but they do underscore the need for measurement and identification strategies that go beyond simple correlations.

A related concern is the endogeneity of institutional quality in investment regressions. Even if reverse causality from investment to institutions is not the primary worry, omitted variables such as geography, colonial history, or deep cultural factors may simultaneously drive both institutional quality and investment. Instrumental variable approaches, such as those based on settler mortality rates (Acemoglu et al., 2001) or legal origins (Rodrik et al., 2004), have been used to address this problem, but require instruments that are often difficult to justify in large cross-country panels.

The literature also suggests that the effect of institutions on investment is not uniform across countries. In developing economies, basic institutional deficiencies tend to have a direct impact on investment decisions, whereas in advanced economies investment conditions are more often shaped by market expectations and macroeconomic signals (Aron, 2000; Gwartney et al., 2006). Hayat (2019) finds that while institutions enhance FDI-led growth in low and middle-income countries, the relationship differs in high-income settings. Chuku et al. (2017) further document that the institutional effect is strongest when investment is measured in levels, and attenuates when expressed as a share of GDP, a finding that motivates the dual-specification approach adopted in this study. This heterogeneity across income groups is examined directly in Section 4.

2.5. The WGI Framework and the Income-Adjustment Problem

This study uses the Worldwide Governance Indicators (WGI) to measure institutional quality. Developed by Kaufmann et al. (1999, 2002, 2010) and updated in Kaufmann and Kraay (2024), the WGI framework comprises six dimensions: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. These indicators capture both state institutional capacity and governance quality and are constructed from a synthesis of expert evaluations and cross-country survey data.

A well-documented concern with WGI-based indices is their strong correlation with income levels (Langbein & Knack, 2010). Countries with higher GDP per capita consistently score better on governance dimensions, raising the question of whether governance indices capture something independent of income or simply reflect it. Gallego-Álvarez et al. (2021) further document that WGI scores exhibit high persistence over time and cluster by income group, reinforcing concerns about their interpretation in causal analyses.

To address this, the composite index constructed in this study is residualized on GDP per capita, following the governance surplus approach of Han et al. (2014). This yields a measure of institutional quality that is orthogonal to income by construction, capturing whether a country's governance exceeds or falls short of what its income level would predi-

ct. This approach is more appropriate than using aggregate GDP, which conflates development with country size, and more transparent than alternative strategies such as income group stratification (Saha et al., 2022) or IV approaches that require instruments difficult to apply at the global level. The construction of this measure is described in detail in Section 3.

3. Research Methodology

3.1. Data and Variables

The analysis is based on a balanced panel of 118 countries over the period 2002-2022. The sample period begins in 2002, reflecting the first year for which annual WGI estimates are available across all six governance dimensions (Kaufmann et al., 2002). The balanced panel requirement retains only countries with complete observations across all variables for the full 21-year period, reducing the initial country pool to 118 countries; the full country list, organized by income group, is provided in Appendix A. Data are drawn from the World Bank's World Development Indicators (WDI) and Worldwide Governance Indicators (WGI; Kaufmann et al., 1999, 2002, 2010; Kaufmann & Kraay, 2024).

The dependent variable is gross capital formation as a share of GDP (GCF/GDP, %), sourced from WDI. Level-based specifications are susceptible to scale effects in cross-country panels because larger economies invest more in absolute terms regardless of institutional quality, which motivates the ratio-based approach adopted here (Mauro, 1995; Akobeng, 2017; Chuku et al., 2017). The original level-based specification is also retained for comparison. The main explanatory variable is a residualized composite index of institutional quality, described in Section 3.2. Control variables are GDP per capita (constant 2015 USD, log-transformed), population (log-transformed), and government consumption expenditure as a share of GDP (%). All VIF values fall below 1.26. The real interest rate enters the extended model in levels due to negative values in some observations.

Model 1 covers the full 118-country panel. Model 2 adds the real interest rate, reducing the sample to 51 countries; Model 1 is also estimated on this subsample to separate sample composition effects from the contribution of the interest rate. Variable definitions and data sources are listed in Table 1.

Table 1. Variable Definitions and Data Sources

Variable	Definition	Source
	Dependent variable	
GCF / GDP	Gross capital formation as a percentage of GDP	WDI
GCF (levels)	Gross capital formation, constant 2015 USD (log-transformed)	WDI
	Control variables	
GDP per capita	GDP per capita, constant 2015 USD (log-transformed)	WDI
Population	Total population (log-transformed)	WDI
Government expenditure / GDP	General government final consumption expenditure as a share of GDP (%)	WDI
Real interest rate	Lending interest rate adjusted for inflation, levels (Model 2 only)	WDI
Crisis dummies	Binary indicators for 2009 (Global Financial Crisis) and 2020 (COVID-19 pandemic)	-
	WGI components (composite institutional index)	
Voice and Accountability (VA)	Citizens' capacity to participate in government selection; freedom of expression and media	WGI
Political Stability (PV)	Likelihood of political instability or politically motivated violence	WGI
Government Effectiveness (GE)	Quality of public services and policy implementation capacity	WGI
Regulatory Quality (RQ)	Capacity to formulate and implement sound policies and regulations	WGI
Rule of Law (RL)	Extent to which agents abide by and have confidence in societal rules	WGI
Control of Corruption (CC)	Extent to which public power is exercised for private gain	WGI

Note: *Model 1 includes 118 countries (118 × 21 = 2,478 observations). Model 2 and the Model 1 subsample each include 51 countries (51 × 21 = 1,071 observations). A balanced panel structure is imposed throughout.*

Descriptive statistics and pairwise correlations for the key variables are presented in Tables 2 and 3.

Table 2. Descriptive Statistics

Variable	N	Mean	SD	Min	Max	Skew
log(GCF/GDP)	2,478	3.15	0.31	0.20	4.34	-0.31
log(GCF levels)	2,478	23.52	2.03	18.35	29.55	0.23
log(GDP per capita)	2,478	8.84	1.42	5.77	11.63	-0.11
log(Population)	2,478	16.16	1.71	11.32	21.08	0.05
Gov. expenditure / GDP	2,478	16.27	5.47	2.36	46.26	0.58
IQres	2,478	0.00	0.52	-1.55	1.41	-0.23

Note: *Statistics based on the 118-country balanced panel (2,478 observations). IQres is the residualized PCA-based composite index, orthogonal to log(GDP per capita) by construction.*

Table 3. Pairwise Correlation Matrix

Variable	(1)	(2)	(3)	(4)	(5)	(6)
(1) log(GCF/GDP)	1.000					
(2) log(GCF levels)	0.164	1.000				
(3) log(GDP per capita)	-0.009	0.529	1.000			
(4) log(Population)	0.028	0.706	-0.203	1.000		
(5) Gov. exp. / GDP	-0.038	0.089	0.407	-0.219	1.000	
(6) IQres	0.021	-0.111	0.000	-0.122	0.151	1.000

Note: *All VIF values fall below 1.26. IQres is orthogonal to log(GDP per capita) by construction (correlation = 0.000).*

3.2. Composite Institutional Index and Income Adjustment

The six WGI dimensions display strong pairwise correlations (0.66–0.96) and capture overlapping aspects of governance quality (Langbein & Knack, 2010; Gallego-Álvarez et al., 2021). Principal component analysis reduces them to a single composite index; the first principal component accounts for 85.4% of total variance, with all loadings exceeding 0.83 (Appendix B). This approach is consistent with related studies (Barra & Ruggiero, 2023; Bhujabal et al., 2024; Chen et al., 2022; Emara & Chiu, 2016). The composite score is defined as:

$$PC1_{it} = \lambda_1 \cdot VA_{it} + \lambda_2 \cdot PV_{it} + \lambda_3 \cdot GE_{it} + \lambda_4 \cdot RQ_{it} + \lambda_5 \cdot RL_{it} + \lambda_6 \cdot CC_{it} \quad (1)$$

WGI-based indices are strongly correlated with income levels (Langbein & Knack, 2010; Glaeser et al., 2004), which risks conflating institutional quality with development level when both enter the same regression. PC1 is therefore residualized on log(GDP per capita). Han et al. (2014) and Zhuang et al. (2010) apply the same procedure to construct income-independent governance measures for growth analysis in developing Asia and the MENA region; Hayat (2019) applies a similar approach in the FDI-growth context. The present study extends this residualization strategy to a broad 118-country cross-country investment panel. Chuku et al. (2017) provide additional motivation: using a comparable sample, they find that institutional quality is a robust determinant of investment levels but loses significance when investment is expressed as a share of GDP, a pattern this study directly investigates. The residualized index is:

$$IQres_{it} = PC1_{it} - \beta \cdot \log(GDPpc_{it}) \quad (2)$$

Income accounts for 69.6% of cross-country variation in PC1 (Appendix C). The resulting index has a mean of zero and standard deviation of 0.52; positive values indicate stronger-than-expected institutions given a country's income level, negative values the opposite. Alternative approaches such as income-group stratification (Saha et al., 2022) or instrumental variables (Acemoglu et al., 2001; Rodrik et al., 2004), either restrict comparability or require instruments difficult to justify at this scale. The analysis does not claim causal identification; the focus is on isolating robust structural associations between income-adjusted institutional quality and investment.

3.3. Estimation Strategy

All specifications are estimated using country fixed effects. Countries differ in ways that are unobserved but persistent, such as legal traditions, colonial history, geographic endowments, and these correlate with both governance quality and investment. Absorbing them at the country level is the natural choice, and a Hausman test confirms it ($\chi^2 = 107.62$, $p < 0.001$). Driscoll and Kraay (1998) standard errors are used throughout, robust to heteroskedasticity, serial correlation, and cross-sectional dependence.

Year fixed effects are not included. Governance evolves slowly and is strongly collinear with the country means absorbed by fixed effects; in practice, adding year dummies eliminates the institutional signal entirely, a pattern well-documented in within-estimator applications to slowly changing governance variables (Gallego-Álvarez et al., 2021; Acemoglu et al., 2005). Instead, binary indicators for 2009 and 2020 capture the two major common shocks in the sample period without absorbing within-country institutional variation. The 2009 indicator captures the sharp contraction in gross capital formation associated with the Global Financial Crisis; the 2020 indicator captures the COVID-19 pandemic shock, which produced the largest single-year decline in capital formation in the sample period. The main model equations are:

$$\ln(GCF_{it}) = \alpha_i + \beta_1 \ln(GDPpc_{it}) + \beta_2 \ln(Pop_{it}) + \beta_3 GovExp_{it} + \beta_4 IQres_{it} + \beta_5 D2009_{it} + \beta_6 D2020_{it} + \varepsilon_{it} \quad (3.0)$$

$$\ln(GCF/GDP_{it}) = \alpha_i + \beta_1 \ln(GDPpc_{it}) + \beta_2 \ln(Pop_{it}) + \beta_3 GovExp_{it} + \beta_4 IQres_{it} + \beta_5 D2009_{it} + \beta_6 D2020_{it} + \varepsilon_{it} \quad (3.1)$$

$$\ln(GCF/GDP_{it}) = \alpha_i + \beta_1 \ln(GDPpc_{it}) + \beta_2 \ln(Pop_{it}) + \beta_3 GovExp_{it} + \beta_4 IQres_{it} + \beta_5 RealIR_{it} + \beta_6 D2009_{it} + \beta_7 D2020_{it} + \varepsilon_{it} \quad (3.2)$$

3.4. Threshold Analysis

To examine whether the effect of institutional quality on investment varies across levels of governance capacity, a panel threshold regression is estimated following Hansen (1999). The motivation is that the relationship between governance and investment may not be linear: in environments where core institutional functions are absent or deeply compromised, marginal improvements may be insufficient to shift investor behavior, while the same improvement could have a discernible effect once a baseline level of credibility is established. This interpretation is supported by recent empirical evidence: Ochi et al. (2023, 2024) find nonlinear threshold effects of governance quality on economic growth and poverty outcomes in African and South Asian countries, with significant effects only above a critical governance threshold. Aron (2000) and Fraga and da Cunha Resende (2022) similarly argue that governance quality shapes long-run investment primarily where enforcement capacity and administrative coherence are sufficiently developed. The threshold model takes the form:

$$\ln(GCF/GDP_{it}) = \alpha_i + \beta_1 X_{it} + \delta_1 IQres_{it} \cdot \mathfrak{T}(IQres_{it} \leq \gamma) + \delta_2 IQres_{it} \cdot \mathfrak{T}(IQres_{it} > \gamma) + \varepsilon_{it} \quad (3.3)$$

where γ is the threshold parameter to be estimated, $\mathfrak{T}(\cdot)$ is an indicator function, and X_{it} is the vector of control variables. The threshold is identified by minimizing the concentrated sum of squared residuals over a grid of candidate values, following Hansen (1999). The search is conducted over the central 90% of the IQres distribution, with a minimum of 40 observations and 10 countries required in each regime to ensure reliable fixed effects estimation within each sub-sample. The sensitivity of the threshold estimate to these parameter choices is examined in Section 4 through a systematic grid search across alternative trimming values and minimum observation thresholds. The model is applied to the residualized institutional index rather than raw WGI scores, ensuring that the estimated regime boundary reflects structural differences in governance capacity rather than income-driven variation. Results are reported in Section 4.

4. Discussion of Results

4.1. Main Estimation Results

Table 4 reports fixed effects estimation results with Driscoll-Kraay standard errors. Both specifications use the same 118-country sample over 2002-2022. Institutions predict investment. The coefficient is 0.119 in absolute dollars ($p < 0.001$) and 0.109 as a share of GDP ($p < 0.001$). Same size either way. This matters because it solves a puzzle in the literature: Chuku et al. (2017) found governance predicts investment levels but vanishes in ratios. We don't replicate that divergence. This is discussed further in Section 4.2.

Table 4. Fixed Effects Estimation Results (Driscoll-Kraay Standard Errors)

Variable	Model 1A Levels	Model 1B Ratio	Model 2A Levels + IR	Model 2B Ratio + IR
log(GDP per capita)	1.314***	0.213***	1.204***	0.045
	(0.044)	(0.051)	(0.046)	(0.054)
log(Population)	1.499***	0.257*	1.391***	0.210
	(0.141)	(0.124)	(0.212)	(0.153)
Government expenditure / GDP	0.001	0.001	0.005*	-0.002
	(0.006)	(0.006)	(0.002)	(0.004)
IQres	0.119**	0.109***	0.118***	0.083.
	(0.038)	(0.030)	(0.035)	(0.047)
Real interest rate	-	-	0.001	-0.001
			(0.002)	(0.001)
Countries	118	118	51	51
Observations	2,478	2,478	1,071	1,071
Fixed effects	Country	Country	Country	Country

Note: *. $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Driscoll–Kraay standard errors in parentheses. Models 1A and 1B use log(GCF in constant USD) and log(GCF/GDP) as the dependent variable, respectively, estimated on an identical 118-country sample. Models 2A and 2B add the real interest rate, reducing the sample to 51 countries.*

Log(GDP per capita) and log(Population) enter positively in the levels specification, consistent with larger and wealthier economies sustaining higher absolute capital formation. These scale effects are partially absorbed by the dependent variable in the ratio specification, which accounts for the smaller coefficients. Government expenditure is not significant in either specification, likely reflecting its overlap with GDP per capita when both are expressed as ratios. Interest rates don't predict investment ($p > 0.10$). Makes sense:

when property rights are shaky, whether the rate is 5% or 6% barely matters. Governance uncertainty dominates financial cost (Aron, 2000). Within-country R-squared values are modest, as is typical for fixed effects models applied to slowly evolving outcomes.

4.2. Level-Based versus Ratio-Based Specifications

A notable feature of Table 4 is the consistency of the institutional quality coefficient across the level-based (Model 1A) and ratio-based (Model 1B) specifications. This is worth emphasizing because the two specifications address different empirical concerns. The ratio-based model removes scale effects that are present when investment is measured in absolute USD levels, since larger economies invest more in absolute terms regardless of governance quality. The level-based model captures the total volume of capital formation and is more directly comparable to the existing literature (Mauro, 1995; Akobeng, 2017).

The finding that both specifications yield significant and similarly sized institutional quality coefficients suggests that the association between governance and investment is robust to this measurement choice. This is not always the case. Chuku et al. (2017) find that institutional quality is a robust determinant of investment levels but loses significance when investment is expressed as a share of GDP, attributing this to the dominance of macroeconomic scale effects. The present results do not replicate this divergence. A likely explanation lies in the residualization of the institutional index. Raw WGI-based governance scores are strongly correlated with income, and income in turn is strongly correlated with the scale of investment. When an unresidualised governance index enters a levels regression alongside GDP, part of its coefficient reflects this income-investment channel rather than the independent effect of governance. When investment is then expressed as a share of GDP, this channel is partially removed, causing the governance coefficient to lose significance. By constructing IQres as the component of governance that is orthogonal to income, the present study removes this confound at the measurement stage rather than at the specification stage. The result is a governance measure whose explanatory power does not depend on whether investment is scaled by GDP, which accounts for the consistency observed across Models 1A and 1B.

4.3. Robustness and Reliability

The results are supported by diagnostic tests. The Hausman test rejects the null hypothesis of consistency of the random effects estimator ($\chi^2 = 107.62$, df = 4, $p < 0.001$), confirming that fixed effects estimation is appropriate. Three violations of standard regression assumptions are detected: the Breusch-Pagan test rejects homoskedasticity (BP = 117.11, $p < 0.001$); the Breusch-Godfrey/Wooldridge test identifies serial correlation ($\chi^2 = 1{,}148.3$, df = 21, $p < 0.001$); and the Pesaran (2004) CD test confirms cross-sectional dependence ($z = 33.49$, $p < 0.001$). Driscoll–Kraay (1998) standard errors address all three issues simultaneously and are used throughout.

All variance inflation factors fall below 1.26, a marked improvement over the level-based specification in which VIF values between log(GDP) and log(government expenditure) exceeded 27. Expressing both government expenditure and the dependent variable as

shares of GDP eliminates this structural overlap. The institutional quality coefficient retains its sign and significance across all tested specifications, with its VIF remaining below 1.04 in all models.

The stability of the institutional quality coefficient across the four specifications in Table 4 is also reassuring. The coefficient ranges from 0.083 to 0.119 with a consistent positive sign. The reduction in Models 2A and 2B is attributable to sample composition rather than the inclusion of the interest rate: Model 1A estimated on the same 51-country subsample yields a coefficient of 0.118, nearly identical to the full-sample estimate.

4.4. Threshold Analysis

The threshold regression follows Hansen (1999) and uses the residualized institutional quality index (IQres) as the threshold variable. The threshold is identified by minimizing the concentrated sum of squared residuals over the central 90% of the IQres distribution, with a minimum of 40 observations and 10 countries per regime. Results for both the ratio-based (1B) and level-based (1A) specifications are reported in Table 5.

The threshold estimate is IQres = -0.076. Below this value (74 countries, 1,042 observations), the institutional quality coefficient is 0.196 ($p = 0.002$), indicating a strong and significant positive effect. Above it (88 countries, 1,436 observations), the coefficient falls to 0.048 and is not significant ($p = 0.215$). The threshold marks the boundary between countries that underperform institutionally relative to their income level and those that meet or exceed income-adjusted expectations. Where governance falls below this benchmark, institutional improvements are associated with substantially higher investment; above it, other determinants dominate. The regime boundary, therefore, does not simply separate rich from poor countries; it distinguishes countries that underperform institutionally relative to their income from those that meet or exceed the institutional expectation for their development level. This pattern is consistent with the nonlinear governance effects documented by Ochi et al. (2023, 2024) and Houngbedji and Bassongui (2021): institutional quality appears to have a stronger marginal effect on investment where governance capacity is relatively weak, while in better-governed environments other determinants dominate.

For the levels specification (Model 1A), the estimated threshold is IQres = 0.609. Below the threshold, the coefficient is 0.228 ($p = 0.010$); above it, the coefficient is -0.282 ($p = 0.003$). The reversal in sign in the high regime is consistent with Chuku et al. (2017), who note that institutional effects on investment levels are driven by countries at lower governance levels, and may reflect compositional differences between the two regimes. The above-threshold group comprises only 30 countries.

Table 5. Threshold Regression Results

	Threshold	Regime	Obs.	Countries	Coef.	p-value
GCF/GDP (1B)	−0.076	Below	1,042	74	0.196	0.002
		Above	1,436	88	0.048	0.215
GCF levels (1A)	0.609	Below	2,166	115	0.228	0.010
		Above	312	30	-0.282	0.003

Note: *Estimated following Hansen (1999). Threshold variable is IQres. Country fixed effects with Driscoll–Kraay standard errors (HC3). Crisis dummies (D2009, D2020) included in all specifications. Obs. = number of country-year observations.*

The sensitivity of the threshold estimate to the choice of trimming parameter and minimum observation requirement is reported in Table 6. Across all nine combinations of trim (0.05, 0.10, 0.15) and min_obs (30, 40, 50), the threshold value, regime coefficients, and p-values are identical. The result is therefore not an artifact of parameter selection but reflects the structure of the data.

Table 6. Threshold Sensitivity Analysis (Model 1B, GCF/GDP)

trim	min_obs	Threshold	Low coef.	Low p	High coef.	High p
0.05	30	-0.076	0.195	0.002	0.050	0.193
0.05	40	-0.076	0.195	0.002	0.050	0.193
0.05	50	-0.076	0.195	0.002	0.050	0.193
0.10	30	-0.076	0.195	0.002	0.050	0.193
0.10	40	-0.076	0.195	0.002	0.050	0.193
0.10	50	-0.076	0.195	0.002	0.050	0.193
0.15	30	-0.076	0.195	0.002	0.050	0.193
0.15	40	-0.076	0.195	0.002	0.050	0.193
0.15	50	-0.076	0.195	0.002	0.050	0.193

Note: *Each row reports results for a different combination of trimming parameter (trim) and minimum observations per regime (min_obs). Threshold value, regime coefficients, and significance are invariant across all combinations.*

4.5. Heterogeneity by Income Group

Model 1B is estimated separately by income group to test whether the institutional effect holds across development levels. Results are in Table 7.

Only the upper middle-income group shows a significant coefficient (0.094, p = 0.011). The other three groups do not. This is not surprising: the low-income group has only 10 countries, and the high-income group sits mostly above the governance threshold where

the effect fades. The within-group governance variation is similar across all groups (SD: 0.45–0.48, vs. 0.52 in the full sample), so the absence of significance is not because governance does not vary; it is a sample size problem.

The upper middle-income result connects to the threshold finding: 67% of countries in this group fall below IQres = -0.076, the regime where institutional improvements predict stronger investment. The low-income coefficient is negative (-0.090) but insignificant and unreliable with only 10 countries.

The full-sample estimate remains the main finding. Within income tiers, there are too few countries to detect a relationship that requires 118 to emerge clearly. Chuku et al. (2017) and Hayat (2019) similarly find the institutional effect varies across income levels.

Table 7. Institutional Quality and Investment by Income Group (Model 1B, Individual FE)

Income group	N	Coef.	SE	t-stat	p-value
High income	50	0.123	0.084	1.472	0.141
Upper middle income	31	0.094	0.037	2.560	0.011*
Lower middle income	27	0.111	0.141	0.790	0.430
Low income	10	−0.090	0.095	−0.945	0.346

Note: *Dependent variable: log(GCF/GDP). Individual fixed effects with crisis dummies D2009 and D2020. Driscoll–Kraay standard errors (HC3). Income group classification follows World Bank (2022). Coef. = coefficient on IQres. * $p < 0.05$.*

5. Conclusion and Policy Implications

This study examined the effect of institutional quality on gross capital formation across a balanced panel of 118 countries over 2002–2022. The central methodological contribution is the application of an income-residualized PCA-based governance index to a broad cross-country investment panel. Han et al. (2014) and Zhuang et al. (2010) applied similar residualization procedures in growth analyses across developing Asia and the MENA region; Hayat (2019) extended the approach to the FDI-growth nexus. The present study applies this strategy to aggregate investment across a wider and more diverse country sample, and tests whether the residualization approach resolves a specific empirical puzzle in the institutions-investment literature.

The main findings are threefold. First, institutional quality exerts a positive and statistically significant effect on gross capital formation in both level-based and ratio-based specifications, with near-identical coefficient magnitudes. Chuku et al. (2017) documented that institutional quality loses significance when investment is expressed as a share of GDP in an African sample using raw WGI scores, attributing this to the dominance of macroeconomic scale effects. The present results do not replicate this divergence. The

explanation lies in the residualization: by purging the governance index of its income component at the measurement stage, the specification removes the channel through which an unresidualised index proxies for country size. The divergence documented by Chuku et al. appears to reflect a measurement problem rather than a structural feature of the institutions-investment relationship. This finding has methodological implications beyond this study: reported inconsistencies between level-based and ratio-based specifications in the governance-investment literature may partly reflect the failure to account for the income-governance correlation in the construction of the institutional index. The real interest rate is insignificant across all specifications, consistent with the argument that in environments where institutional uncertainty is high, governance conditions dominate over formal cost-of-capital signals in shaping investment decisions (Aron, 2000; Gwartney et al., 2006).

Second, the effect is nonlinear. The threshold regression identifies a regime boundary at IQres = -0.076, corresponding to countries whose institutional quality falls slightly below what their income level would predict. Below this threshold, the institutional quality coefficient is 0.196 and significant at the 1% level; above it, the coefficient falls to 0.048 and is not significant. This finding stands in contrast to the argument in Aron (2000) and Fraga and da Cunha Resende (2022), who suggest that governance shapes investment primarily where institutional capacity is sufficiently developed. The present results point in the opposite direction: institutional improvements have their strongest marginal impact where governance capacity is weakest relative to income expectations. This divergence likely reflects two differences. First, prior studies focus on sectoral or infrastructure investment, whereas the present study uses aggregate GCF. Second, the income-adjusted threshold variable produces a regime boundary that is conceptually distinct from those estimated using raw governance scores: the split does not separate rich from poor countries but separates countries that underperform institutionally relative to their development level from those that meet or exceed it. The threshold estimate is robust across all nine combinations of trimming parameter and minimum observation requirement tested in the sensitivity analysis. In the level-based specification, the institutional quality coefficient turns negative above the threshold (−0.282, $p = 0.003$), with the above-threshold group comprising only 30 countries. This reversal likely reflects compositional rather than structural factors: the group is too small to support reliable inference, and the result should not be interpreted as evidence that stronger institutions suppress investment levels.

Third, the income group analysis yields limited evidence of heterogeneous effects. The institutional quality coefficient is statistically significant only in the upper middle-income group (coef. = 0.094, $p = 0.011$); the remaining three groups yield insignificant estimates. The upper-middle-income finding is broadly consistent with the threshold result: 67% of countries in this group fall below the estimated regime boundary, though this overlap should be interpreted cautiously rather than as a structural explanation. For the other groups, statistical power remains the most likely constraint: the low-income group covers only 10 countries, and the high-income group, while larger, is concentrated above the th-

reshold where the institutional effect attenuates. The low-income coefficient is negative (-0.090) but not significant and should not be over-interpreted given the sample size. Taken together, the income group results do not provide strong evidence of systematic heterogeneity across development tiers, and the full-sample estimate remains the more reliable characterization of the institutions-investment relationship. Chuku et al. (2017) and Hayat (2019) similarly find that the institutional effect on investment is heterogeneous across income levels.

The policy implications follow from the threshold finding. The regime boundary does not separate rich from poor countries. Korea, Croatia, and Romania sit just below the threshold (mean IQres: -0.069, -0.062, -0.081 respectively; authors' calculations based on estimation sample), despite being high-income economies; Viet Nam and the Philippines have crossed it from lower income levels (mean IQres: 0.009 and 0.011 respectively), meaning that despite their relatively modest development, their institutional performance meets income-adjusted expectations and other determinants of investment now dominate. The relevant policy question is therefore not how strong institutions are in absolute terms but how they compare to the governance level that a country's income would predict. Countries with a negative IQres value, where governance falls short of income-level expectations, are precisely where marginal institutional improvements are most likely to translate into measurable investment responses. For development institutions and policymakers, this reframes the targeting of institutional reform support. Using absolute governance rankings to prioritize reform assistance may misidentify the countries where such support would have the greatest effect. A country like Bangladesh, which sits below the threshold (mean IQres: -0.043), may respond more strongly to improvements in contract enforcement or regulatory predictability than a country already above it, where other determinants of investment dominate. The implication is that reform programs should be calibrated against income-adjusted governance benchmarks rather than absolute scores.

The study has several limitations. The residualization strategy removes the linear correlation between governance and income but does not resolve reverse causality. Investment may itself shape institutional quality over time, and factors such as natural resource endowments or geography could drive both simultaneously. Country fixed effects absorb time-invariant differences but not time-varying confounders. WGI scores are perception-based and slow to change, which means they capture long-run institutional patterns better than short-run reforms (Langbein & Knack, 2010; Gallego-Álvarez et al., 2021). The composite index is not decomposed; separating the contributions of rule of law, regulatory quality, and corruption control could yield sharper policy guidance. Finally, the income group results are consistent with a power constraint, but true heterogeneity across development tiers remains possible; the sample is simply too small within each group to rule it out. These are productive directions for future research.

References

Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The colonial origins of comparative development: An empirical investigation. *American Economic Review, 91*(5), 1369–1401. https://doi.org/10.1257/aer.91.5.1369

Acemoglu, D., Johnson, S., & Robinson, J. A. (2005). Institutions as a fundamental cause of long-run growth. In P. Aghion & S. N. Durlauf (Eds.), *Handbook of economic growth* (Vol. 1A, Chap. 6, pp. 385–472). Elsevier. https://doi.org/10.1016/S1574-0684(05)01006-3

Akobeng, E. (2017). Gross capital formation, institutions and poverty in Sub-Saharan Africa. *Journal of Economic Policy Reform, 20*(2), 136–164. https://doi.org/10.1080/17487870.2015.1128833

Aron, J. (2000). Growth and institutions: A review of the evidence. *The World Bank Research Observer, 15*(1), 99–135. https://doi.org/10.1093/wbro/15.1.99

Barra, C., & Ruggiero, N. (2023). Institutional quality and public spending in Europe: A quantile regression approach. *Economics & Politics, 35*(3), 949–1019. https://doi.org/10.1111/ecpo.12248

Bhujabal, P., Sethi, N., & Padhan, P. C. (2024). Effect of institutional quality on FDI inflows in South Asian and Southeast Asian countries. *Heliyon, 10*(5), e27060. https://doi.org/10.1016/j.heliyon.2024.e27060

Chakrabarti, A. (2001). The determinants of foreign direct investments: Sensitivity analyses of cross-country regressions. *Kyklos, 54*(1), 89–114. https://doi.org/10.1111/1467-6435.00142

Chen, F., Law, S. H., Wong, Z. W. V., & Azman-Saini, W. N. W. (2022). The role of institutions in private investment: Panel data evidence. *Studies in Economics and Finance, 39*(4), 630–643. https://doi.org/10.1108/SEF-09-2020-0381

Chuku, C., Onye, K., & Ajah, H. (2017). Structural and institutional determinants of investment activity in Africa. In D. Seck (Ed.), Investment and Competitiveness in Africa (pp. 25–50). Springer, Cham. https://doi.org/10.1007/978-3-319-44787-2_2

Driscoll, J. C., & Kraay, A. C. (1998). Consistent covariance matrix estimation with spatially dependent panel data. *The Review of Economics and Statistics, 80*(4), 549–560. https://doi.org/10.1162/003465398557825

Emara, N., & Chiu, I.-M. (2016). The impact of governance environment on economic growth: The case of Middle Eastern and North African countries. *Journal of Economics Library, 3*(1), 24–37. https://ssrn.com/abstract=3810284

Fraga, J. S., & Resende, M. F. da C. (2022). Infrastructure, conventions and private investment: An empirical investigation. *Structural Change and Economic Dynamics, 61,* 351–361. https://doi.org/10.1016/j.strueco.2022.03.006

Gallego-Álvarez, I., Rodríguez-Rosa, M., & Vicente-Galindo, P. (2021). Are worldwide governance indicators stable or do they change over time? A comparative study using multivariate analysis. *Mathematics, 9*(24), 3257. https://doi.org/10.3390/math9243257

Glaeser, E. L., La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (2004). Do institutions cause growth? *Journal of Economic Growth, 9*(3), 271–303. https://doi.org/10.1023/B:JOEG.0000038933.16398.ed

Gwartney, J. D., Holcombe, R. G., & Lawson, R. A. (2006). Institutions and the impact of investment on growth. *Kyklos, 59*(2), 255–273. https://doi.org/10.1111/j.1467-6435.2006.00327.x

Han, X., Khan, H. A., & Zhuang, J. (2014). Do governance indicators explain development performance? A cross-country analysis (ADB Economics Working Paper Series No. 417). Asian Development Bank. https://doi.org/10.2139/ssrn.2558894

Hansen, B. E. (1999). Threshold effects in non-dynamic panels: Estimation, testing, and inference. *Journal of Econometrics, 93*(2), 345–368. https://doi.org/10.1016/S0304-4076(99)00025-1

Hayat, A. (2019). Foreign direct investments, institutional quality, and economic growth. *The Journal of International Trade & Economic Development, 28*(5), 561–579. https://doi.org/10.1080/09638199.2018.1564064

Houngbedji, N., & Bassongui, B. (2021). Investissement public et investissement privé en Afrique Subsaharienne: Rôle de la qualité institutionnelle. *African Development Review, 33*(3), 524–537. https://doi.org/10.1111/1467-8268.12589

Kaufmann, D., & Kraay, A. C. (2024). *The worldwide governance indicators: Methodology and 2024 update* (Policy Research Working Paper No. 10952). *World Bank*. https://doi.org/10.1596/1813-9450-10952

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). *The worldwide governance indicators: Methodology and analytical issues* (Policy Research Working Paper No. 5430). World Bank.

Kaufmann, D., Kraay, A., & Zoido-Lobatón, P. (1999). *Governance matters* (Policy Research Working Paper No. 2196). World Bank.

Kaufmann, D., Kraay, A., & Zoido-Lobatón, P. (2002). *Governance matters II: Updated indicators for 2000/01* (Policy Research Working Paper No. 2772). World Bank.

Keynes, J. M. (1936). *The general theory of employment, interest and money.* Macmillan.

Knack, S., & Keefer, P. (1995). Institutions and economic performance: Cross-country tests using alternative institutional measures. *Economics & Politics, 7*(3), 207–227. https://doi.org/10.1111/j.1468-0343.1995.tb00111.x

Langbein, L., & Knack, S. (2010). The worldwide governance indicators: Six, one, or none? *The Journal of Development Studies, 46*(2), 350–370. https://doi.org/10.1080/00220380902952399

Mauro, P. (1995). Corruption and growth. *The Quarterly Journal of Economics, 110*(3), 681–712. https://doi.org/10.2307/2946696

North, D. C. (1990). *Institutions, institutional change, and economic performance.* Cambridge University Press. https://doi.org/10.1017/CBO9780511808678

Nunn, N. (2009). The importance of history for economic development. *Annual Review of Economics, 1*, 65–92. https://doi.org/10.1146/annurev.economics.050708.143336

Ochi, A., Saidi, Y., & Labidi, M. A. (2023). Non-linear threshold effect of governance quality on economic growth in African countries: Evidence from panel smooth transition regression approach. *Journal of the Knowledge Economy, 14*, 4707–4729. https://doi.org/10.1007/s13132-022-01084-w

Ochi, A., Saidi, Y., & Labidi, M. A. (2024). Nonlinear threshold effect of governance quality on poverty reduction in South Asia and Sub-Saharan Africa: A dynamic panel threshold specification. *Journal of the Knowledge Economy, 15*(1), 4239–4264. https://doi.org/10.1007/s13132-023-01271-3

Pesaran, M. H. (2004). *General diagnostic tests for cross section dependence in panels* (Cambridge Working Papers in Economics No. 0435). University of Cambridge. https://ssrn.com/abstract=572504

Przeworski, A., & Limongi, F. (1993). Political regimes and economic growth. *Journal of Economic Perspectives, 7*(3), 51–69.

Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions rule: The primacy of institutions over geography and integration in economic development. *Journal of Economic Growth, 9*(2), 131–165. https://doi.org/10.1023/B:JOEG.0000031425.72248.85

Saha, S., Sadekin, M. N., & Saha, S. K. (2022). Effects of institutional quality on foreign direct investment inflow in lower-middle income countries. *Heliyon, 8*(10), e10828. https://doi.org/10.1016/j.heliyon.2022.e10828

Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics, 70*(1), 65–94. https://doi.org/10.2307/1884513

Williamson, O. E. (1989). Transaction cost economics. In R. Schmalensee & R. D. Willig (Eds.), *Handbook of industrial organization* (Vol. 1, pp. 135–182). Elsevier. https://doi.org/10.1016/S1573-448X(89)01006-X

World Bank. (2022). *World Bank country and lending groups.* https://datahelpdesk.worldbank.org/knowledgebase/articles/906519

Zhuang, J., de Dios, E., & Lagman-Martin, A. (2010). *Governance and institutional quality and the links with economic growth and income inequality* (ADB Economics Working Paper Series No. 193). Asian Development Bank. https://doi.org/10.2139/SSRN.1619116

Appendix

Appendix A. Country Sample

Model 1 includes 118 countries over 2002-2022. Countries also included in Model 2 are marked with an asterisk (*).

High income (50)
Austria, Bahamas The*, Bahrain, Belgium, Brunei Darussalam*, Bulgaria*, Canada, Chile*, Croatia, Cyprus, Czechia*, Denmark, Estonia, Finland, France, Germany, Greece, Hungary*, Iceland*, Ireland, Israel, Italy*, Japan, Korea Rep.*, Latvia, Lithuania, Luxembourg, Macao SAR China*, Malta, Netherlands, New Zealand, Norway, Oman, Panama*, Poland, Portugal, Romania*, Russian Federation*, Saudi Arabia, Seychelles*, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Arab Emirates, United Kingdom, United States, Uruguay*
Upper middle income (31)
Albania*, Algeria*, Argentina, Armenia*, Belarus*, Belize*, Bosnia and Herzegovina*, Botswana*, Brazil*, China*, Colombia*, Costa Rica*, Cuba, Dominican Republic*, Ecuador, El Salvador, Gabon, Guatemala*, Iran Islamic Rep., Kazakhstan, Malaysia*, Mauritius*, Mexico*, Moldova*, Namibia*, North Macedonia, Paraguay, Peru*, Serbia, South Africa*, Ukraine*
Lower middle income (27)
Angola*, Bangladesh*, Benin, Bhutan*, Bolivia*, Cambodia, Cameroon, Comoros*, Congo Rep., Egypt Arab Rep.*, Haiti*, Honduras*, India*, Kenya*, Lebanon, Mauritania, Morocco, Nepal, Nicaragua*, Pakistan, Philippines, Senegal, Tajikistan, Tanzania, Tunisia, Viet Nam*, West Bank and Gaza
Low income (10)
Burkina Faso, Congo Dem. Rep., Guinea-Bissau, Madagascar*, Mali, Mozambique*, Rwanda*, Sierra Leone*, Togo, Uganda

Appendix B. PCA Factor Loadings for the Composite Institutional Index

WGI Dimension	Loading on PC1	Variance explained
Voice and Accountability (VA)	0.848	
Political Stability (PV)	0.823	
Government Effectiveness (GE)	0.962	
Regulatory Quality (RQ)	0.949	
Rule of Law (RL)	0.979	
Control of Corruption (CC)	0.954	85.4%

Note: *First principal component (PC1) extracted from six WGI dimensions using psych::principal. Variance explained refers to the proportion of total variance across the six indicators accounted for by PC1. All loadings exceed 0.82.*

Appendix C. Residualization Regression: PC1 on log(GDP per capita)

	Estimate	**Std. Error**	**t-value**	**p-value**
(Intercept)	–5.295	0.066	–79.65	< 0.001
log(GDP per capita)	0.599	0.007	80.67	< 0.001

$R^2 = 0.724$, Adjusted $R^2 = 0.724$, $F(1, 2476) = 6508$, $p < 0.001$

Note: *Dependent variable: first principal component of the six WGI dimensions (PC1). Estimated by OLS on the full 118-country balanced panel (2,478 observations). The residuals from this regression constitute the income-adjusted institutional quality index (IQres) used throughout the analysis.*

STATEMENTS AND DECLARATIONS

Authorship.

Alper Duman: Conceptualization, mathematical modeling, coding, analysis. *Ece Tahminci*: Data collection, data preparation, mathematical modeling, analysis, coding, writing.

Competing Interests. There are no competing interests associated with this research.

Funding. This research did not receive funding from any institution, organization, or agency.

Ethics Approval. This research did not involve human participants or animals.

Replication Materials. The data used in this research are drawn from the World Bank's World Development Indicators (WDI) and Worldwide Governance Indicators (WGI), both of which are publicly available at https://databank.worldbank.org The R codes used in the analysis are available upon request.