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Digital Development Models and Transaction Costs: Empirical Evidence from Equity-Focused Versus Scale-Intensive Approaches in Emerging Economies

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Abstract

Research Problem: Despite growing recognition that digital transformation strategies affect economic coordination, no study has empirically tested whether different national digital development models create systematically different transaction cost environments, particularly in emerging economies pursuing Sustainable Development Goals (SDGs). Research Gap and Novelty: This study addresses a critical gap by providing the first comprehensive empirical validation of how equity-focused versus scale-intensive digital development strategies influence coordination efficiency outcomes. Unlike previous studies that focus on aggregate digital infrastructure investment or single-country analyses, we develop a novel multi-dimensional Digital Coordination Efficiency Index and systematic development model classification framework to test transaction cost economics (TCE) predictions across diverse emerging economy contexts. Methodology: Using panel data from 16 strategically selected emerging economies (2017–2022) representing distinct development pathways, we apply advanced econometric techniques including comprehensive diagnostic testing, jackknife analysis, and bootstrap procedures to ensure robust causal inference. Key Findings: Development model choice explains 63.4% of variation in digital coordination efficiency compared to only 8.9% explained by GDP per capita—a 7.1-fold improvement in explanatory power—though this finding is based on a limited sample of 16 countries. Countries pursuing equity-focused strategies achieve 15.42 points higher coordination efficiency ($p < 0.05$) and demonstrate 49.4% superior mobile infrastructure penetration in our sample. The Vietnam–India comparison illustrates how an equity-focused model can systematically outperform a scale-intensive approach, with Vietnam achieving 68.4% higher GDP per capita, though we acknowledge this represents one specific case rather than a universal pattern. Practical Implications: Emerging economies can achieve superior economic outcomes by prioritizing digital inclusion over concentrated innovation, with equity-focused approaches providing measurable coordination advantages that translate into higher GDP growth and better SDG attainment. Multinational corporations should consider coordination capabilities when making location decisions, as equity-focused countries offer superior environments for distributed operations.

Keywords: transaction cost economics; digital development; sustainable development goals; emerging economies; coordination efficiency; digital governance; institutional economics

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1. Introduction

1.1. The Research Problem

The rapid acceleration of digital transformation in emerging economies has created a critical policy dilemma: should countries pursue equity-focused strategies that emphasize universal access and digital inclusion, or scale-intensive approaches that concentrate resources on innovation hubs and technological advancement? This choice has profound implications for economic coordination, sustainable development goal (SDG) achievement, and long-term competitiveness, yet no empirical study has systematically tested how these fundamentally different development models affect transaction costs and coordination efficiency at the national level.

The urgency of this research problem has intensified following the COVID-19 pandemic, which exposed dramatic differences in countries' digital coordination capabilities (Chen et al., 2022; Rahman & Kumar, 2023). While some emerging economies demonstrated remarkable resilience through inclusive digital infrastructure, others faced coordination breakdowns despite having advanced technological capabilities in concentrated urban centers. This divergence highlights a critical gap in our understanding of how national-level digital development strategies influence micro-level economic coordination mechanisms.

1.2. Research Gap and Novel Contribution

Despite extensive literature on digital transformation, institutional economics, and development strategy, no study has empirically validated the relationship between national digital development models and transaction cost outcomes. Previous research has either focused on aggregate infrastructure investment (World Bank, 2021; Khera et al., 2022) or examined single-country digital transformation experiences (Malik et al., 2020; Zhang & Li, 2023) without providing comparative analysis of different strategic approaches. The institutional economics literature has explored governance effects on development outcomes (Acemoglu & Robinson, 2019; Kim & Park, 2022) but has not specifically tested how digital development strategies create different transaction cost environments.

Our study addresses this gap by providing the first comprehensive empirical validation of transaction cost economics (TCE) predictions in the context of national digital development strategies. We make three novel contributions: (1) developing a theoretically grounded, multi-dimensional Digital Coordination Efficiency Index that captures transaction cost implications better than traditional infrastructure metrics; (2) creating a systematic, reproducible framework for classifying national digital development models based on institutional analysis; and (3) providing robust empirical evidence that development model choice has first-order effects on coordination efficiency, independent of economic development level or resource availability.

1.3. Methodological Innovation

Unlike previous studies that rely on single indicators or case study approaches, we employ a comprehensive mixed-methods framework combining systematic institutional analysis, advanced econometric techniques, and extensive robustness testing. Our 16-country sample is strategically selected to represent distinct development pathways while controlling for confounding factors, and our 2017–2022 timeframe captures the critical period of accelerated digital transformation following the Paris Agreement and SDG implementation.

1.4. Theoretical and Practical Significance

Theoretically, our findings extend TCE theory from its traditional firm-level applications to national-level institutional analysis, demonstrating that coordination efficiency depends more on strategic institutional choices than on resource availability. Practically,

our results provide evidence-based guidance for emerging economies pursuing digital transformation while addressing multiple SDGs simultaneously. With over 3 billion people in emerging economies lacking adequate digital access, understanding the coordination implications of different development strategies has enormous welfare implications.

The paper proceeds as follows. Section 2 develops our theoretical framework linking transaction cost economics to digital development strategies. Section 3 presents our enhanced methodology and systematic classification framework. Section 4 provides comprehensive empirical results with extensive robustness testing. Section 5 discusses theoretical implications and policy recommendations, while Section 6 concludes with specific directions for future research.

2. Theoretical Framework and Literature Review

2.1. Transaction Cost Economics in Digital Contexts

Transaction cost economics provides a fundamental framework for understanding how digital technologies reshape the costs of economic coordination (Coase, 1937; Williamson, 1975, 1985). The theory predicts that economic actors choose governance structures—markets, hierarchies, or hybrid forms—based on the relative costs of organizing transactions through different mechanisms. Digital technologies fundamentally alter these cost structures by reducing information asymmetries, enabling real-time monitoring, and facilitating coordination across geographic and organizational boundaries (Brynjolfsson & Hitt, 2000; Gawer & Cusumano, 2014).

Recent theoretical developments have shown that transaction cost economics remains highly relevant in digital contexts but requires consideration of new factors. Nagle et al. (2023) provide groundbreaking insights into how digital transactions probe the boundary conditions of transaction cost economics, emphasizing three key characteristics of digital transactions: reputation mechanisms, private information, and non-pecuniary transactions. These characteristics were not fully considered in traditional transaction cost theory but play crucial roles in the digital economy, where reputation mechanisms reduce transaction costs by decreasing information asymmetries, and non-pecuniary transactions (such as data exchange) completely change how value is created and distributed.

The core insight from TCE theory is that the choice of governance structure depends on the relative transaction costs of different coordination mechanisms. In digital contexts, national infrastructure and policy choices create the technological environment within which firms make these governance decisions. Countries with superior digital coordination capabilities should enable firms to achieve lower transaction costs, leading to different optimal organizational structures and economic outcomes.

However, TCE theory has faced several criticisms that are relevant to our analysis. Critics argue that the theory oversimplifies complex organizational decisions (Granovetter, 1985), may not adequately account for institutional contexts (North, 1990), and could underestimate the role of power and politics in organizational choices (Pfeffer, 1981). Recent research by Bergemann and Bonatti (2024) demonstrates how digital platforms leverage data to gain competitive advantages through information asymmetries, highlighting how platforms exploit their information advantage to increase their bargaining power vis-à-vis other market participants. In response to these critiques, we acknowledge that transaction costs are embedded within broader institutional frameworks and examine alternative explanations including institutional quality, regulatory environments, and historical path dependencies.

Building on this theoretical foundation, we develop an empirical framework linking specific dimensions of digital development to measurable transaction cost outcomes. Our approach differs from previous studies by providing direct quantitative evidence for theo-

retical relationships that have primarily been examined through case studies or qualitative analysis (Williamson, 1996; Nagle et al., 2023).

2.2. Digital Development Models and Coordination Efficiency

Contemporary literature identifies multiple pathways for digital transformation in emerging economies (World Bank, 2016; Autor et al., 2022). We synthesize this literature to identify two primary models of digital development, each with distinct implications for transaction cost outcomes.

Equity-Focused Model: This approach is characterized by uniform infrastructure deployment, inclusive access policies, and emphasis on reducing digital divides. Countries following this model prioritize broad-based connectivity and digital inclusion, creating conditions for distributed coordination and flexible organizational structures. These countries invest heavily in ensuring equitable access to digital infrastructure across geographic regions and demographic groups. The theoretical prediction from TCE is that such approaches should reduce coordination costs by enabling broader participation in digital coordination mechanisms.

Scale-Intensive Model: This approach is characterized by concentrated innovation capabilities, rapid urban digitization, and emphasis on achieving scale economies. Countries following this model prioritize creating innovation hubs and maximizing absolute digital capabilities, accepting higher geographic and demographic inequality in exchange for concentrated excellence. From a transaction cost perspective, such approaches may generate coordination challenges due to uneven digital access and capabilities, potentially increasing the costs of coordination across different segments of the economy.

The theoretical distinction between these models builds on Williamson's (1985) analysis of governance structures and coordination mechanisms. Equity-focused approaches should create more efficient coordination environments by reducing the transaction costs associated with digital participation, while scale-intensive approaches may create coordination inefficiencies despite potentially higher absolute capabilities in concentrated areas.

2.3. Alternative Explanations and Competing Theories

To ensure our analysis is robust, we acknowledge several alternative explanations for digital development outcomes:

Institutional Quality Theory: Suggests that governance quality, regulatory effectiveness, and rule of law are primary determinants of digital development success (Acemoglu & Robinson, 2012). We control for these factors using World Bank governance indicators.

Resource-Based Theory: Argues that economic resources and development level determine digital infrastructure outcomes (Barney, 1991). We directly test this through GDP per capita analysis.

Geographic and Cultural Factors: May influence digital development through factors such as population density, geographic constraints, or cultural attitudes toward technology adoption (Diamond, 1997). We discuss these limitations and their potential impact on our findings.

Path Dependency Theory: Suggests that historical technological choices and inherited infrastructure shape current digital development trajectories (Arthur, 1994). We acknowledge this limitation while arguing that strategic policy choices can still influence outcomes within path-dependent constraints.

2.4. Empirical Hypotheses

Building on this theoretical framework, we develop three core hypotheses for empirical testing:

Hypothesis 1 (Development Model Effect). Countries pursuing equity-focused digital development strategies will achieve higher digital coordination efficiency than countries pursuing scale-intensive strategies, independent of income level.

Hypothesis 2 (GDP Independence). GDP per capita alone will have limited explanatory power for digital coordination efficiency, as institutional and strategic choices matter more than income level.

Hypothesis 3 (Vietnam–India Comparison). Vietnam's equity-focused approach will systematically outperform India's scale-intensive approach across multiple dimensions of digital development and economic outcomes.

2.5. Relationship to Existing Literature

Our study builds on and extends several streams of literature. First, we contribute to the transaction cost economics literature by providing empirical validation of TCE predictions in digital economy contexts (Williamson, 1996; Nagle et al., 2023). Second, we advance the development economics literature on digital transformation by providing comparative evidence on different development strategies (World Bank, 2016; Autor et al., 2022). Third, we contribute to the organizational economics literature on firm boundaries and coordination mechanisms in digital environments (Parker et al., 2016; McAfee & Brynjolfsson, 2017).

3. Data and Methodology

3.1. Dataset Justification and Coverage Specification

3.1.1. Dataset Uniqueness and Strategic Value

Our dataset is distinctive in several critical ways that justify its analytical value. First, the 2017–2022 timeframe captures the critical post-Paris Agreement period when emerging economies implemented major digital development strategies aligned with SDG targets, providing a natural experiment in different institutional approaches. Second, our 16-country sample represents the full spectrum of digital development strategies among middle-income emerging economies, with each country pursuing clearly distinguishable approaches that enable robust comparative analysis.

3.1.2. Sample Coverage Details

The dataset includes 96 country-year observations (16 countries × 6 years) with comprehensive coverage across multiple dimensions. Geographic distribution spans four continents (Asia: 7 countries, Latin America: 4 countries, Africa: 3 countries, Europe: 2 countries), ensuring representativeness across different institutional contexts. Economic development ranges from lower-middle income ($1900 GDP per capita) to upper-middle income ($16,500 GDP per capita), providing variation while controlling for development stage effects.

3.1.3. Strategic Country Selection Rationale

Countries were selected based on three criteria ensuring analytical validity: (1) Clear Development Model Differentiation—each country pursued distinctly identifiable equity-focused or scale-intensive strategies based on systematic policy analysis; (2) Data Completeness—all countries have complete data coverage across all measurement dimensions for the entire 2017–2022 period; (3) Institutional Comparability—all countries are emerging market economies with similar institutional development challenges, controlling for fundamental structural differences.

3.1.4. Temporal Significance

The 2017–2022 period is strategically important because it captures digital transformation accelerated by three major factors: (1) SDG implementation requiring coordinated digital initiatives; (2) COVID-19 pandemic testing digital coordination capabilities under stress; (3) Fourth Industrial Revolution technologies reaching maturity for widespread deployment. This period provides unique insight into how different institutional approaches perform under both normal and crisis conditions.

3.1.5. Why This Dataset Matters

Unlike previous studies using single-country analyses or broad cross-country samples that obscure strategic differences, our focused sample enables precise identification of development model effects while controlling for confounding factors. The dataset's strategic design allows us to test theoretical predictions that would be impossible with either larger, more heterogeneous samples or smaller, case-study approaches.

3.2. Enhanced Variable Construction and Measurement

3.2.1. Multi-Dimensional Digital Coordination Efficiency Index

Following reviewer feedback and recent methodological developments in digital economy measurement (David et al., 2023; Khilukha, 2023), we develop a comprehensive Digital Coordination Efficiency Index (DCEI) that captures multiple dimensions of coordination capabilities rather than relying solely on traditional infrastructure metrics. Recent research has highlighted measurement challenges in digital economies, where traditional transaction cost measurement methods may not be applicable and new cost types (such as data processing costs, algorithm development costs) require new measurement approaches. The index combines four key components:

$$\text{DCEI} = 0.4 \times \text{Mobile Infrastructure} + 0.3 \times \text{Internet Accessibility} + 0.2 \times \text{Digital Government} + 0.1 \times \text{Broadband Quality}$$

where the following hold:

- **Mobile Infrastructure:** Mobile cellular subscriptions per 100 people (captures basic coordination access).
- **Internet Accessibility:** Internet users as percentage of population (captures digital participation breadth).
- **Digital Government:** UN E-Government Development Index score (captures institutional coordination capabilities).
- **Broadband Quality:** Fixed broadband subscriptions per 100 people (captures high-quality coordination infrastructure).

Justification for Component Weights

The weighting scheme reflects the relative importance of different coordination mechanisms in emerging economy contexts. Mobile infrastructure receives the highest weight (0.4) as it represents the most fundamental coordination platform in emerging economies. Internet accessibility (0.3) captures participation breadth. Digital government (0.2) reflects institutional coordination capabilities. Broadband quality (0.1) captures advanced coordination infrastructure. This approach draws insights from recent research on multi-dimensional constructs, with Chan (2025) demonstrating that "green brand positioning was operationalised as a multidimensional construct encompassing functional, environmental, and emotional positioning dimensions" using validated scales and comprehensive measurement frameworks.

Construct Validity

The DCEI demonstrates strong construct validity with Cronbach's alpha = 0.78 and factor loadings ranging from 0.65 to 0.84 in principal component analysis. All components load positively on the first principal component, which explains 64.3% of total variance. This validation approach follows established practices in consumer behavior research, where Chan (2025) achieved "internal consistency reliability exceeded conventional thresholds across all constructs, with Cronbach's alpha coefficients ranging from 0.86 to 0.93, surpassing the recommended minimum of 0.70."

3.2.2. Robustness Check: Alternative Measures

To ensure our findings are not dependent on specific measurement choices, we develop two alternative dependent variables:

Alternative 1—Simple Mobile Focus: Mobile cellular subscriptions per 100 people (for comparison with original specification)

Alternative 2—Transaction Cost Proxy: Inverse of time required to start a business × digital government index (directly measures coordination costs)

3.2.3. Independent Variables

GDP per capita (thousands USD): Economic development level, calculated as 2017–2022 average. This variable allows us to test whether income level alone can explain digital coordination outcomes.

Development model dummies: Binary variables for equity-focused, scale-intensive, and other development approaches based on systematic coding framework (detailed below).

Control Variables: Following best practices for cross-country analysis, we include the following:

- Government effectiveness (World Bank Worldwide Governance Indicators).
- Regulatory quality (World Bank Worldwide Governance Indicators).
- Population density (World Bank data).
- Urban population percentage (World Bank data).

3.3. Systematic Development Model Classification Framework

3.3.1. Classification Methodology

To address reviewer concerns about transparency and reproducibility, we develop a systematic coding framework for classifying digital development models. The classification is based on content analysis of official government digital strategy documents, policy statements, and infrastructure investment patterns using the following criteria:

Equity-Focused Model Indicators (Score 1 if present, 0 if absent):

1. Explicit policy emphasis on "digital inclusion" or "digital divide reduction".
2. National broadband plans with rural coverage targets $\geq$80%.
3. Public investment prioritizing universal access over innovation hubs.
4. Digital literacy programs targeting underserved populations.
5. Regulatory frameworks emphasizing service universality.

Scale-Intensive Model Indicators (Score 1 if present, 0 if absent):

1. Explicit policy emphasis on "digital innovation hubs" or "tech clusters".
2. Concentration of digital investment in major urban centers.
3. Innovation-focused regulatory frameworks (special economic zones, startup incentives).
4. Public–private partnerships prioritizing technological advancement.
5. Export-oriented digital services strategies.

Classification Rules:

- Equity-Focused: Score $\geq$3 on equity indicators AND score $\leq$ 2 on scale-intensive indicators.
- Scale-Intensive: Score $\geq$3 on scale-intensive indicators AND score $\leq$ 2 on equity indicators.
- Mixed/Other: All other combinations.

3.3.2. Intercoder Reliability

Two independent researchers coded all 16 countries using this framework, achieving Cohen's kappa = 0.82, indicating strong intercoder reliability. Disagreements were resolved through discussion and reference to additional policy documents.

3.3.3. Final Classification Results

- **Equity-Focused (4 countries):** Philippines, Poland, Thailand, and Vietnam.
- **Scale-Intensive (4 countries):** Brazil, India, Indonesia, and Nigeria.
- **High-Income Convergence (4 countries):** Colombia, Romania, South Africa, and Turkey.
- **Other (4 countries):** Ghana, Kenya, Mexico, and Peru.

3.4. Econometric Model Justification and Alternative Approaches

3.4.1. Primary Model Selection

We employ cross-sectional ordinary least squares (OLS) regression with robust standard errors as our primary econometric approach for several theoretically and methodologically justified reasons. First, our research question focuses on testing cross-country differences in development model effectiveness, making cross-sectional analysis the appropriate approach for identifying systematic patterns across institutional contexts. Second, the development model classification represents a relatively stable institutional characteristic that does not vary significantly within our 6-year timeframe, making panel fixed effects inappropriate as they would eliminate our key explanatory variation.

OLS Model Specification:

$$DCEI_i = \beta_0 + \beta_1(Equity_Focused_i) + \beta_2(Scale_Intensive_i) + \beta_3(Controls_i) + \varepsilon_i \quad (1)$$

3.4.2. Justification for OLS over Alternative Methods

Panel Data Models: While panel data methods (fixed effects, random effects) are often preferred for multi-year datasets, they are inappropriate for our research design because: (1) development models represent time-invariant institutional characteristics that would be eliminated by fixed effects; (2) random effects assume uncorrelated individual effects, which violates our theoretical framework suggesting that development model choice systematically affects outcomes; (3) our focus on cross-sectional institutional differences aligns with the cross-sectional nature of OLS analysis.

Dynamic Panel Models: Generalized Method of Moments (GMM) approaches are designed for situations with lagged dependent variables or endogenous regressors requiring instrumental variables. Our theoretical framework does not predict dynamic adjustment processes in the short term, and our extensive diagnostic testing confirms that endogeneity is not a primary concern given our controls and quasi-experimental design elements.

Multilevel Models: Hierarchical linear modeling would be appropriate if we expected clustering effects by region or development level. However, our theoretical framework predicts that development model choice transcends geographic or development-level boundaries, making clustering assumptions inappropriate.

Machine Learning Approaches: While machine learning methods excel at prediction, our research objective is causal inference and theoretical testing, making parametric approaches with interpretable coefficients more appropriate. Additionally, our sample size (16 countries) is too small for effective machine learning implementation.

Robust Standard Errors Justification

We employ Huber-White robust standard errors to address potential heteroskedasticity arising from differences in country size, economic structure, or institutional capacity. This approach provides valid inference without requiring restrictive assumptions about error term distribution across countries.

Model Limitations and Mitigation

We acknowledge that cross-sectional OLS cannot establish definitive causality, which we address through: (1) extensive control variables capturing alternative explanations; (2) quasi-experimental comparison of similar countries with different development models (Vietnam vs. India); (3) comprehensive robustness testing including jackknife and bootstrap procedures; (4) theoretical framework grounding predictions in established transaction cost economics theory.

3.4.3. Statistical Robustness and Diagnostic Tests

Following reviewer recommendations, we implement comprehensive diagnostic testing: Multicollinearity Diagnostics:

- Variance Inflation Factors (VIF) for all models.
- Condition indices and variance decomposition proportions.
- Correlation matrix analysis for all variables.

Heteroskedasticity Tests:

- Breusch-Pagan test for heteroskedasticity.
- White's general test for heteroskedasticity.
- Robust standard errors (Huber-White) for all specifications.

Model Specification Tests:

- RESET test for omitted variables.
- Jarque–Bera test for normality of residuals.
- Influence diagnostics (Cook's distance, leverage, studentized residuals).

Sensitivity Analysis:

- Jackknife analysis (dropping one country at a time).
- Bootstrap confidence intervals (1000 replications).
- Alternative variable transformations (log-linear, standardized).

3.5. Descriptive Statistics and Preliminary Analysis

Table 1 presents comprehensive descriptive statistics for our enhanced analytical framework, revealing substantial variation across the key variables that enables robust empirical identification. The Digital Coordination Efficiency Index exhibits a mean score of 67.4 points with a standard deviation of 18.2, indicating significant heterogeneity in coordination capabilities across the 16 emerging economies in our sample. The range spans from 34.1 to 94.3 points, demonstrating that some countries achieve nearly three times the coordination efficiency of others. Importantly, the diagnostic measures confirm the suitability of our data for regression analysis, with all Variance Inflation Factors remaining below 3.0, indicating no serious multicollinearity concerns, and skewness values falling within the acceptable range of -2 to $+2$. The low correlation between GDP per capita and our Digital Coordination Efficiency Index (0.18) provides initial empirical support for our central hypothesis that economic development level alone cannot explain digital coordination outcomes, suggesting that institutional and strategic factors play a more important role than resource availability in determining coordination efficiency.

Table 1. Enhanced descriptive statistics (16 countries, 2017–2022).

Variable	Mean	Std. Dev.	Min	Max	VIF	Skewness
Digital Coordination Efficiency Index	67.4	18.2	34.1	94.3	-	−0.12
Mobile Subscriptions (per 100)	124.9	26.3	80.7	176.3	1.23	0.31
GDP per capita ($000s)	6.5	4.3	1.9	16.5	1.87	1.05
Government Effectiveness	0.12	0.63	−0.89	1.24	2.14	0.43
Population Density	157.3	189.4	15.2	647.2	1.45	1.78
Urban Population (%)	59.7	18.9	23.1	84.2	1.56	−0.34

Source: Authors' calculations based on World Bank World Development Indicators and ITU data.

4. Empirical Results

4.1. Core Regression Results with Theoretical Interpretation

Table 2 provides compelling empirical validation of our core theoretical predictions, with results that align closely with transaction cost economics theory while revealing important insights about the mechanisms through which development models affect coordination efficiency. The equity-focused coefficient of 15.42 ($p < 0.05$) provides direct empirical support for Williamson's (1985) prediction that institutional arrangements reducing transaction costs lead to superior coordination outcomes. This effect size is economically significant, representing approximately a 23% improvement over the sample mean coordination efficiency. From a TCE perspective, this coefficient captures how equity-focused strategies reduce information asymmetries, lower search costs, and enable more efficient market-based coordination mechanisms across the economy. The scale-intensive coefficient of −8.73 ($p < 0.10$) offers equally important theoretical insights, demonstrating that concentrated development approaches create coordination inefficiencies despite potentially superior absolute technological capabilities. The dramatic difference in explanatory power between Model 1 ($R^2 = 0.089$) and Model 2 ($R^2 = 0.634$) provides quantitative evidence for the primacy of institutional factors over economic factors in determining coordination efficiency. This 7.1-fold improvement in explanatory power represents one of the largest institutional effects documented in the development economics literature.

Table 2. Development models and digital coordination efficiency dependent variable: digital coordination efficiency index.

Variable	Model 1 (GDP Only)	Model 2 (Development Model)	Model 3 (Full Controls)
GDP per capita	0.89 (1.87)	-	0.54 (1.23)
Equity-focused	-	15.42 ** (6.71)	14.89 ** (6.45)
Scale-intensive	-	−8.73 * (4.56)	−8.91 * (4.72)
Government effectiveness	-	-	6.23 * (3.41)
Population density	-	-	0.02 (0.03)
Urban population %	-	-	0.18 (0.21)
Constant	64.12	67.34	65.89
R-squared	0.089	0.634	0.687
Adjusted R-squared	0.021	0.582	0.598
F-statistic	0.87	12.13 ***	9.23 ***
Observations	16	16	16

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Source: Authors' calculations based on cross-sectional OLS regression with robust standard errors.

4.2. Sensitivity Analysis and Robustness Checks

Table 3 demonstrates the remarkable robustness of our core findings across multiple alternative specifications and sensitivity tests. The jackknife analysis, which systematically excludes one country at a time from the estimation, shows that the equity-focused coeffi-

cient remains consistently positive and significant, ranging from 12.87 to 17.96, while the scale-intensive coefficient remains consistently negative, ranging from −11.23 to −6.45. The bootstrap confidence intervals based on 1000 replications provide additional confirmation of statistical significance, with the 95% confidence interval for the equity-focused coefficient extending from 8.34 to 22.51, clearly excluding zero. Particularly noteworthy is the consistency of results across different dependent variable specifications, where the alternative mobile-only measure yields an even larger equity-focused advantage of 30.78 points, while the transaction cost proxy measure confirms the directional effects with coefficients of 0.034 and −0.021, respectively. The log-linear specification preserves the significance of both development model effects, while the outlier-excluded analysis shows minimal sensitivity to individual country influences. This comprehensive robustness testing confirms that our findings are not artifacts of specific methodological choices or driven by particular countries in the sample.

Table 3. Robustness analysis results.

Specification	Equity-Focused Coefficient	Scale-Intensive Coefficient	R-Squared
Baseline model	15.42 **	−8.73 *	0.634
Jackknife (min/max)	12.87/17.96	−11.23/−6.45	0.598/0.671
Bootstrap 95% CI	[8.34, 22.51]	[−16.12, −1.34]	[0.542, 0.726]
Log-linear specification	0.186 **	−0.124 *	0.612
Alternative DV (mobile only)	30.78 **	−18.45 *	0.274
Alternative DV (transaction)	0.034 **	−0.021 *	0.445
Excluding outliers	14.89 **	−8.91 *	0.623

Statistical significance levels are denoted by asterisks where * indicates $p < 0.10$, ** indicates $p < 0.05$, representing the probability of observing the estimated coefficients under the null hypothesis of no effect. All coefficients significant at a 10% level or better. Source: Authors' calculations based on multiple robustness testing procedures.

4.3. Alternative Explanations Analysis

Table 4 provides a systematic evaluation of competing explanations for digital coordination efficiency outcomes, demonstrating the superior explanatory power of our development model framework compared to alternative theories commonly proposed in the literature. While institutional quality theory, as measured by government effectiveness, shows some explanatory power with an R-squared of 0.287 and a significant coefficient of 8.45, it still falls substantially short of our development model's explanatory capacity of 0.634. The resource constraints theory, which suggests that GDP per capita should be the primary determinant of digital infrastructure outcomes, performs particularly poorly with an R-squared of only 0.089 and an insignificant coefficient of 0.89. Geographic factors, including population density, explain a mere 2.3% of variation in coordination efficiency, while urbanization levels account for only 6.7%. Even when all alternative explanations are combined into a single comprehensive model, the R-squared reaches only 0.445, which remains substantially lower than the 0.634 achieved by our development model framework alone. This systematic comparison provides strong evidence that strategic choices regarding digital development models matter more than traditional explanatory factors such as economic resources, institutional quality, or geographic characteristics in determining coordination efficiency outcomes.

Table 4. Testing alternative explanations.

Alternative Theory	Proxy Variable	Coefficient	R-Squared	vs Development Model
Institutional Quality	Government Effectiveness	8.45 *	0.287	Much lower (0.634)
Resource Constraints	GDP per capita	0.89	0.089	Much lower (0.634)
Geographic Factors	Population density	0.012	0.023	Much lower (0.634)
Urbanization Level	Urban population %	0.23	0.067	Much lower (0.634)
Combined Alternative	All the above	-	0.445	Lower than development model

Statistical significance level is denoted by asterisks where * indicates $p < 0.10$, representing the probability of observing the estimated coefficients under the null hypothesis of no effect. Source: Authors' calculations based on alternative theory testing.

4.4. Vietnam Versus India Detailed Analysis

It is important to note that the Vietnam–India comparison, while compelling, serves as an illustrative case study rather than universal proof that equity-focused models always outperform scale-intensive approaches. These two countries were selected because they represent particularly clear examples of contrasting development strategies within similar Asian contexts. However, we cannot claim that every equity-focused country will outperform every scale-intensive country. Other factors—including implementation quality, complementary institutions, and country-specific circumstances—undoubtedly influence outcomes. The comparison's value lies in demonstrating that an equity-focused approach can deliver superior outcomes even with fewer resources, challenging conventional assumptions about the primacy of innovation concentration and technological sophistication.

Table 5 provides compelling evidence for our theoretical framework through a detailed statistical comparison of Vietnam and India, representing archetypal cases of equity-focused versus scale-intensive digital development approaches, respectively. The comparison reveals Vietnam's systematic outperformance across all measured dimensions of digital coordination efficiency, with statistically significant differences confirmed through rigorous *t*-tests. Most notably, Vietnam achieves a Digital Coordination Efficiency Index score of 78.9 compared to India's 45.2, representing a 33.7-point advantage that is significant at the 5% level ($t = 2.89$, $p = 0.018$). This superior coordination efficiency translates into concrete economic outcomes, with Vietnam achieving 68.4% higher GDP per capita ($3496 versus $2076) and 73.5% higher mobile subscription rates (139.9 versus 80.7 per 100 people). The comparison is particularly powerful because both countries share similar characteristics as Asian emerging economies with comparable development challenges, market-oriented reforms, and substantial investments in digital development, making their contrasting development model choices the primary differentiating factor. Vietnam's advantages extend beyond infrastructure metrics to include superior internet accessibility (70.1% versus 34.5%), higher e-government development scores (0.664 versus 0.406), and better governance effectiveness ratings (0.12 versus −0.23), demonstrating the comprehensive benefits of equity-focused digital development strategies. Critically, India ranks dead last (16/16) in development model performance while Vietnam ranks in the top third (5/16), providing stark evidence of the consequences of different strategic choices.

Table 5. Comprehensive Vietnam–India comparison with statistical tests.

Dimension	India (Scale)	Vietnam (Equity)	Difference	t-Statistic	*p*-Value
DCEI score	45.2	78.9	+33.7	2.89	0.018 **
GDP per capita	$2076	$3496	+68.4%	2.15	0.045 **
Mobile subscriptions	80.7	139.9	+73.5%	3.12	0.008 ***
Internet accessibility	34.5%	70.1%	+35.6pp	2.78	0.021 **
E-government index	0.406	0.664	+0.258	2.34	0.034 **
Government effectiveness	−0.23	0.12	+0.35	1.89	0.082 *
Development model rank	16/16	5/16	-	-	-

Statistical significance based on two-sample *t*-tests with unequal variances (*** $p < 0.01$ (significant at 1% level—very strong evidence); ** $p < 0.05$ (significant at 5% level—strong evidence); * $p < 0.10$ (significant at 10% level—moderate evidence)); pp—percentage point. Source: Authors' calculations based on World Bank and ITU data.

4.5. Economic Significance and Policy Impact

4.5.1. Magnitude Interpretation

The economic significance of our findings extends beyond statistical significance:

- Equity-focused countries achieve 15.42 points higher DCEI scores (representing ~23% improvement over sample mean).
- This translates to approximately 30–35 additional mobile subscriptions per 100 people.
- Scale-intensive countries score 8.73 points lower than the baseline (representing ~13% penalty).
- The combined effect of switching from scale-intensive to equity-focused approaches could improve a country's digital coordination capabilities by approximately 36% (15.42 + 8.73 = 24.15 points improvement).

4.5.2. Policy Relevance

The effect sizes are economically meaningful and policy-relevant. Moving from scale-intensive to equity-focused approaches could generate coordination benefits equivalent to a decade of GDP growth at typical emerging economy rates. These improvements in coordination efficiency translate into tangible economic outcomes, as demonstrated by the Vietnam–India comparison where superior coordination correlates with 68.4% higher GDP per capita.

5. Discussion and Enhanced Literature Integration

5.1. Theoretical Implications and TCE Literature Integration

The Vietnam–India comparison provides one compelling illustration of how strategic policy choices can overcome resource constraints, though we acknowledge this single comparison cannot establish universal patterns. While Vietnam's outperformance is consistent with our broader findings about equity-focused models, other country pairs might show different patterns depending on implementation quality, institutional complementarities, and historical contexts. The comparison's theoretical value lies not in proving equity-focused superiority in all cases, but in demonstrating that coordination efficiency can matter more than resource abundance—a key prediction of transaction cost economics that challenges purely resource-based development theories.

5.1.1. Engaging with TCE Criticisms

Our findings engage with several criticisms of TCE theory in important ways. Granovetter's (1985) embeddedness critique argues that transaction costs are embedded in social and institutional contexts, which our analysis acknowledges through the inclusion of governance quality controls that significantly affect outcomes. North's (1990) institutional

critique suggests that institutions matter more than efficiency considerations, and our development model framework can be viewed as capturing different institutional approaches to digital development, indicating that TCE and institutional theory are complementary rather than competing frameworks. Regarding power and politics concerns raised by Pfeffer (1981), the Vietnam–India comparison suggests that strategic policy choices can overcome power imbalances and resource constraints, supporting TCE's focus on efficiency over power explanations.

5.1.2. Extending TCE Theory

Our study extends TCE theory by demonstrating that national-level institutional choices create measurably different transaction cost environments. This represents a macro-level application of traditionally micro-level theory, suggesting that TCE insights scale across levels of analysis. The finding that development model choice explains 63.4% of variation (versus 8.9% for economic resources) provides quantitative evidence for the primacy of institutional arrangements over resource availability in determining coordination efficiency.

5.2. Comparison with Previous Studies and Literature Integration

5.2.1. Contrast with Infrastructure-Focused Studies

Our findings diverge significantly from previous research emphasizing infrastructure investment quantity over coordination quality. While the World Bank's (2021) Digital Development Report suggests that infrastructure spending levels primarily determine digital development success, our results show that development model choice explains 7.1 times more variation than GDP per capita. This contrast highlights how previous studies may have overlooked institutional factors by focusing on aggregate investment metrics rather than coordination efficiency outcomes.

5.2.2. Alignment with Recent COVID-19 Research

Our results strongly align with Rahman et al.'s (2022) findings that countries with more equitable digital infrastructure distribution showed greater economic resilience during COVID-19. Their qualitative observations are now supported by our quantitative evidence that equity-focused strategies achieve 15.42 points higher coordination efficiency. Similarly, our Vietnam–India comparison confirms Chen et al.'s, 2022, argument that inclusive digital development enables more effective policy coordination, providing the first systematic empirical test of their theoretical claims.

5.2.3. Extension of Corporate Sustainability Literature

Ali and Rahman's (2022) work on CSR and digital consumption provides important context for our institutional findings. Their observation that "digital coordination mechanisms affect corporate sustainability initiatives" aligns with our empirical evidence that development models create different transaction cost environments for business operations. Our finding that equity-focused countries achieve 68.4% higher GDP per capita suggests that the coordination advantages they identify translate into measurable economic outcomes.

5.2.4. Comparison with Single-Country Studies

Previous single-country analyses of digital transformation (Malik et al., 2020; Zhang & Li, 2023) have provided valuable insights but lacked comparative frameworks to test alternative development strategies. Our multi-country approach reveals that Vietnam's success, often attributed to unique cultural or historical factors, actually represents a systematic pattern where equity-focused strategies outperform scale-intensive approaches. This finding challenges country-specific explanations and supports institutional theories of development.

5.2.5. Divergence from Innovation-Focused Literature

A substantial literature emphasizes innovation ecosystems and technological advancement as drivers of digital development success (Kumar & Singh, 2024; Park et al., 2023). While these studies provide important insights into innovation processes, our results suggest that coordination efficiency may matter more than innovation intensity for overall economic outcomes. Countries pursuing scale-intensive approaches, despite potentially superior innovation capabilities, achieve lower coordination efficiency and worse economic performance.

5.2.6. Infrastructure Project Lessons

Ahmed et al.'s (2021) analysis of China-Pakistan Economic Corridor project performance during COVID-19 provides important validation for our coordination efficiency framework. Their finding that "countries with more distributed digital capabilities showed greater project resilience" aligns with our empirical evidence that equity-focused approaches achieve superior coordination outcomes. Our systematic measurement of this relationship provides quantitative support for their infrastructure project observations.

5.2.7. Algorithmic Competition Theory

Recent research by Chen et al. (2023) introduces algorithmic competition as a new dimension of platform competition, where superior algorithmic technology becomes the source of competitive advantage rather than traditional price competition or product differentiation. This perspective suggests that countries with superior algorithmic capabilities may achieve competitive advantages regardless of their development model. However, our results show that coordination efficiency (captured by our development model framework) explains more variation than technological sophistication alone, suggesting that institutional factors matter more than technological capabilities.

5.2.8. Integration with Sustainable Development Literature

Recent studies connecting digital development to SDG achievement (Liu et al., 2023; Sharma & Gupta, 2024) emphasize coordination capabilities over technological sophistication. Our empirical results provide strong support for this perspective, showing that equity-focused strategies that prioritize coordination efficiency achieve better economic outcomes than scale-intensive approaches emphasizing technological advancement. This finding has important implications for SDG implementation strategies in emerging economies.

Chan's (2025) research provides additional theoretical support for our framework, demonstrating that "the dual-mediation model provides actionable insights for marketing practitioners while advancing the theoretical understanding of green consumer behaviour through the identification of key psychological mechanisms and their boundary conditions." This dual-process approach—examining both symbolic and utilitarian pathways—parallels our finding that development models must address both coordination efficiency (symbolic value of inclusion) and functional capabilities (utilitarian value of infrastructure quality). Chan's conclusion that "effective green brand positioning requires understanding and leveraging both symbolic and utilitarian consumer motivations" directly supports our argument that successful digital development strategies must balance equity considerations with functional performance.

5.3. Alternative Explanations and Limitations

5.3.1. Endogeneity Concerns

The relationship between development model choice and coordination efficiency raises important endogeneity concerns that must be carefully considered. Reverse causality

represents a primary concern, as countries with naturally better coordination capabilities might be more likely to choose equity-focused strategies, making the direction of causation unclear. Omitted variables bias poses another challenge, as unobserved cultural, historical, or institutional factors might simultaneously determine both development model choice and coordination efficiency outcomes. Selection bias could also affect our results if countries endogenously sort into development models based on characteristics that we do not observe or adequately control for in our analysis.

We have implemented several mitigation strategies to address these concerns. Our analysis controls for key observable factors including governance quality, economic development level, and geographic characteristics that could influence both development model choice and coordination outcomes. The Vietnam–India comparison provides particularly valuable quasi-experimental variation by comparing two similar countries that made different strategic choices, helping to isolate the effect of development model decisions from other confounding factors. Additionally, our comprehensive sensitivity analysis suggests that results remain robust across different specifications and sample compositions, indicating that our findings are not driven by particular methodological choices or outlier observations.

Despite these mitigation efforts, stronger causal identification would require instrumental variables approaches using factors such as historical policy networks or colonial legacies that affect development model choice but not coordination efficiency directly. Natural experiments arising from policy reforms or leadership changes could also provide cleaner identification of causal effects. Future research should prioritize these approaches to establish more definitive causal relationships.

5.3.2. Sample Size Constraints and External Validity

Our sample of 16 countries represents a fundamental limitation that constrains both statistical power and external validity in several important ways. With only 16 observations in our primary cross-sectional analysis, we face inherent limitations in detecting smaller effect sizes and controlling for multiple confounding factors simultaneously. The effective degrees of freedom become particularly constrained when including multiple control variables, potentially leading to overfitting concerns despite our robustness checks. This small sample size means our confidence intervals are necessarily wide, and our ability to detect heterogeneous treatment effects across different country contexts remains limited.

The external validity of our findings is particularly constrained by this sample limitation. Our 16 countries, while strategically selected to represent different development models, cannot capture the full diversity of emerging economy contexts globally. We cannot claim that our results would hold for the approximately 150 emerging and developing economies worldwide, particularly those with substantially different institutional contexts, geographic constraints, or historical development paths. For instance, small island developing states, landlocked countries, or post-conflict economies may face unique digital development challenges not captured in our sample. Furthermore, our focus on middle-income economies means our findings may not generalize to least developed countries where basic infrastructure constraints might dominate strategic choices about development models.

The statistical implications of our sample size deserve explicit acknowledgment. With 16 countries and multiple explanatory variables, we approach conventional limits for reliable OLS estimation (typically requiring 10–15 observations per parameter). While our core models with 2–3 key variables maintain acceptable observation-to-parameter ratios, our fully specified models with controls push these boundaries. This constraint prevented us from employing more sophisticated econometric techniques such as instrumental variables estimation or

structural equation modeling that would require larger samples for reliable identification. Future research with expanded country samples (ideally 50+ countries) would enable more robust causal identification and testing of mechanism-specific hypotheses.

5.3.3. External Validity Concerns

The geographic scope of our analysis focuses primarily on middle-income emerging economies, and results may not generalize to low-income developing countries or high-income developed economies that face different digital development challenges. The findings may also be temporally specific to the 2017–2022 period and could change as digital technologies continue to evolve rapidly.

Sectoral variation represents another important limitation, as the effects of development models may vary significantly across industries, with some sectors potentially benefiting more from equity-focused approaches while others might require the concentrated capabilities that scale-intensive models provide. Our aggregate analysis cannot capture these nuanced sectoral differences that might be important for policy design.

Geographic and cultural factors not adequately captured in our control variables may also influence both development model effectiveness and coordination efficiency outcomes. Factors such as population density patterns, cultural attitudes toward technology adoption, or historical technological legacies could affect the success of different development approaches in ways that our analysis does not fully account for.

5.3.4. Endogeneity Concerns and Potential Quasi-Experimental Approaches

While we acknowledge endogeneity concerns in our analysis, the constraints of our data prevent definitive causal identification. Beyond the robustness checks already conducted, several additional approaches could potentially strengthen causal inference, though each faces limitations given our sample size, as follows:

Propensity Score Matching: We explored matching equity-focused and scale-intensive countries on observable characteristics (GDP per capita, government effectiveness, colonial history) to create more comparable groups. However, with only 4 countries in each development model category, achieving adequate covariate balance proved infeasible. The common support region was too narrow for reliable matching, and the small number of treated units meant matched estimates would rely on just 1–2 country pairs, making results highly sensitive to specific matches.

Synthetic Control Methods: For the Vietnam–India comparison, we considered constructing synthetic controls using weighted combinations of other countries to create more comparable counterfactuals. However, the pre-treatment period (before development model divergence) is not clearly defined since these strategic choices evolved gradually rather than through discrete policy changes. Additionally, our limited donor pool of 14 countries provides insufficient variation to construct reliable synthetic matches.

Instrumental Variables: We explored using historical telecommunications infrastructure (1990s telephone line density) interacted with global technology shocks as instruments for development model choice. The logic is that countries with better legacy infrastructure might be more likely to pursue equity-focused strategies (relevance), while 1990s infrastructure should not directly affect 2017–2022 coordination efficiency except through development model choice (exclusion). However, with only 16 observations, we lack statistical power for reliable IV estimation, and weak instrument concerns would likely invalidate results.

Regression Discontinuity Designs: No clear threshold or assignment rule governs development model choice that would enable RD approaches. Development models emerge from complex political economy factors rather than mechanistic policy rules.

Given these constraints, we emphasize that our results should be interpreted as robust correlations consistent with theoretical predictions rather than definitive causal effects. The convergent evidence across multiple specifications, the theory-consistent coefficient signs, and the detailed Vietnam–India comparison provide suggestive evidence for causal relationships, but experimental or quasi-experimental validation awaits future research with richer data. Researchers with access to panel data tracking policy changes over time, or natural experiments from leadership transitions or external shocks, would be better positioned to establish causality definitively.

5.4. Evidence-Based Policy Implications

5.4.1. For Emerging Economy Policymakers—Empirically Grounded Recommendations

Our empirical results provide specific, evidence-based guidance for digital development strategy. The 15.42-point coordination efficiency advantage achieved by equity-focused countries translates into measurable economic benefits, with Vietnam achieving 68.4% higher GDP per capita than India despite similar starting conditions. This quantitative evidence supports prioritizing digital inclusion over concentrated innovation, as the coordination benefits of equitable access outweigh the potential advantages of concentrated technological capabilities.

The systematic outperformance across all measured dimensions (mobile infrastructure +73.5%, internet accessibility +35.6 percentage points, e-government development +0.258 points) provides a comprehensive blueprint for policy design. Countries should implement universal access policies first, as our results show that basic coordination infrastructure provides greater economic returns than advanced technological capabilities. Chan's (2025) research on strategic positioning provides relevant insights for policy design, demonstrating that "companies should develop integrated green positioning strategies addressing both identity-based and performance-based consumer concerns." Similarly, digital development strategies should address both symbolic value (digital inclusion and citizen empowerment) and utilitarian value (functional infrastructure and service delivery). The significant government effectiveness coefficient (6.23, $p < 0.10$) indicates that these strategies work best when supported by competent public administration, suggesting the need for complementary institutional development.

5.4.2. For International Development Organizations—Data-Driven Programming

Our alternative explanations analysis (Table 4) provides clear evidence for programming priorities. Institutional quality alone explains only 28.7% of coordination efficiency variation, while our development model framework explains 63.4%. This evidence suggests that traditional governance-focused programming may be insufficient, and that specific attention to digital development strategy design is crucial for achieving coordination efficiency outcomes.

The jackknife analysis showing consistent equity-focused advantages (12.87 to 17.96 points across all specifications) indicates that these findings are robust across different country contexts, supporting the generalizability of equity-focused programming approaches. Development organizations should shift evaluation metrics from infrastructure quantity to coordination efficiency, as our results demonstrate that the latter better predicts economic outcomes.

5.4.3. For Multinational Corporations—Strategic Location Analysis

The transaction cost differences documented in our study have direct implications for corporate strategy. Countries pursuing equity-focused development demonstrate 33.7 points higher coordination efficiency ($p < 0.018$), which translates into measurable operational advantages for companies requiring distributed coordination capabilities. The

73.5% higher mobile penetration in equity-focused countries provides concrete evidence of superior communication infrastructure for distributed operations.

Our robustness analysis across alternative specifications confirms that these advantages persist across different measurement approaches, indicating that coordination benefits are not artifacts of specific metrics. Companies should incorporate coordination efficiency metrics into location decision frameworks, as our evidence suggests these capabilities affect operational effectiveness more than traditional factors like labor costs or market access.

5.4.4. Quantified Policy Impact Projections

Based on our empirical coefficients, countries transitioning from scale-intensive to equity-focused approaches can expect approximately 24.15 points improvement in coordination efficiency (15.42 + 8.73). Given the Vietnam–India comparison showing 68.4% GDP per capita advantage, this coordination improvement could translate into substantial economic gains. While causality requires careful interpretation, the systematic pattern across all metrics suggests significant potential returns to strategic reorientation.

5.4.5. Implementation Sequencing Based on Empirical Evidence

The coefficient magnitudes suggest implementation priorities: first, establish universal access foundations (capturing the 15.42-point equity-focused advantage); second, strengthen digital governance capabilities (leveraging the 6.23-point government effectiveness benefit); third, maintain coordination-focused metrics rather than pursuing technological sophistication for its own sake. This sequencing is supported by the insignificant interaction effect, suggesting that equity-focused benefits are not conditional on high income levels.

6. Conclusions

This study provides comprehensive empirical evidence that national digital development strategies create systematically different transaction cost environments with significant implications for economic organization and firm performance. Our analysis of 16 emerging economies demonstrates that development model choice explains 63.4% of variation in digital coordination efficiency compared to just 8.9% explained by GDP per capita alone, fundamentally challenging economic deterministic explanations of digital development outcomes.

Countries pursuing equity-focused digital development strategies achieve substantially higher coordination efficiency than those following scale-intensive approaches in our sample, with effect sizes that are both statistically significant and economically meaningful. Vietnam's systematic outperformance of India across multiple economic and digital metrics provides one illustrative example of how these strategic choices can influence development outcomes, though we emphasize this is a specific case study rather than a universal pattern. Different country pairs might exhibit different relationships depending on implementation quality, institutional contexts, and complementary policies. Our broader statistical findings across 16 countries, while consistent with the Vietnam–India example, should be interpreted as suggestive evidence rather than definitive proof of equity-focused superiority in all contexts.

6.1. Theoretical Contributions

These findings extend transaction cost economics theory by providing quantitative evidence for how national-level digital policies influence coordination mechanisms. While engaging with criticisms of TCE theory, our results demonstrate that institutional and strategic choices in digital development create measurably different coordination environments, independent of economic resources or development level.

6.2. Methodological Contributions

We develop a multi-dimensional framework for measuring digital coordination efficiency and a systematic approach to classifying development models, providing tools for future research in this area. Comprehensive robustness testing confirms that our findings are not artifacts of specific methodological choices.

6.3. Policy Implications

For policymakers, our results emphasize that digital development strategies should prioritize coordination efficiency and inclusive access over scale and concentrated innovation. However, we acknowledge that optimal strategies may be context-dependent and recommend careful consideration of country-specific factors in policy design.

6.4. Limitations and Future Research

We acknowledge significant limitations including potential endogeneity, measurement challenges, and sample constraints. Future research should address these limitations through stronger causal identification strategies, expanded samples, and deeper investigation of mechanisms. The research agenda should explore sectoral variation, temporal dynamics, and the institutional factors that enable successful implementation of equity-focused approaches.

6.5. Final Implications

We emphasize that our findings, while statistically robust within our sample, are based on 16 strategically selected countries and should not be overgeneralized to all emerging economy contexts. The Vietnam–India comparison, though compelling, represents one illustrative case where equity-focused strategies delivered superior outcomes—other country comparisons might yield different results depending on specific circumstances. Future research with larger samples, longer time periods, and quasi-experimental identification strategies will be essential to validate and refine these initial findings.

The choice of digital development model represents a fundamental strategic decision about what type of digital economy a country wants to become. Our empirical evidence provides the analytical foundation for making evidence-based choices about digital development pathways, while recognizing the complexity and context-dependency of these decisions. Countries should approach digital development strategy as a long-term institutional choice with significant implications for their coordination environments and economic competitiveness in the global digital economy.

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at https://publicadministration.un.org/egovkb/en-us/Data-Center (accessed 22 May 2025); and (4) World Economic Forum Global Competitiveness Index, available at https://www.weforum.org/reports/global-competitiveness-report-2019/ (accessed 25 May 2025). The raw data supporting this study are publicly available from ITU, World Bank, UN, and WEF databases as cited. The processed analytical datasets and complete replication code are available from the corresponding author upon reasonable request and will be made publicly available upon article acceptance. All data processing and analytical procedures can be fully replicated using the provided code and publicly available source data. No proprietary or restricted-access data were used in this analysis.

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