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Regulatory Quality and New Business Formation in East and Southeast Asia: Nonlinear and Heterogeneous Effects

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ABSTRACT. This study examines the relationship between regulatory quality and new business formation across 13 East and Southeast Asian economies from 2006 to 2022. Combining the World Bank's Worldwide Governance Indicators (Regulatory Quality, WGI-RQ) with World Development Indicators (new business density and macro controls), we estimate two-way fixed-effects models with country-clustered and wild-cluster bootstrap inference. On average, we do not find a robust partial association between WGI-RQ and new business density. Instead, the relationship is nonlinear and state-dependent: a quadratic specification indicates concavity (diminishing marginal association at higher WGI-RQ), and a median-threshold model shows a flatter slope at low baseline WGI-RQ and a more negative slope at higher WGI-RQ. Neither digital intensity (internet use) nor the post-2020 period significantly moderates this linkage once year effects are absorbed for common shocks. Results are robust to country-trend adjustments, lagged WGI-RQ, percentile scaling, leave-one-out checks, and distribution-sensitive estimators (conditional quantiles and RIF-OLS). Policy implication: "better rules" do not uniformly raise firm entry; payoffs depend on where countries start on the institutional ladder. Foundational governance upgrades are necessary but may require complementary reforms (such as finance, skills, and markets) in settings with weak institutions, whereas additional rule refinements in strong-institution contexts yield incremental returns.

1. Introduction

Business formation is widely regarded as a crucial driver of structural transformation, innovation, and job creation. Among the factors influencing entrepreneurial activity, the institutional and regulatory environment has received continuous attention. Regulatory Quality (WGI-RQ), broadly defined as the government's capacity to develop and implement effective policies and regulations that facilitate private sector development, can reduce entry costs,

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enhance predictability, and create opportunities for new firms [1]. Economic theories traditionally suggest that clearer, less burdensome regulations combined with robust enforcement encourage firm entry by lowering barriers and decreasing uncertainty. Recent empirical studies reinforce this concept: across diverse countries, higher governance quality, including better regulatory quality, is positively associated with increased entrepreneurial activity [2], [3]. For instance, improvements in governance indicators are strongly correlated with higher new-firm density worldwide[4]. Similarly, research on South Asian economies suggests that improved institutional quality positively affects entrepreneurial development [5]. These findings align well with the expectation that a more supportive regulatory framework fosters business creation.

However, emerging evidence suggests that the relationship between Worldwide Governance Indicators - Regulatory Quality (WGI-RQ) and entrepreneurship is neither uniform nor necessarily linear [3], [6]. Some cross-country studies report weak or insignificant average effects of governance reforms on new firm formation after controlling for other factors [2]. In middle-income contexts, the impact of improved regulation may depend heavily on initial conditions and complementary capacities[7], [8]. Incremental improvements in already well-regulated economies may yield diminishing returns if other constraints, such as limited access to finance, inadequate human capital, or small market size, become binding bottlenecks [2], [4]. Conversely, in environments with very weak regulatory institutions, even modest reforms such as simplifying business licensing or reducing bureaucratic burdens can remove critical barriers and stimulate a stronger entrepreneurial response [6], [9]. This pattern indicates state-dependent marginal effects: higher in low-regulation settings and lower in highly regulated ones, suggesting possibly non-monotonic relationships across the regulatory quality spectrum [3], [6].

Moreover, the Worldwide Governance Indicators - Regulatory Quality (WGI-RQ) may interact with other structural factors, especially digital readiness [10], [11]. High levels of internet usage and well-established digital infrastructure can enhance the benefits of effective regulation by reducing information and compliance costs and facilitating e-government services such as online business registration [12], [13], [14]. Theoretically, regulatory reforms tend to yield higher returns when digital tools, such as online licensing and information portals, support implementation and adoption; without this digital connectivity, these effects may be significantly weaker. Furthermore, short-term shocks like the COVID-19 pandemic disrupted global business environments, prompting rapid regulatory adjustments (e.g., temporary procedural simplifications and the adoption of online services) and changes in entrepreneurial behavior, such as the emergence of necessity-driven startups and a shift toward digital business models [15]. By 2021, new business registrations rebounded in a large majority of economies relative to 2020, reversing the pandemic-induced decline [12], [14], [15]. However, it remains an empirical question whether these shocks have altered the fundamental relationship between WGI-RQ and entrepreneurship, for instance, by strengthening resilience in countries with stronger regulations or by reducing differences through necessity-driven business entries [11], [13], [14].

Given these gaps, this study examines the relationship between WGI-RQ and new business formation across East and Southeast Asia, with a focus on potential nonlinearities, heterogeneity, digital moderation, and post-2020 structural breaks. We assemble a panel of 13 economies in the region (e.g., Indonesia, Malaysia, Thailand, Vietnam, the Philippines, China, Japan) with annual data on new business density (newly registered firms per 1,000 working-age people) and the Worldwide Governance Indicators' Regulatory Quality index, along with key controls. By applying country and year fixed-effects models, we isolate within-country variation over time and rigorously test five research questions:

RQ1: (Average association): What is the average effect of WGI-RQ on new business density in East/Southeast Asia, controlling for country-specific and time-specific factors?

RQ2: Nonlinearity): Is the WGI-RQ–entrepreneurship relationship nonlinear, e.g., exhibiting diminishing returns at higher levels of WGI-RQ?

RQ3: (Heterogeneity by baseline): Does the impact of WGI-RQ differ between lower-RQ vs higher-RQ contexts, consistent with state-dependent or threshold effects?

RQ4 (Digital moderation): Does digital connectivity (internet usage) moderate the effect of WGI-RQ on new business density?

RQ5 (post-2020 change): Has the WGI-RQ–entrepreneurship relationship changed in the post-2020 pandemic era?

By addressing these questions, our study makes three contributions. First, we provide a transparent, replicable analysis grounded entirely in open data sources, grounding regional policy discussions in evidence. Second, we move beyond average effects to examine theoretically motivated nonlinear and heterogeneous patterns that matter for policy design, for example, whether reforms are most effective under institutional conditions or in conjunction with complementary digital readiness. Third, we implement inference suited to panels with a relatively small number of clusters (countries), including cluster-robust standard errors and wild-cluster bootstrap p-values, to ensure robust statistical inference. The next section reviews the relevant literature and develops hypotheses H1–H5 corresponding to the above RQs.

2. Literature review

2.1 Institutions, regulation, and firm entry

Formal institutions set the fundamental "rules of the game" that shape economic activities (North, 1990). In entrepreneurship, strong legal and regulatory institutions are essential for reducing transaction costs, protecting property rights, and lowering barriers to entrepreneurs starting and running businesses. The World Bank's Worldwide Governance Indicators (WGI), particularly the Regulatory Quality dimension (WGI-RQ), assess the perceived ability of governments to create and enforce policies that foster private sector growth [1]. A high WGI-RQ score indicates effective regulation, transparency, and strong enforcement, which, in theory, should support firm formalization. Evidence shows that burdensome regulations, such as lengthy

procedures and high fees, hinder new business formation, while reforms that simplify entry processes increase business registrations [2], [3], [16], [17], [18]. For example, countries that adopt electronic registration and streamline processes see improvements in new firm creation. Overall, the data confirms a positive link between higher regulatory quality and entrepreneurial activity in various settings [2], [3], [7].

Institutional theory emphasizes that not all entrepreneurship is equally productive or responsive to formal rules [19]. High-quality regulations that reduce entry barriers and uncertainty tend to support productive entrepreneurship, characterized by innovative and growth-oriented ventures, rather than unproductive or rent-seeking activities [3], [9]. Supporting this perspective, improvements in governance, such as regulatory quality and government effectiveness, are positively linked not only to increased startup activity but also to higher growth ventures and broader economic benefits [2], [4]. We therefore state:

H1 (Average effect): WGI-RQ has a non-zero impact on new business density (expected positive on average, while allowing for null or negative effects a priori). We test this in a baseline fixed-effects model with appropriate inference.

2.2 Mixed empirical evidence and the case for nonlinearity

Despite strong theoretical expectations, empirical evidence from cross-country studies on the relationship between institutions and entrepreneurship remains mixed [2], [3]. Some studies confirm the anticipated positive association, whereas others report weak or statistically insignificant effects after accounting for country-specific fixed effects and addressing concerns about endogeneity[7], [9]. This inconsistency can be attributed to several factors, including measurement errors in institutional indicators, omitted variables, and significant heterogeneity in how institutional changes impact entrepreneurial outcomes across different contexts [2], [9]. One critical possibility is that the relationship between institutional quality and entrepreneurship exhibits diminishing marginal returns, following a concave pattern [6]. When regulatory quality is very low, initial reforms such as simplifying licensing processes or reducing administrative delays can remove substantial barriers, leading to a sharp increase in new business registrations [12], [13]. However, as regulatory quality improves from moderate to high levels, further refinements tend to have marginal effects, especially if other constraints, such as credit availability, human capital, and market size, become more binding [3], [7]. In some cases, stringent enforcement in already highly regulated environments may even discourage marginal or smaller ventures [9]. Such observations highlight the importance of explicitly testing for concavity in the institutional impact on entrepreneurship [6].

Formally, we include a quadratic term in regulatory quality. A significantly negative coefficient on RQ^2 would indicate diminishing returns, i.e., the slope flattens or turns negative at high RQ values. While related inverted-U patterns have been noted for institutions and outcomes

such as investment and innovation, explicit tests for nonlinearity in entrepreneurship remain limited. We address this gap:

H2 (Nonlinearity/Diminishing Returns): The relationship between regulatory quality and new business density is concave, as reflected by a negative coefficient on RQ^2.

2.3 Heterogeneity by baseline regulatory quality

Even if the average effect is positive, impacts may differ systematically across weaker versus stronger institutional contexts [20], [21]. Theory suggests threshold or state-dependent effects, in which baseline institutions are weak, and incremental improvements can yield outsized gains by alleviating severe barriers (cumbersome procedures, opacity) [6]. In such low-RQ settings, a latent pool of inhibited entrepreneurs may formalize once rules become more enabling. In high-RQ environments, most regulatory barriers are already minimal; further refinements may matter less relative to market saturation, innovation cycles, or macroeconomic conditions [22], [23].

Empirical evidence highlights that the impact of regulatory reforms varies significantly across different institutional contexts. For example, digital-government and business-facilitation reforms exhibit larger post-reform increases in new firm creation, particularly in initial business environments that are more challenging [13], [24]. Related threshold analyses also document concave or state-contingent responses of entrepreneurial activity to governance improvements [6]. Building on these insights, our approach models this heterogeneity by interacting the Worldwide Governance Indicator for Regulatory Quality (WGI-RQ) with a categorical indicator denoting below-median baseline regulatory quality, thereby allowing the slope of the effect to vary depending on the initial institutional conditions.

H3 (Baseline heterogeneity): The marginal effect of WGI-RQ on new business density is stronger in low-RQ contexts (i.e., $RQ \times LowRQ > 0$).

2.4 Digital readiness as a moderator

Digital infrastructure plays an increasingly crucial role in shaping entrepreneurial ecosystems by enhancing connectivity and facilitating the flow of information [25], [26]. Broad internet access and digital platforms lower transaction costs and create expanded distribution opportunities [27]. Furthermore, e-government initiatives streamline regulatory processes by moving activities such as search, registration, and licensing onto online platforms, significantly reducing both the time and cost involved [24], [28]. It is posited that the combination of effective regulations and digital tools fosters particularly advantageous environments for startups (Gan, Zhang, & Zhang, 2025). In contexts where internet penetration is limited, even well-formulated policies might fail to reach entrepreneurs effectively; conversely, higher connectivity levels enable faster diffusion and utilization of reforms[26], [29].

Recent studies highlight the synergy between governance quality and digital infrastructure in promoting new firm formation, and the positive impact of digital investment on entrepreneurship is predominantly observed in robust institutional frameworks [12], [13], [20]. Similarly, evidence from developing economies suggests that the advantages of regulatory reforms tend to manifest primarily where e-government initiatives, such as online one-stop shops, have been implemented [24], [28]. This study further tests the moderating effect through the interaction between Worldwide Governance Indicators – Regulatory Quality (WGI-RQ) and internet usage (population share).

H4 (Digital moderation): The effect of WGI-RQ on new business density increases with higher internet usage (a positive RQ×Internet coefficient).

2.5 Period effects after 2020

The COVID-19 pandemic significantly transformed business dynamics worldwide. In 2020, numerous countries experienced steep declines in new firm registrations (Haltiwanger, 2022; U.S. Small Business Administration, 2023). This downturn was followed by policy responses, including temporary regulatory relaxations and an accelerated shift toward the digitalization of business services. By 2021, the landscape rebounded in a large share of economies, with business formation recovering relative to 2020 [15], [30]. These shifts prompt an inquiry into whether the relationship between government regulatory quality (WGI-RQ) and entrepreneurship altered post-pandemic. On one hand, pent-up demand and stimulus measures may have lessened the marginal importance of regulatory quality [30]. On the other hand, countries with stronger WGI-RQ likely managed the shocks more effectively, potentially reinforcing institutional differences [3]. These shifts have been widely documented across countries, including declines in 2020 followed by broad rebounds in business formation and accelerated digital-government adoption [15], [31], [32], [33], [34], [35], [36], [37].

We therefore interact WGI-RQ with a Post-2020 indicator (1 for years ≥ 2020) to test for changes in slope. With no strong prior on direction, we treat this as a two-sided problem.

H5 (post-2020 shift): The association between WGI-RQ and new business density changed after 2020 (non-zero RQ×Post2020).

3. Methodology

3.1 Data Acquisition

We programmatically retrieve internationally comparable secondary data from the World Bank's World Development Indicators (WDI) and Worldwide Governance Indicators (WGI) for the study's countries and years. WDI supplies new business density and macro controls (including internet usage); WGI provides the Regulatory Quality estimate. Outputs are standardized tabular datasets, keyed by ISO 3 country code and year, for subsequent cleaning, merging, and analysis.

3.2 WGI Shape Harmonization

The WGI-RQ file (years in columns) is normalized to long format with keys (iso3c, year) and a numeric value column for RQ. We enforce data types, verify year span and country coverage, and document non-missing counts to ensure merge-readiness with WDI.

3.3 Panel Construction

We merge the WDI series and WGI-RQ on (iso3c, year) to construct a country–year panel containing NBD, RQ, and controls X. If specified, we apply a minimum time-series length per country before estimation.

3.4 Baseline Panel Analysis (Two-Way Fixed Effects)

We estimate the average association between WGI-RQ and NBD using:

$$NBD_{it} = \alpha_i + \tau_t + \beta\, RQ_{it} + \gamma' X_{it} + \varepsilon_{it},$$

with country fixed effects (α_i)and year fixed effects (τ_t). Standard errors are clustered at the country level.

3.5 Model Diagnostics Export

We report fit and specification diagnostics (within/between/overall R^2, variance components $\sigma_u, \sigma_e, \varrho$, F/Wald tests, and the coefficient/SE/t for RQ) to support transparent and reproducible inference.

3.6 Country-Specific Linear Trends

Robustness to gradual country-level drifts is assessed by adding country-specific linear trends**:**

$$NBD_{it} = \alpha_i + \tau_t + \delta_i t + \beta\, RQ_{it} + \gamma' X_{it} + \varepsilon_{it},$$

retaining clustered standard errors at the country level.

3.7 Lagged Regulatory Quality

To mitigate simultaneity concerns, we use lagged WGI-RQ:

$$NBD_{it} = \alpha_i + \tau_t + \beta\, RQ_{i,t-1} + \gamma' X_{it} + \varepsilon_{it}.$$

3.8 Percentile Transformation of WGI-RQ

We test scale robustness by replacing the raw estimate with the percentile rank of RQ(0–100):

$$NBD_{it} = \alpha_i + \tau_t + \beta\, RQ_{it}^{per} + \gamma' X_{it} + \varepsilon_{it}.$$

3.9 Leave-One-Out Robustness

We re-estimate the baseline model while dropping one country at a time, collecting $\hat{\beta}_{RQ}$ and test statistics to gauge sensitivity to single-country influence.

3.10 Nonlinearity in WGI-RQ

We examine curvature via two specifications:

(i) Quadratic (centered): let $RQ_{it}^{c} = RQ_{it} - \bar{RQ}$and include $(RQ_{it}^{c})^2$.

$$NBD_{it} = \alpha_i + \tau_t + \beta_1 RQ_{it}^{c} + \beta_2 (RQ_{it}^{c})^2 + \gamma' X_{it} + \varepsilon_{it}.$$

(ii) Threshold (median split): define $LowRQ_{it} = 1\{RQ_{it} \leq \text{median}(RQ)\}$and include $RQ_{it} \times LowRQ_{it}$. Both are estimated with TWFE and clustered SEs.

3.11 Interaction with Digital Adoption

We test whether digital connectivity moderates the WGI-RQ effect using internet-user intensity:

$$NBD_{it} = \alpha_i + \tau_t + \beta_1 RQ_{it} + \beta_2 Internet_{it} + \beta_3 (RQ_{it} \times Internet_{it}) + \gamma' X_{it} + \varepsilon_{it}.$$

3.12 Structural Break Analysis (Post-2020)

We assess post-pandemic shifts by interacting WGI-RQ with a post-2020 indicator (the main dummy is absorbed by year FE):

$$NBD_{it} = \alpha_i + \tau_t + \beta_1 RQ_{it} + \beta_2 (RQ_{it} \times Post2020_t) + \gamma' X_{it} + \varepsilon_{it}.$$

3.13 Wild-Cluster Bootstrap Inference

We provide finite-sample, cluster-robust p-values for key parameters (e.g., β_{RQ}) using wild-cluster bootstrap at the country level (Rademacher weights; replication count as configured).

3.14 Wild-Cluster Bootstrap Extensions

We extend wild-cluster inference to additional focal parameters (e.g., RQ^{per}, RQ_{t-1}, $RQ \times Internet$, $RQ \times Post2020$) and, where relevant, compare alternative weighting schemes.

3.15 Quantile Regression with Clustered Bootstrap

To probe distributional heterogeneity, we estimate panel quantile regressions at $\tau \in \{0.25, 0.50, 0.75\}$, keeping country FE and omitting year dummies to avoid high-dimensional QR issues. Country-clustered bootstrap (e.g., $B = 200$) provides SEs and percentile CIs.

3.16 RIF–OLS for Unconditional Quantile Effects

Using the RIF–OLS framework, we estimate unconditional quantile partial effects of WGI-RQ:

$$RIF(Y_{it}; q_\tau) = \alpha_i + \beta_{rq}(\tau) RQ_{it} + X_{it}' \gamma(\tau) + \varepsilon_{it},$$

with country-clustered bootstrap and 95% CIs.

3.17 Specification Robustness Plus

We run a specification grid varying FE structures (country vs country+year), control sets (baseline vs expanded), functional forms (standardized/percentile, log outcome, winsorization), weighting (population), sample restrictions (crisis-year exclusion, small-N trims), and variance estimators (cluster default; Driscoll–Kraay if specified). We summarize $\hat{\beta}_{RQ}$ and uncertainty across specifications.

3.18 Reproducibility & Data Availability

All code; indicator lists (WDI/WGI), preprocessing details, and estimation scripts are archived in an open replication package (link provided in Declarations). The package includes a manifest that maps each analysis step to its corresponding outputs, ensuring full transparency and replication.

Table 1. Model-Hpothesis Map

Hypothesis / Check	Substantive claim	Model specification	Expected sign / outcome
H1	Baseline average association between RQ and NBD	TWFE (country & year FE); controls: growth, inflation, internet users, GDP pc	β_RQ ≈ 0 (small/weak, sign uncertain)
H2	Nonlinearity: diminishing returns (curvature in RQ to NBD)	TWFE + quadratic terms (centered RQ, RQ²)	$\beta_{RQ^2} < 0$
H3	Heterogeneous effect at low RQ (threshold)	TWFE + LowRQ dummy + RQ×LowRQ interaction	β_interaction > 0 for LowRQ
H4	Digital intensity moderates RQ to NBD	TWFE + RQ×Digital (internet users or alt. index)	β_RQ×Digital ≈ 0 (ns)
H5	Structural change post-2020	TWFE + RQ×post-2020	β_RQ×post-2020 ≈ 0 (ns)
Robust-A	Temporal dynamics	Lagged RQ (t−1), leads (placebo), leave-one-out	Signs consistent with H1–H3; placebo ≈ 0
Robust-B	Distributional effects	Quantile (τ=.25/.50/.75) & RIF-OLS (uncond. τ)	Heterogeneity consistent with LowRQ patterns

4. Results

4.1 Outcomes of Data Acquisition

Both WDI and WGI extractions cover 13 economies from 2006 to 2023 (Table 2). New business density (NBD) is the only WDI series with notable gaps (182 non-missing vs. 52 missing; Table 3), but annual coverage is broad, with all 13 economies represented each year in the raw download

Table 2. Dataset coverage summary (WDI & WGI)

Dataset	Rows	Countries (ISO3)	Years
WDI (macro & business formation)	234	13	2006–2023
WGI (Regulatory Quality)	234	13	2006–2023

Table 3. Availability by WDI variable

Variable	Non-null	Missing
newbiz_density	182	52
gdp_pc	234	0
gdp_growth	234	0
inflation	230	4
internet_users	233	1

4.2 Outcomes of WGI Shape Harmonization

The WGI Regulatory Quality (WGI-RQ) reshape from wide to long is complete and lossless: 234 country–year rows, 13 distinct economies, 2006–2023 span, and no missing in rq_est (Table 4)

Table 4. WGI (Regulatory Quality) reshape summary

Metric	Value
Rows (wide, original file)	13
Rows (long, reshaped)	234
Distinct countries (ISO3)	13
Year min	2006
Year max	2023
Number of distinct years	18
Non-missing rq_est	234
Missing rq_est	0

4.3 Outcomes of Panel Construction

Intersecting WDI and WGI yields a full 13×18 grid (2006–2023). The estimation panel is harmonized for the period 2006–2022, with N = 181 complete cases for the NBD and covariates.

Descriptive statistics for the analysis sample are in Tables 5 and 6. NBD has a mean of 1.955 (sd 2.696), and WGI-RQ has a mean of 0.192 (sd 0.984).

Table 5. Descriptive statistics (complete-case subset)

Variable	N	Mean	Std	Min	P25	Median	P75	Max
newbiz_density	181	1.955	2.696	0.011	0.251	0.895	2.267	11.322
rq_est	181	0.192	0.984	-2.274	-0.430	0.063	0.918	2.252
gdp_pc	181	14,604.3	17,175.7	702.04	2,355.2	5,764.9	29,200.2	62,622.7
gdp_growth	181	4.701	3.535	-5.765	2.613	5.458	7.149	12.208
inflation	181	3.347	4.087	-1.279	0.972	2.583	4.573	24.637
internet_users	181	50.168	31.585	0.219	20.1	53.8	79	97.24

Table 6. Descriptive statistics (estimation sample)

	newbiz_density	rq_est	gdp_growth	inflation	internet_users
count	181	181	181	181	181
mean	1.955	0.192	4.701	3.347	50.168
std	2.696	0.984	3.535	4.087	31.585
min	0.011	-2.274	-5.765	-1.279	0.219
25%	0.251	-0.43	2.613	0.972	20.1
50%	0.895	0.063	5.458	2.583	53.8
75%	2.267	0.918	7.149	4.573	79
max	11.322	2.252	12.208	24.637	97.24

4.4 Descriptive Statistics

Summary statistics for all variables used in FE regressions are reported in Table 6; dispersion is sizeable for NBD and internet use, foreshadowing the need for robust inference.

4.5 Baseline Fixed-Effects Estimates

The two-way fixed-effects (TWFE) model with country-clustered SEs (Table 7) yields a small and statistically insignificant partial association between WGI-RQ and NBD: $\hat{\beta}_{RQ} = -0.392$ (SE 0.487, $t = -0.804$).

Controls are likewise not statistically significant at conventional levels. Overall fit is moderate (Table 8: $R^2_{within} \approx 0.544$).

Table 7. Country & year FE estimates (SE clustered by country)

term	coef	se	t	model
Intercept	3.254	0.822	3.960	FE_Entity+Time_ClusterEntity
rq_est	-0.392	0.487	-0.804	FE_Entity+Time_ClusterEntity
gdp_growth	-0.042	0.029	-1.458	FE_Entity+Time_ClusterEntity
inflation	0.0119	0.016	0.764	FE_Entity+Time_ClusterEntity
internet_users	-0.021	0.016	-1.346	FE_Entity+Time_ClusterEntity

Table 8. Baseline FE model diagnostics (country-clustered SE)

model	r^2_within	r^2_between	r^2_overall
FE: entity+year (cluster=country)	0.54383	-0.47896	0.419764

4.6 Model Diagnostics

Model diagnostics (Table 8) confirm a reasonable within-fit and document variance components; no red flags emerge that would overturn the baseline inferences.

4.7 Fixed-Effects with Country-Specific Trends

Adding country-specific linear trends leaves the qualitative conclusion unchanged (Table 9): $\hat{\beta}_{RQ} = -0.632$(SE 0.391, $t = -1.618$). The effect remains negative in sign but is not conventionally significant.

Table 9. FE estimates with country-specific trends (SE clustered by country)

model	term	coef	se	t	n_obs	n_countries
FE + CountryTrends (OLS dummies, cluster=country)	rq_est	-0.632	0.391	-1.618	181	13

4.8 Fixed-Effects with Lagged WGI-RQ

Using $RQ_{i,t-1}$ to mitigate simultaneity produces similar results (Table 10): $\hat{\beta}_{RQ_{t-1}} = -0.620$ (SE 0.622, $t = -0.997$). The lag specification does not reveal a robust average association.

Table 10 FE with lagged regulatory quality (SE clustered by country)

term	coef	se	t	model
Intercept	-1.503	0.423	-3.554	FE Entity+Time (cluster entity) — rq_est_lag1
rq_est_lag1	-0.620	0.622	-0.997	FE Entity+Time (cluster entity) — rq_est_lag1
gdp_growth	-0.020	0.029	-0.702	FE Entity+Time (cluster entity) — rq_est_lag1
inflation	-0.010	0.008	-1.226	FE Entity+Time (cluster entity) — rq_est_lag1
internet_users	0.003	0.006	0.405	FE Entity+Time (cluster entity) — rq_est_lag1

4.9 Fixed-Effects with Percentile WGI-RQ

Replacing the raw estimate with the percentile rank of RQ leaves the substantive conclusion intact (Table 11). The RQ percentile coefficient is small in magnitude and not significant.

Table 11 FE with percentile Regulatory Quality (SE clustered by country)

term	coef	se	t	model
Intercept	-0.087	1.213	-0.072	FE Entity+Time (cluster entity) — rq_per (percentile)
gdp_growth	-0.013	0.021	-0.631	FE Entity+Time (cluster entity) — rq_per (percentile)
inflation	-0.007	0.008	-0.831	FE Entity+Time (cluster entity) — rq_per (percentile)
internet_users	0.002	0.005	0.478	FE Entity+Time (cluster entity) — rq_per (percentile)

4.10 Leave-One-Out Robustness

Leave-one-country-out exercises (Table 12) show that the estimated RQ coefficient remains stable in sign and generally small across exclusions (mean ≈ −0.508; range: −1.283 to −0.090). No single country overturns the overall pattern.

Table 12 Leave-one-out results for the Regulatory Quality coefficient

LeftOut	rq_est_coef	rq_est_t
BRN	-0.234	-0.467
CHN	-0.090	-0.263
IDN	-0.462	-0.945
JPN	-0.450	-0.942
KHM	-0.515	-0.912
KOR	-0.494	-0.949
LAO	-0.476	-0.973
MMR	-1.283	-1.608
MYS	-0.548	-1.066
PHL	-0.472	-0.947
SGP	-0.524	-1.133
THA	-0.514	-0.915
VNM	-0.539	-1.047

4.11 Nonlinearity in WGI-RQ

Two nonlinear checks point to curvature and baseline heterogeneity**:**

(i) Quadratic (centered): the squared term is negative and wild-cluster significant (Table 13; Table 14): $RQ_c^2 p_{boot} = 0.024$, indicating diminishing returns at higher WGI-RQ.

Table 13 Nonlinear FE estimates (quadratic centered RQ and median-threshold interaction)

term	coef	se	t	model
Intercept	-2.044	0.353	-5.786	FE — RQ + RQ² (centered)
gdp_growth	-0.012	0.021	-0.576	FE — RQ + RQ² (centered)
inflation	-0.003	0.007	-0.472	FE — RQ + RQ² (centered)
internet_users	0.000	0.008	0.054	FE — RQ + RQ² (centered)
gdp_pc	0.000	0.000	6.354	FE — RQ + RQ² (centered)
Intercept	-0.978	0.578	-1.691	FE — RQ × LowRQ (median threshold)
rq_est	-2.517	1.221	-2.062	FE — RQ × LowRQ (median threshold)
gdp_growth	-0.015	0.022	-0.689	FE — RQ × LowRQ (median threshold)
inflation	-0.002	0.007	-0.307	FE — RQ × LowRQ (median threshold)
internet_users	-0.002	0.008	-0.310	FE — RQ × LowRQ (median threshold)
gdp_pc	0.000	0.000	7.289	FE — RQ × LowRQ (median threshold)

(ii) Threshold (median split): the interaction is positive and significant (Table 13; Table 14): $RQ \times LowRQp_{boot} = 0.000$, while the baseline RQ slope is negative ($p_{boot} = 0.013$). Together, these imply a flatter (near-zero) slope in low-RQ contexts (within-low-RQ slope ≈ −0.115) and a more negative slope in higher-RQ contexts. In short, the marginal association varies by baseline institutional quality.

Table 14 Wild-cluster p-values for extension terms

model	term	coef	t	p_boot
newbiz_density ~ rq_c + rq_c2 + gdp_growth + inflation + gdp_pc + C(country) + C(year)	rq_c	-1.394	-1.661	0.101
newbiz_density ~ rq_c + rq_c2 + gdp_growth + inflation + gdp_pc + C(country) + C(year)	rq_c2	-0.373	-1.982	0.024
newbiz_density ~ rq_est + low_rq + rq_x_low + gdp_growth + inflation + internet_users01 + gdp_pc + C(country) + C(year)	rq_est	-2.517	-1.987	0.013
newbiz_density ~ rq_est + low_rq + rq_x_low + gdp_growth + inflation + internet_users01 + gdp_pc + C(country) + C(year)	rq_x_low	2.402	2.449	0.000
newbiz_density ~ rq_est + internet_users01 + rq_x_inet + gdp_growth + inflation + gdp_pc + C(country) + C(year)	rq_est	-0.464	-0.969	0.392
newbiz_density ~ rq_est + internet_users01 + rq_x_inet + gdp_growth + inflation + gdp_pc + C(country) + C(year)	rq_x_inet	-1.218	-0.913	0.472
newbiz_density ~ rq_est + internet_users01 + rq_x_inet + gdp_growth + inflation + gdp_pc + C(country) + C(year)	internet_users01	-0.083	-0.084	0.958
newbiz_density ~ rq_est + rq_x_post + gdp_growth + inflation + gdp_pc + C(country) + C(year)	rq_est	-0.540	-1.140	0.295
newbiz_density ~ rq_est + rq_x_post + gdp_growth + inflation + gdp_pc + C(country) + C(year)	rq_x_post	0.207	0.776	0.703

4.12 Digital Moderation (RQ × Internet)

The interaction between WGI-RQ and internet use is not statistically significant (Table 18; Table 14): $RQ \times Internet\hat{\beta} = -1.218$(SE 1.286, $t = -0.947$, $p_{boot} = 0.472$).

We do not find evidence that measured digital connectivity amplifies the RQ–NBD link in this sample.

4.13 Structural Break: Post-2020 Interaction

Post-2020 interaction results are also not significant **(**Table 14; Table 15): $RQ \times Post2020p_{boot} = 0.703$.

Thus, we do not detect a systematic change in the RQ–NBD association after 2020, once year fixed effects absorb common shocks.

Table 15 FE with RQ × Post-2020 (SE clustered by country)

model	term	coef	se	t
OLS + FE (C(country),C(year)) — RQ × Post2020 (cluster=country)	Intercept	-5.381	0.465	-11.578
OLS + FE (C(country),C(year)) — RQ × Post2020 (cluster=country)	rq_est	-0.457	0.494	-0.925
OLS + FE (C(country),C(year)) — RQ × Post2020 (cluster=country)	rq_x_post	0.307	0.328	0.937
OLS + FE (C(country),C(year)) — RQ × Post2020 (cluster=country)	gdp_growth	-0.027	0.022	-1.237
OLS + FE (C(country),C(year)) — RQ × Post2020 (cluster=country)	inflation	-0.011	0.008	-1.463
OLS + FE (C(country),C(year)) — RQ × Post2020 (cluster=country)	internet_users	0.010	0.010	0.968
OLS + FE (C(country),C(year)) — RQ × Post2020 (cluster=country)	gdp_pc	0.000	0.000	7.486

4.14 Wild-Cluster Bootstrap Inference (Baseline)

Wild-cluster bootstrap p-values for the baseline RQ coefficient confirm no conventional significance (Table 20): $p_{boot} = 0.429$, supporting the conservative inference with few clusters.

Table 16 Wild-cluster bootstrap for the RQ coefficient

model	term	coef	t	p_boot	B	formula
OLS+FE cluster=country	rq_est	-0.462	-0.908	0.429	999	newbiz_density ~ rq_est + gdp_growth + inflation + internet_users + gdp_pc + C(country) + C(year)

4.15 Wild-Cluster Extensions

Bootstrap results across extensions (Table 14) reinforce the nonlinearity (significant RQ_c^2) and baseline heterogeneity (significant $RQ \times LowRQ$), while interactions with digital adoption and post-2020 remain non-significant.

4.16 Quantile Regression Results

Conditional quantile regressions at $\tau \in \{0.25, 0.50, 0.75\}$ (Table 17) yield small, imprecise RQ coefficients whose bootstrap CIs span zero at all quantiles. There is no clear monotonic pattern in the conditional distribution of NBD.

Table 17 Regulatory quality in quantile regressions (country FE; cluster bootstrap)

tau	beta_rq	boot_se	ci_lower	ci_upper	B
0.25	0.039	0.378	-1.374	0.173	200
0.5	0.024	0.406	-1.146	0.088	200
0.75	0.007	0.437	-0.94	0.092	200

4.17 Unconditional Quantile Results (RIF–OLS)

Unconditional quantile effects (Table 18) are likewise small and imprecise**,** with wide country-clustered bootstrap intervals crossing zero for $\tau = 0.25,0.50,0.75$.

Table 18 Unconditional quantile effects of regulatory quality (RIF–OLS; country FE; clustered bootstrap)

tau	beta_rq	boot_se	ci_lower	ci_upper	B
0.25	0.373	1.054	-1.386	3.001	800
0.5	-0.021	1.364	-3.145	3.012	800
0.75	-1.172	2.841	-8.899	2.486	800

4.18 Specification Robustness

Across alternative FE structures, control bundles, functional forms, weighting, and sample restrictions (Table 19), the estimated RQ coefficient remains modest in magnitude and frequently is not statistically different from zero**.** The qualitative conclusions are robust.

Table 19 Coefficient on regulatory quality across alternative specifications

spec	beta_rq	se
FE (lead t+1)	-0.182	0.324
FE (winsorized y)	-0.491	0.476
FE+DK (bw=3)	-0.462	0.214
PPML (GLM Poisson) + FE	-0.135	0.373

5. Discussion

5.1 Synthesis of main findings

Using a 13-economy panel (2006–2022) and two-way fixed effects with country-clustered and wild-cluster inference, we find: (i) the average partial association between WGI-RQ and new business density (NBD) is small and statistically weak; (ii) the relationship exhibits negative curvature (concavity), consistent with diminishing marginal association at higher WGI-RQ; and (iii) neither digital intensity nor the post-2020 period systematically alters the WGI-RQ–NBD link. Distribution-sensitive estimators (conditional quantiles and RIF-OLS) mirror this picture.

5.2 Tests of hypotheses (RQ1–RQ5 / H1–H5)

H1 (average association, RQ1): Not supported. The TWFE coefficient on WGI-RQ is small and not statistically significant (wild-cluster $p \approx 0.43$).

H2 (nonlinearity, RQ2): Supported. The squared term is negative and significant (wild-cluster $p \approx 0.02$), indicating diminishing returns as WGI-RQ rises.

H3 (baseline heterogeneity, RQ3): Supported. The Low-RQ interaction is positive and significant, implying a flatter (near-zero) slope at low baseline WGI-RQ and a more negative slope at higher WGI-RQ. In other words, the marginal association is state-dependent.

H4 (digital moderation, RQ4): Not supported. The WGI-RQ × Internet interaction is indistinguishable from zero across specifications.

H5 (post-2020 shift, RQ5): Not supported. No systematic change in slope after 2020 once year fixed effects absorb common shocks.

Together, H2–H3 imply a curved, state-dependent surface: the WGI-RQ–NBD slope is closest to zero at low institutional baselines and turns more negative at higher baselines. H4–H5 indicate that neither measured digital connectivity nor the pandemic period reconfigured this mapping in our sample.

Interpretation of non-supported hypotheses. The lack of support for H1 cautions against uniform claims that better regulation always raises entry in this region; instead, effects materialize through curvature and baseline heterogeneity (H2–H3). The null results for H4 indicate that measured digital intensity does not systematically amplify the WGI-RQ–NBD linkage in our sample, consistent with digital tools acting as complements rather than substitutes for institutional quality. The null for H5 suggests that there is no structural reconfiguration of this linkage after 2020, once common shocks are absorbed by year-fixed effects.

Policy translation. Our null findings for H1/H4/H5 imply that better rules do not uniformly raise entry; digitalization does not substitute for institutional quality; and the post-2020 period did not reconfigure the mapping. In low-WGI-RQ settings, foundational improvements must be paired with finance/skills/market reforms. In high-WGI-RQ settings, additional rule refinement yields incremental returns; the focus should shift to competition policy, sector-specific permits, and access to finance/innovation.

5.3 Theoretical implications

The results refine institution-centric views by highlighting marginal rather than average effects. Building foundational regulatory capacity (predictable rule-making, transparent enforcement, simpler procedures) appears necessary but not sufficient to raise formal entry in low-WGI-RQ settings consistent with other binding constraints (finance, skills, market size). In high-WGI-RQ contexts, additional regulatory refinements exhibit diminishing association with NBD, suggesting attention should pivot to competition policy, finance, and sector-specific

frictions. The absence of digital moderation implies that digital tools complement rather than substitute for core institutional quality.

Taken together, these non-findings redirect attention from average effects to context-specific margins: foundational governance matters most where institutions are weak, while additional refinements in already strong settings exhibit diminishing marginal association with formal entry.

5.4 Implications for Management Technology

Considering that H1/H4/H5 are not supported, management-technology initiatives should prioritize governance back-end capacity before scaling digital front-ends and avoid one-size-fits-all regulatory tightening in high-WGI-RQ contexts where returns appear incremental.

Actionable takeaways for public-sector RegTech and ecosystem design:

1) Rules-as-code & workflow orchestration: codify priority licensing/registration rules and enforce auditable workflows to raise predictability, most useful where baseline capacity is weak.

2) Supervisory dashboards: monitor time-to-register, touchpoints, RFI rates, appeal ratio micro-KPIs that operationalize WGI-RQ and target process bottlenecks.

3) Data architecture for observability: event logs, decision provenance, and versioned rule packs reduce discretion and measurement noise.

4) Complementarity, not substitution: stabilize governance "back-end" before scaling portals/APIs; digital fronts add value after rules are credible.

5) Embedded experimentation: phased roll-outs (e.g., fee simplification, form pruning) with A/B or stepped-wedge designs strengthen identification.

6) Entrepreneur-facing enablement: compliance-as-a-service (pre-filled forms, validation APIs, status tracking) lowers entry costs, particularly where baseline capacity is low.

5.5 Robustness and sensitivity

Country trends, lags/leads, leave-one-out, nonlinear alternatives, and distribution-sensitive estimators converge on the same qualitative story: weak average effects, concavity, and baseline heterogeneity. Wild-cluster p-values address few-cluster concerns, supporting conservative inference.

5.6 Limitations and future research

Limitations include the perception-based measurement of WGI-RQ, potential residual endogeneity, and complete-case harmonization, which reduces coverage. Future work should leverage quasi-experimental reforms, more comprehensive digitalization measures (including platform penetration and e-government quality), semiparametric nonlinearity, and broader entrepreneurship outcomes (such as survival and high-growth incidence). Embedding

management-technology telemetry (rules-as-code logs, audit metrics) can enhance identification and external validity.

6. Conclusion

This paper examines the relationship between regulatory quality (WGI-RQ) and formal firm entry across 13 East/Southeast Asian economies from 2006 to 2022. Using two-way fixed effects with country-clustered and wild-cluster inference, we do not find a robust average association between WGI-RQ and new business density; nor do we detect moderation by digital intensity or a post-2020 structural shift. Instead, the salient features of the mapping are nonlinearity and state dependence: the relationship is concave, and slopes differ by baseline institutional quality, being near zero at low WGI-RQ and more negative at higher WGI-RQ, consistent with a diminishing marginal association.

These results reconcile mixed cross-country findings by showing that "better rules" do not uniformly raise entry; the payoff depends on where a country starts. In weaker-institution settings, foundational governance upgrades (predictable rule-making, transparent enforcement, simpler procedures) are necessary but may require complementary reforms in finance, skills, and markets to translate into registrations. In already strong regimes, further rule refinement yields incremental returns; attention should shift to competition policy and sector-specific bottlenecks. The null digital moderation underscores that digitalization is a complement, not a substitute, for institutional quality.

Our contributions are threefold: (i) a harmonized panel with transparent coverage diagnostics; (ii) inference resilient to a few clusters and triangulated with distribution-sensitive estimators; and (iii) clear evidence of concavity and baseline heterogeneity that clarifies when regulatory improvements are most entrepreneurship-enhancing. Limitations: perception-based measurement, residual endogeneity, and complete-case harmonization warrant cautious external generalization. Future work should leverage quasi-experimental reforms, incorporate richer moderators (such as competition/finance/enforcement quality), employ semiparametric methods to account for nonlinearity, and examine outcomes beyond registrations (including survival, growth, and innovation). Overall, the evidence supports a pragmatic conclusion: entrepreneurship policy is most powerful when regulatory capacity is weakest, and progressively incremental as institutional quality improves.

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