

Finance 5.0: Reimagining Financial Ecosystems in an Era of AI, Sustainability and Global Uncertainty The Emerging Role of Banking Innovation and Risk Management

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Abstract

Finance 5.0 is a human-centred phase of financial transformation where artificial intelligence (AI), digital public infrastructure, sustainability and resilience are interwoven rather than pursued as distinct goals. This conceptual research paper explores how banking innovation enhances inclusivity, customer experience, credit assessment, fraud prevention, regulatory compliance, and climate finance intermediation, while simultaneously creating model, cyber, conduct, concentration and operational concerns. This paper uses a structured integrative review of academic literature and selected policy evidence from Reserve Bank of India (RBI), Bank for International Settlements (BIS), Financial Stability Board (FSB), National Payments Corporation of India (NPCI), and international sustainability frameworks with specific reference to India in the period 2016-2026. It develops an Innovation-Trust-Resilience framework to support responsible AI governance and enterprise-wide risk management in an effort to break the link between banking innovation and sustainable stakeholder value. India gives an interesting context: In September 2025, RBI Digital Payments Index was at 516.76, and UPI handled around 24,162 crore transactions worth close to ₹314 lakh crore in FY2025–26. However, scale also leads to increased risk to fraud, service interruption, exclusion, data exploitation and third party concentration. It claims that competitive advantage of Finance 5.0 will not come from maximal automation but from trustworthy augmentation: explainable models, human responsibility, inclusive design, climate-risk competence, interoperable infrastructure and operational resilience. It ends with a governance architecture and recommendations for banks, regulators and researchers.

Keywords: *Finance 5.0; banking innovation; artificial intelligence (AI); sustainable stakeholder value; operational resilience.*

JEL Classification: *G21, G28, O33, Q56.*

Introduction

Banking has moved from branch-based intermediation to 24/7 digital ecosystems that connect banks, fintechs, payment networks, cloud providers, public digital infrastructure and customers. Mobile banking, APIs, biometric authentication, real-time payments and machine learning and distributed ledgers have all helped to reduce transaction friction and allow products to be supplied at a scale never before possible. The emerging Finance 5.0 paradigm puts a normative need on technology to improve human wellbeing, sustainability, trust and systemic resilience, not just efficiency or shareholder rewards.

In India, this change is particularly evident. UPI has emerged as the backbone of mass retail payments. Account aggregation, digital identity, consent-based data sharing and innovation sandboxes are changing how credit and services are delivered. The RBI-DPI grew from 100 in March 2018 to 516.76 in September 2025 (RBI, 2026a). As to the official data related to NPCI, UPI processed around 24,161.69 crore transactions valued around ₹314 lakh crore in FY2025–26 (PIB, 2026). These achievements illustrate inclusivity and interoperability, but also broaden the attack surface and the impacts of outages, fraud, incorrect algorithms and concentrated dependence on technology companies.

Choice of the Study and Problem Statement

Banking innovation is selected because banks remain central to payments, savings, credit creation, monetary transmission and financial stability. They are simultaneously technology adopters, regulated fiduciaries and allocators of capital toward—or away from—sustainable development. AI can analyse transactions, alternative data and climate exposure at speeds unavailable to conventional systems. However, opacity, biased data, automation error, privacy violations and procyclical model behaviour can weaken trust. The central research problem is therefore not whether banks should innovate, but how they can capture innovation benefits without externalising technological, social, environmental or systemic risk.

Earlier research often studies digital adoption, AI, green finance, cybersecurity or financial inclusion in isolation. This fragmentation is inadequate for Finance 5.0, where risks interact. A cloud outage can become liquidity and reputational risk; biased credit models can create conduct and inclusion risk; common AI models can increase market correlation; and incomplete climate data can misprice long-dated credit. The paper addresses this integration problem through a unified conceptual framework.

Objectives, Scope and Research Questions

- To explain Finance 5.0 and examine how banking innovation is changing products, processes, customer relationships and business models.
- To assess the role of AI, digital platforms, RegTech, blockchain and data analytics in customer service, financial inclusion and risk management.
- To integrate cyber, model, operational, conduct, third-party, climate and geopolitical risks within one banking-governance framework.
- To analyse India's experience, including UPI scale, the RBI's FREE-AI initiative, digital-payment indicators and sustainable-finance measures.
- To propose testable hypotheses, a future empirical design and actionable recommendations for resilient, inclusive and sustainable banking.

The review covers major developments from 2016 to August 2026, while retaining seminal earlier theories. It addresses three questions: (RQ1) How does innovation create value in a Finance 5.0

banking ecosystem? (RQ2) Which risks intensify as AI and platform dependence grow? (RQ3) Which governance capabilities convert innovation into trusted, sustainable and resilient outcomes?

Theoretical Foundation

The framework combines four complementary perspectives. The Resource-Based View treats data, analytical capability, cybersecurity and digital talent as strategic resources (Barney, 1991). Dynamic Capabilities Theory explains a bank's capacity to sense technological and climate change, seize opportunities and reconfigure processes (Teece, 2007). Stakeholder Theory requires value creation for depositors, borrowers, employees, regulators, communities and the environment rather than a narrow technology-profit calculus (Freeman, 1984). Enterprise Risk Management links strategy, governance and risk appetite so that innovation is assessed across risk silos (COSO, 2017). Together, these theories predict that technology alone is insufficient: governance quality and adaptive risk capability determine outcomes.

Literature Review

The latter is characterised by the introduction of new suppliers and the rapid diffusion of technology. This is referred to as the post-crisis phase of modern fintech by Arner, Barberis and Buckley (2016). Gomber, Koch and Siering (2017) conceptualise digital finance within the framework of technology, institutions and business processes. Vives (2019) highlights the impact of fintech and BigTech on competitiveness, customer welfare and regulatory trade-offs. The studies portray the impact of banking innovation on the market and delivery structure.

AI research reports applications in prediction, portfolio management, fraud detection, credit scoring, advising services and compliance. According to Milana and Ashta (2021) there are several potential for efficiency and decision support, but they warn that welfare increases are not guaranteed.

The principal clusters of studies were identified by Goodell et al. (2021) as follows: fraud & distress, value, investor behaviour & planning. As Aldasoro et al (2024) put it: "Trustworthy financial AI requires openness, transparency, justice, safety and oversight by humans. Third party concentration, cyber risk and weaknesses in model risk, market correlation, data quality and governance are systemically important (FSB, 2024, 2025).

The second shift is from the sustainability literature. However, greenwashing might be encouraged by inconsistent taxonomies and black-box models (Lim, 2024). Artificial intelligence can improve the extraction of ESG data, the computation of emissions, the study of climate scenarios and the surveillance of green assets. As of June 2023, RBI's green-deposit system identifies qualified income for green projects and provides allocation and effect disciplines (RBI, 2023). The draft climate disclosure framework is based on governance, strategy, risk management and metrics and targets (RBI, 2024). This turns climate risk from a corporate responsibility into a banking precaution.

Research on digital inclusion shows that lower transaction costs and remote access can extend formal finance, yet connectivity, language, disability, digital literacy and fraud exposure can reproduce exclusion. In Finance 5.0, inclusion must therefore be evaluated by effective, safe and comprehensible usage—not simply account or application access.

Table 1. Synthesis of the literature and unresolved research gaps

Stream	Established insight	Unresolved Finance 5.0 issue
FinTech and competition	Platforms lower friction and reshape intermediation.	How should innovation, contestability and systemic concentration be balanced?

Stream	Established insight	Unresolved Finance 5.0 issue
AI and analytics	Models improve prediction, personalisation and anomaly detection.	How do explainability, fairness and human review affect trust and outcomes?
Cyber/operational resilience	Digital scale increases dependency and attack surfaces.	How should common vendors and critical-service tolerances be governed?
Sustainable finance	Digital tools can support ESG measurement and green allocation.	How can banks prevent weak data, model error and greenwashing?
Financial inclusion	Mobile and instant payments widen reach and reduce cost.	Who remains excluded or exposed to fraud, and how should harm be measured?

Research Gap and Contribution

Three gaps emerge. First, much of the literature is technology-specific and does not examine the joint influence of AI, sustainability and global uncertainty. Second, bank innovation studies commonly emphasise adoption or efficiency while treating trust, inclusion and resilience as secondary outcomes. Third, global frameworks require contextualisation for India's scale, public digital infrastructure, linguistic diversity and uneven digital capability. This article contributes an integrated Innovation–Trust–Resilience model, separates enabling innovation from risk transmission, and proposes measurable constructs for future bank-level research.

Conceptual Framework and Hypotheses

The proposed framework views banking innovation capability (BIC) as the capacity to deploy AI, interoperable platforms, automation, digital products and data-driven processes. Sustainable banking capability (SBC) incorporates green finance, climate-risk assessment and credible ESG governance. Enterprise risk-management maturity (ERM) includes board oversight, model governance, cyber resilience, third-party control, business continuity and conduct safeguards. Human-centred trust (HCT) – fairness, explainability, privacy, accessibility and effective redress – converts technical performance into stakeholder adoption. GU includes geopolitical tension, macro-economic instability, cyber hazards, supply-chain disruption and climate shocks.

Figure 1. Innovation–Trust–Resilience logic of Finance 5.0

INPUT	GOVERNANCE	CAPABILITIES	OUTCOMES
AI, platforms, data and digital products	Human oversight, model control, privacy and risk appetite	Inclusion, green intermediation and real-time risk intelligence	Trust, resilience, stability and sustainable stakeholder value

Table 2. Testable hypotheses

Code	Alternative hypothesis	Expected sign
H1	Banking innovation capability is positively associated with operational efficiency and service quality.	$\beta_1 > 0$
H2	Responsible AI governance positively moderates the relationship between banking innovation and stakeholder trust.	$\beta_2 > 0$
H3	Enterprise risk-management maturity positively moderates the relationship between banking innovation and operational resilience.	$\beta_3 > 0$
H4	Sustainable banking capability is positively associated with long-term stakeholder value.	$\beta_4 > 0$
H5	Global uncertainty weakens the positive relationship between banking innovation and banking performance.	$\beta_5 < 0$
H6	Digital inclusion mediates the relationship between banking innovation and social value creation.	Indirect effect > 0

A future panel model may be specified as: $\text{Performance}_{it} = \alpha + \beta_1 \text{BIC}_{it} + \beta_2 \text{RAIG}_{it} + \beta_3 \text{ERM}_{it} + \beta_4 \text{SBC}_{it} + \beta_5 \text{GU}_t + \beta_6 (\text{BIC} \times \text{RAIG})_{it} + \beta_7 (\text{BIC} \times \text{ERM})_{it} + \text{Controls}_{it} + \mu_i + \lambda_t + \varepsilon_{it}$. Mediation by inclusion and trust can be tested through structural equation modelling or causal mediation analysis.

Database and Methodology

This article uses a structured integrative review method rather than claiming original causal estimates. The evidence base comprises peer-reviewed studies on fintech, AI in finance, sustainable digital finance, banking risk, and inclusion, along with policy documents from RBI, NPCI/PIB, BIS/BCBS, FSB, UNEP FI, and COSO. Priority is given to primary and institutional sources for contemporary facts. Evidence was coded under innovation, value mechanism, risk transmission, governance response and stakeholder outcome. Triangulation across academic and policy sources reduces dependence on promotional technology narratives.

For subsequent empirical validation, a panel of scheduled commercial banks may be constructed using RBI's Database on Indian Economy and annual reports for 2016–2026. BIC can combine digital-transaction intensity, technology expenditure, AI disclosure and API/cloud adoption. ERM may combine board risk oversight, cyber incidents, recovery performance, model-validation practice and third-party controls. Outcomes can include cost-to-income ratio, return on assets, non-performing assets, digital complaints, fraud losses, service availability, green-finance share and inclusion indicators. Fixed-effects estimation, clustered standard errors, lagged regressors, instrumental variables or system GMM should be considered; textual indices must be validated manually and robustness-tested.

Analysis and Discussion

AI-enabled banking innovation

AI expands banks' sensing capacity. Supervised learning can improve probability-of-default estimates; graph analytics can detect mule accounts and fraud networks; natural-language processing can review contracts and regulatory changes; and generative AI can assist employees and customers. These applications can reduce cost and improve response time. However, decision quality depends on

representative data, stability under stress and the ability to challenge outputs. GenAI introduces hallucination, prompt-injection, confidentiality, intellectual-property and uncontrolled-agent risks. High-impact decisions therefore require inventory, tiering, validation, traceability, override rules and accountable human approval.

Digital public infrastructure and inclusion

India's payment trajectory illustrates both potential and responsibility. The RBI-DPI's rise to 516.76 by September 2025 and UPI's FY2025–26 scale indicate that innovation can become public economic infrastructure. Interoperability, low marginal cost and open participation stimulate competition and inclusion. Nevertheless, volume is not the same as welfare. Banks must monitor failed transactions, fraud burden, grievance resolution, accessibility, local-language comprehension and exclusion of low-connectivity users. Assisted digital channels and branch options remain part of a human-centred architecture.

Risk management as an innovation capability

Risk management should not operate as a late-stage compliance gate. In Finance 5.0, it is a design capability embedded in product discovery, data sourcing, model development, deployment and monitoring. The FSB's vulnerability categories show why: dependence on common cloud, data or model providers can turn an institutional weakness into a sector-wide event; similar models can amplify correlated behaviour; AI can strengthen both defence and attack; and opaque data-model chains complicate accountability. BCBS guidance on operational resilience and its 2026 ICT-practices report emphasise governance of critical operations, dependencies, testing and recovery. Boards should set impact tolerances, not merely uptime targets, and receive decision-useful reporting on customer harm and critical-service recovery.

Sustainability and climate-risk intermediation

Banks influence the transition through credit pricing, project finance, green deposits, advisory services and stewardship. AI can map physical hazards, analyse borrower transition plans and identify inconsistent disclosures. However, climate models involve long horizons, data gaps and scenario uncertainty; precision must not be confused with reliability. The RBI's green-deposit framework and draft climate disclosures supply institutional foundations, but banks also need sector pathways, financed-emissions capability, scenario analysis and independent assurance. Sustainable finance should be integrated with credit and concentration risk rather than handled as a corporate-social-responsibility overlay.

Global uncertainty and resilience

Geopolitical conflict, trade fragmentation, volatile capital flows, climate events and cyber campaigns affect liquidity, credit quality, technology supply chains and cross-border payments. Digital systems can improve real-time monitoring and scenario response, but they can also transmit shocks rapidly. The resilient bank requires a diversified group of service providers, tested exit plans, offline or degraded-mode procedures, liquidity contingency planning and clear crisis communication. The strategic goal is graceful degradation, which means providing key services and high customer confidence when normal systems are down.

Table 3. Finance 5.0 opportunity–risk–control matrix

Innovation	Principal value	Material risk	Essential control
AI credit models	Faster, granular underwriting	Bias, drift, opacity, procyclicality	Validation, explainability, fairness tests, human appeal

Innovation	Principal value	Material risk	Essential control
GenAI assistants	Productivity and 24x7 service	Hallucination, leakage, unsafe agency	Grounding, access control, logging, escalation
Cloud/API banking	Scalability and ecosystem reach	Outage, vendor lock-in, concentration	Due diligence, resilience tests, exit and portability
Real-time payments	Low-cost inclusion and commerce	Fraud velocity and systemic disruption	Behavioural monitoring, limits, rapid redress
Green digital finance	Climate-aligned capital allocation	Bad data, greenwashing, model uncertainty	Taxonomy, audit trail, assurance, scenario analysis

Principal Findings

- Banking innovation creates the strongest value when it augments human judgment and is integrated with governance, rather than when automation is treated as an end in itself.
- Scale changes the nature of risk: a small design flaw, vendor outage or biased model can affect millions of transactions or customers rapidly.
- Trust is an economic asset. Explainability, privacy, accessibility and redress influence adoption, franchise value and regulatory legitimacy.
- Sustainability and prudential risk increasingly converge because climate hazards and transition policies affect borrower cash flows, collateral, sectors and concentrations.
- India's digital public infrastructure offers global lessons, but success should be evaluated through safe usage, inclusion, resilience and customer outcomes alongside transaction growth.
- The risk function can accelerate responsible innovation by supplying reusable controls, model standards, safe experimentation and early challenge.

Recommendations

For banks and boards

- Establish a board-approved Finance 5.0 strategy linking innovation portfolios to risk appetite, inclusion, customer outcomes and climate commitments.
- Maintain an enterprise AI inventory with risk tiers, model/data lineage, independent validation, monitoring, incident reporting and retirement criteria.
- Apply secure-by-design and privacy-by-design controls, red-team high-risk AI and test critical services against severe but plausible scenarios.
- Treat cloud, model and data vendors as critical dependencies; map concentration, subcontractors, portability, recovery objectives and exit options.
- Measure digital inclusion by successful and safe usage, grievance outcomes, accessibility and affordability; retain assisted and non-digital alternatives.
- Integrate climate variables into credit, concentration, collateral, ICAAP and scenario processes, with credible green-finance taxonomies and assurance.

For regulators and ecosystem institutions

- Operationalise proportional AI rules around accountability, fairness, transparency, safety and human oversight, building on the RBI FREE-AI framework.

- Expand sector-wide cyber, cloud and payment-resilience exercises and develop shared incident and model-risk taxonomies.
- Support privacy-preserving data infrastructure, multilingual consumer education and rapid cross-institutional fraud intelligence.
- Harmonise climate disclosures and green classifications while allowing staged implementation and capacity building for smaller institutions.

For researchers

Future work should build bank-level longitudinal datasets, distinguish adoption from effective use, and test whether governance and ERM moderate innovation outcomes. Quasi-experimental designs around regulatory changes, platform adoption or infrastructure outages can strengthen causal inference. A distributional research is needed, because average efficiency gains may mask divergent outcomes for vulnerable customers, regions or small borrowers.

Limitations

The study is conceptual and relies on secondary evidence; it does not estimate causal effects or rank banks. Definitions and disclosures of AI investment, cyber events, green finance and customer harm are not yet fully standardised. Rapid technological and regulatory change can date specific examples. These limitations are addressed through a transparent scope, reliance on authoritative sources for current facts, and an explicit future empirical design.

Conclusion

Finance 5.0 reframes banking progress. The relevant question is not how much technology a bank deploys, but whether innovation creates durable value while preserving fairness, safety, inclusion, sustainability and financial stability. AI, real-time payments, platforms and digital public infrastructure can improve credit, service and risk intelligence. The same systems can magnify opacity, cyber exposure, third-party concentration, conduct failure and rapid contagion. Banking innovation and risk management are therefore complements, not opposing forces.

The proposed Innovation–Trust–Resilience framework places responsible AI governance, human accountability and ERM between technology and stakeholder outcomes. For India, UPI and the wider digital ecosystem demonstrate the possibilities of scale; RBI initiatives on responsible AI, green deposits and climate disclosure indicate the direction of governance. The emerging banking institution will be competitive not because it automates everything, but because it knows where automation helps, where human judgment must remain decisive, and how critical services can continue under stress. That combination of intelligence, sustainability and resilience is the practical meaning of Finance 5.0.

Implications for India and the Mysore Conference Context

The Finance 5.0 agenda has particular relevance for Karnataka, where a strong technology and start-up ecosystem coexists with large agricultural, microenterprise, cooperative and tourism economies. Bengaluru supplies financial institutions with software, analytics, cybersecurity and fintech capabilities, while cities such as Mysore connect urban services with semi-urban and rural markets. This makes the state an appropriate setting for examining whether advanced financial technology can move beyond metropolitan convenience to improve the resilience of households, farmers, small firms and local institutions. Banks can use consent-based cash-flow data to assess viable small borrowers with thin collateral records, deploy multilingual tools for customer education, and combine digital channels with business correspondents and branches. The safeguards are equally important: alternative-data models must not turn location, device quality or digital behaviour into hidden proxies for socioeconomic disadvantage.

For Indian banks, the immediate managerial implication is to build joint accountability between business, technology, risk, compliance and customer-service functions. Product approval should explicitly document the customer problem, intended benefit, affected groups, data sources, automated decisions, human intervention points and fallback arrangements. Risk committees need dashboards that connect technical measures—model drift, false positives, outages and vendor dependence—with financial and human consequences such as blocked legitimate payments, delayed credit, complaint recurrence and vulnerable-customer loss. This translation is essential because a technically accurate model may still produce an unacceptable conduct outcome, while a resilient system must preserve essential access during infrastructure failure.

The wider policy implication is that India can shape an internationally relevant model of responsible digital finance. Its advantage lies in interoperable public infrastructure and scale; its obligation is to demonstrate that scale can remain safe, contestable and inclusive. Regulatory sandboxes and innovation hubs should therefore evaluate social and resilience outcomes alongside technical feasibility. Shared fraud intelligence can be expanded with due-process protections, while sector exercises can test cloud concentration, payment disruption and AI-enabled cyber incidents. Climate-finance innovation should connect local project data, credible taxonomies and impact reporting so that green claims translate into measurable environmental outcomes. If these elements are aligned, banking innovation can support not only faster finance but also more productive credit, climate adaptation and balanced regional development.

Appendix

Brief Note on JEL Classification and Hypotheses

Finance 5.0: Banking Innovation, Sustainability and Risk Management

Purpose: To explain the paper's JEL codes and clarify the meaning, types and empirical interpretation of its testable hypotheses.

JEL Classification

The **Journal of Economic Literature (JEL) classification system** is an internationally recognised subject-coding system developed by the American Economic Association. It helps conferences, journals, researchers and bibliographic databases identify, classify and retrieve studies according to their principal areas of economic inquiry.

Recommended presentation: JEL Classification: G21, G28, O33, Q56.

Code	Official subject area	Relevance to the paper
G21	Banks; Depository Institutions; Microfinance Institutions	Covers banking innovation, AI-enabled banking, digital payments, financial inclusion, credit delivery and bank risk management.
G28	Government Policy and Regulation	Applies to RBI regulation, responsible-AI governance, cybersecurity supervision, climate-risk disclosure and regulatory oversight.
O33	Technological Change: Choices and Consequences; Diffusion Processes	Captures the adoption, diffusion and consequences of AI, digital platforms, automation, RegTech and related financial technologies.

Code	Official subject area	Relevance to the paper
Q56	Environment and Development; Sustainability; Environmental Accounts and Accounting; Environmental Equity	Reflects sustainable banking, green finance, climate-risk management and the creation of long-term sustainable stakeholder value.

Meaning and Purpose of Hypotheses

A **hypothesis** is a clear and empirically testable statement about an expected relationship among variables. The null hypothesis (H_0) generally states that no statistically significant relationship, moderating effect or mediating effect exists. The alternative hypothesis (H_1) states the theoretically expected relationship. In this conceptual paper, the hypotheses translate the Innovation-Trust-Resilience framework into propositions that may be tested later with bank-level data.

Interpretation of the Proposed Hypotheses

Code	Effect	Alternative hypothesis	Expected sign	Brief interpretation
H1	Direct effect	Banking innovation capability is positively associated with operational efficiency and service quality.	Positive	Greater innovation capability should improve process efficiency and the quality of banking services.
H2	Moderation	Responsible AI governance positively moderates the relationship between banking innovation and stakeholder trust.	Positive interaction	Explainability, fairness, privacy and human oversight should strengthen the trust generated by banking innovation.
H3	Moderation	Enterprise risk-management maturity positively moderates the relationship between banking innovation and operational resilience.	Positive interaction	Stronger model, cyber, third-party and continuity controls should convert innovation into greater resilience.
H4	Direct effect	Sustainable banking capability is positively associated with long-term stakeholder value.	Positive	Green finance, climate-risk competence and credible ESG governance should support durable stakeholder value.
H5	Moderation	Global uncertainty weakens the positive relationship between banking innovation and banking performance.	Negative interaction	Geopolitical, macroeconomic, cyber, supply-chain and climate shocks should reduce the performance benefit of innovation.

Code	Effect	Alternative hypothesis	Expected sign	Brief interpretation
H6	Mediation	Digital inclusion mediates the relationship between banking innovation and social value creation.	Positive indirect effect	Innovation should create social value partly by improving safe, affordable and effective access to financial services.

Null and Alternative Forms

- For H1 and H4, the null hypothesis states that the relevant direct-effect coefficient is non-positive or statistically insignificant; the alternative predicts a positive and statistically significant coefficient.
- For H2 and H3, the null hypothesis states that the interaction coefficient equals zero; the alternative predicts a positive interaction coefficient.
- For H5, the null hypothesis states that global uncertainty does not weaken the innovation-performance relationship; the alternative predicts a negative coefficient for the Banking Innovation Capability $\times$ Global Uncertainty interaction.
- For H6, the null hypothesis states that the indirect effect through digital inclusion equals zero; the alternative predicts a positive and statistically significant indirect effect.

Technical Alignment with the Empirical Model

Coefficient numbering should follow the model specification. In the stated panel model, the responsible-AI-governance interaction is represented by $\beta_6(\text{BIC} \times \text{RAIG})$, while the enterprise-risk-management interaction is represented by $\beta_7(\text{BIC} \times \text{ERM})$. Therefore, H2 and H3 should refer to $\beta_6 > 0$ and $\beta_7 > 0$ respectively, rather than $\beta_2 > 0$ and $\beta_3 > 0$.

H5 also requires an explicit interaction term. Because it proposes that global uncertainty weakens the innovation-performance relationship, the empirical equation should include $\text{BIC} \times \text{GU}$. A negative and statistically significant coefficient on this interaction would support H5. The coefficient on GU alone measures only the direct effect of uncertainty and cannot test the proposed weakening effect.

Decision rule: reject the null hypothesis when $p < .05$, provided that the model is valid and the estimated effect is economically meaningful.

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