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Research Article

Synchronized Sharia Reorganization of Coastal MSMEs: A Structural Model of Digital Transformation, Green Economy, Islamic Capital, and Multi-Stakeholder Collaboration

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Abstract

This study tests a livelihood-oriented model of micro, small, and medium enterprise (MSME) reorganization in Sibolga City, Indonesia. Using survey data from 150 coastal food MSME actors and partial least squares structural equation modeling, the study examines whether Sharia digital transformation, Sharia green economy orientation, and Islamic capital enhance MSME reorganization directly and indirectly through multi-stakeholder collaboration. All direct paths are positive and significant ($p < .001$). Collaboration is the strongest predictor of reorganization ($\beta = .556$) and partially mediates the effects of digital transformation, green orientation, and Islamic capital. The model explains 41.7% of collaboration and 71.2% of reorganization. Multi-group analysis shows that digital transformation is more influential among enterprises with higher platform readiness, whereas green orientation, Islamic capital, and collaboration remain stable across groups. The study introduces a Synchronized Sharia Reorganization Model that treats technology, ecological responsibility, ethical-relational resources, and institutional coordination as complementary capabilities. The findings support inclusive coastal livelihood policy, particularly for women-participatory, household-based food enterprises.

Keywords: Coastal Food MSMEs; Inclusive Livelihoods; Islamic Capital; Multi-Stakeholder Collaboration; Sharia Digital Transformation; Sustainability.

INTRODUCTION

Micro, small, and medium enterprises (MSMEs) are a central vehicle for local livelihoods, household-income diversification, and inclusive development. Yet digital transformation in small enterprises is uneven because it requires more than access to platforms; it requires organizational capability, managerial learning, and a fit between technology and the local business model [1], [2], [3], [4], [5], [6]. For coastal food MSMEs, these requirements are especially consequential because value creation depends on short supply chains, product safety, packaging, timely customer communication, and the capacity to connect local identity with wider markets.

This article examines chip-producing MSMEs in Sibolga City, North Sumatra, Indonesia. The enterprises produce fish, banana, cassava, sweet-potato, and related snack products from locally embedded resources. Their reorganization is understood as the deliberate reconfiguration of operating routines, task allocation, transaction records, quality control, customer management, and external linkages. This definition is compatible with technology-acceptance reasoning, which highlights usefulness and ease of use in adoption decisions [7], and with organizational-change, resource-based, and dynamic-capability perspectives, which explain why routines must be renewed when the environment changes [8], [9], [10], [11].

The study also addresses sustainability. A green orientation becomes materially relevant to small food enterprises when it changes resource efficiency, sanitation, waste handling, packaging, and production standards. Research on circular economy, sustainable business models, sustainable supply chains, green product innovation, and green supply-chain management indicates that environmental improvement is most durable when it is embedded in operating routines rather than treated as a symbolic commitment [12], [13], [14], [15], [16]. In this study, the term Sharia green economy denotes environmentally responsible business practice aligned with halal-thayyib production, stewardship, fairness, and harm avoidance.

The study is situated within women-participatory livelihood development. The archived study documentation indicates substantial participation of women in the coastal food MSME sector. Consequently, the findings are relevant to household-based women's economic participation, but they do not estimate gender effects because gender was not modeled as an explanatory variable. This distinction is essential: women's empowerment should be evaluated through resources, agency, and achievements rather than inferred solely from participation [17], [18]. Digital financial and market access may nevertheless create welfare-relevant opportunities when institutions reduce barriers to use and trust [19].

The proposed mechanism is multi-stakeholder collaboration. Collaborative-governance research shows that collective outcomes depend on institutional design, trust, shared motivation, and the capacity to mobilize complementary resources [20], [21], [22], [23]. Innovation-system scholarship likewise emphasizes that local transformation is strengthened when government, universities, industry, community organizations, and financial actors coordinate their roles [24]. In a coastal food ecosystem, the corresponding actors include local government agencies, Islamic financial institutions and cooperatives, universities, MSME associations, community groups, halal-related services, and digital platform providers.

The model retains the source study's Sharia-compliant MSME perspective. Halal certification and Islamic cooperative participation have been linked to food-SME performance

and Islamic economic empowerment [25], [26]. At the same time, social networks, trust, and shared values are recognized as organizational resources that facilitate coordinated action [27], [28], while inclusive finance can broaden access to resources and reduce exclusion from growth opportunities [29], [30], [31]. In a food-business context, halal supply-chain principles further connect compliance with product integrity, traceability, and stakeholder confidence [32]. However, these streams are often analyzed separately. The present study integrates digital transformation, green orientation, Islamic capital, and collaboration in one empirically tested framework.

Accordingly, the study asks whether Sharia digital transformation, Sharia green economy orientation, and Islamic capital are associated with multi-stakeholder collaboration and MSME reorganization; whether collaboration mediates these relationships; and whether the pathways differ by digital platform readiness. The article contributes a Synchronized Sharia Reorganization Model in which the four components are treated as mutually reinforcing capabilities for inclusive livelihood upgrading rather than as isolated interventions.

METHODS

Research Design and Setting

The study employed an explanatory, cross-sectional quantitative design derived from a doctoral-dissertation survey of coastal food MSMEs in Sibolga City, North Sumatra, Indonesia. The design is prediction-oriented because it examines theoretically specified relationships among latent constructs and evaluates their explanatory and predictive relevance. Partial least squares structural equation modeling (PLS-SEM) was selected because the model includes multiple reflective constructs, direct and indirect pathways, and a multi-group comparison [33], [34], [35], [36].

Participants and Sampling

The analytical sample comprised 150 owners or managers of chip-producing MSMEs. The study population included enterprises producing fish chips, banana chips, cassava chips, sweet-potato chips, and related snack products. Available documentation identifies a sector dominated by mature micro and small enterprises, commonly employing one to five workers, with many operators aged 31–50 years and a substantial proportion of women participants. These characteristics position the setting as a household-based, women-participatory livelihood sector with a need for digital, managerial, and institutional strengthening.

Table 1. Respondent and Enterprise Profile Reported in the Source Study Documentation

Characteristic	Dominant Pattern	Analytical Relevance
Age	Most respondents were 31–50 years old	The group combines accumulated business experience with continuing capability-upgrading needs.
Gender	Women formed a substantial share of respondents	The sector is relevant to women-participatory livelihood development; no

Characteristic	Dominant Pattern	Analytical Relevance
		gender-comparison model was estimated.
Education	Senior high school was the largest education group	Accessible digital and financial-literacy support is important.
Business age	Most enterprises had operated for more than five years	The enterprises show continuity but remain vulnerable to stagnation without upgrading.
Employment	Most enterprises employed 1–5 workers	Operational roles are simple and require gradual formalization rather than corporate restructuring.

Constructs and Instrument

A structured questionnaire measured five reflective constructs: Sharia digital transformation, Sharia green economy, Islamic capital, multi-stakeholder collaboration, and MSME reorganization. Sharia digital transformation captures technology adoption, digital literacy, and perceived compatibility of digital practice with Islamic business ethics. Sharia green economy captures resource efficiency, Sharia-oriented investment decisions, and environmentally responsible production. Islamic capital is operationalized as a relational-ethical resource bundle comprising social networks, trust and commitment, and Islamic values; it should not be interpreted as a direct measure of financing volume. Collaboration captures institutional synergy, community participation, and policy or regulatory support. Reorganization captures operational restructuring, strategic adaptation, and capacity improvement.

Table 2. Construct Definitions and Retained Reflective Indicators

Construct	Operational Definition	Retained Indicators
Sharia digital transformation	Value-aligned adoption and use of digital tools for market access, communication, and management.	Technology adoption; digital literacy; Sharia compatibility
Sharia green economy	Environmentally responsible and halal-thayyib-oriented production and investment practice.	Resource efficiency; Sharia-based investment; environmentally friendly production
Islamic capital	Relational-ethical resources that support cooperative and accountable business action.	Social network; trust and commitment; Islamic values
Multi-stakeholder collaboration	Coordinated support and joint action among ecosystem actors.	Institutional synergy; community participation; policy and regulation
MSME reorganization	Reconfiguration of routines and capabilities for adaptive, accountable enterprise operation.	Operational restructuring; strategic adaptation; capacity improvement

Data Analysis and Research Integrity

The analysis followed established PLS-SEM reporting guidance. The measurement model was evaluated using indicator loadings, composite reliability (CR), average variance extracted (AVE), and discriminant-validity diagnostics based on the heterotrait-monotrait ratio [37]. The structural model was evaluated using inner variance inflation factors (VIFs), R^2, Q^2, standardized path coefficients, bootstrapped t-statistics, p-values, and reported effect sizes. Significance testing used 5,000 bootstrap subsamples. Indirect effects were interpreted using the product-of-coefficients logic and the variance-accounted-for (VAF) index [38].

The study also compared low- and high-platform-digitalization groups. Before comparing coefficients, the Measurement Invariance of Composite Models (MICOM) procedure was applied to establish partial measurement invariance [39]. Predictive relevance was assessed using Q^2, consistent with prediction-oriented PLS-SEM guidance [40]. The available source data retained final loading and structural-path output. In this manuscript, CR and AVE were recomputed from reported standardized loadings; no independent re-estimation from raw respondent-level data was undertaken. Participation in the source survey was voluntary and anonymous. No personally identifying information is reported in this manuscript.

RESULTS AND DISCUSSION

Results

Measurement Model Assessment

All 15 retained indicators exceeded the conventional .70 loading threshold. The outer loadings ranged from .82 to .91, indicating that the items were strongly represented by their intended constructs. The highest loading was strategic adaptation (.91), followed by operational restructuring (.89) and social network (.88). The lowest retained loading was community participation (.82), which nevertheless remained acceptable. Recomputed CR values ranged from .875 to .922 and AVE values ranged from .700 to .798. These results support internal consistency and convergent validity for the final reflective measurement solution.

Table 3. Measurement Model Assessment

Construct	Retained Indicators (Outer Loadings)	Loading Range	CR	AVE	Conclusion
Sharia digital transformation	Technology adoption (.85); digital literacy (.87); Sharia compatibility (.84)	.84–.87	.889	.728	Adequate
Sharia green economy	Resource efficiency (.83); Sharia-based investment (.86);	.83–.86	.884	.717	Adequate

Construct	Retained Indicators (Outer Loadings)	Loading Range	CR	AVE	Conclusion
	environmentally friendly production (.85)				
Islamic capital	Social network (.88); trust and commitment (.86); Islamic values (.87)	.86–.88	.903	.757	Adequate
Multi-stakeholder collaboration	Institutional synergy (.84); community participation (.82); policy and regulation (.85)	.82–.85	.875	.700	Adequate
MSME reorganization	Operational restructuring (.89); strategic adaptation (.91); capacity improvement (.88)	.88–.91	.922	.798	Adequate

Structural Model Quality

The inner-model diagnostics show no serious collinearity. Reported VIF values ranged from 1.367 to 1.534, well below conservative concern thresholds. The antecedents explained 41.7% of the variance in multi-stakeholder collaboration, and the complete model explained 71.2% of the variance in MSME reorganization. The Q^2 values for collaboration (.368) and reorganization (.596) were above zero, demonstrating predictive relevance. The higher explanatory power for reorganization indicates that the combined digital, green, Islamic-capital, and collaboration conditions capture a substantial portion of the organizational-change process in this coastal MSME context.

Table 4. Structural Model Explanatory Power and Predictive Relevance

Endogenous Construct	R^2	Adjusted R^2	Q^2	Interpretation
Multi-stakeholder collaboration	.417	.409	.368	Moderate explanatory power and strong predictive relevance
MSME reorganization	.712	.705	.596	Substantial explanatory

Endogenous Construct	R^2	Adjusted R^2	Q^2	Interpretation
				power and strong predictive relevance

Direct Effects and Hypothesis Testing

All seven hypothesized direct relationships were supported. Sharia digital transformation showed the strongest association with collaboration (β = .520), followed by Sharia green economy (β = .482) and Islamic capital (β = .463). Reorganization was most strongly associated with multi-stakeholder collaboration (β = .556). The three antecedents also had positive direct associations with reorganization: Sharia digital transformation (β = .412), Sharia green economy (β = .389), and Islamic capital (β = .371). All paths were statistically significant at $p < .001$.

Table 5. Bootstrapped Direct Effects

Hypothesis	Structural Path	β	t	p	Reported Effect Size	Decision
H1	Sharia digital transformation → Collaboration	.520	8.964	< .001	.371	Supported
H2	Sharia green economy → Collaboration	.482	7.853	< .001	.312	Supported
H3	Islamic capital → Collaboration	.463	7.210	< .001	.295	Supported
H4	Sharia digital transformation → Reorganization	.412	6.948	< .001	.256	Supported
H5	Sharia green economy → Reorganization	.389	6.217	< .001	.233	Supported
H6	Islamic capital → Reorganization	.371	5.986	< .001	.218	Supported
H7	Collaboration → Reorganization	.556	9.742	< .001	.402	Supported

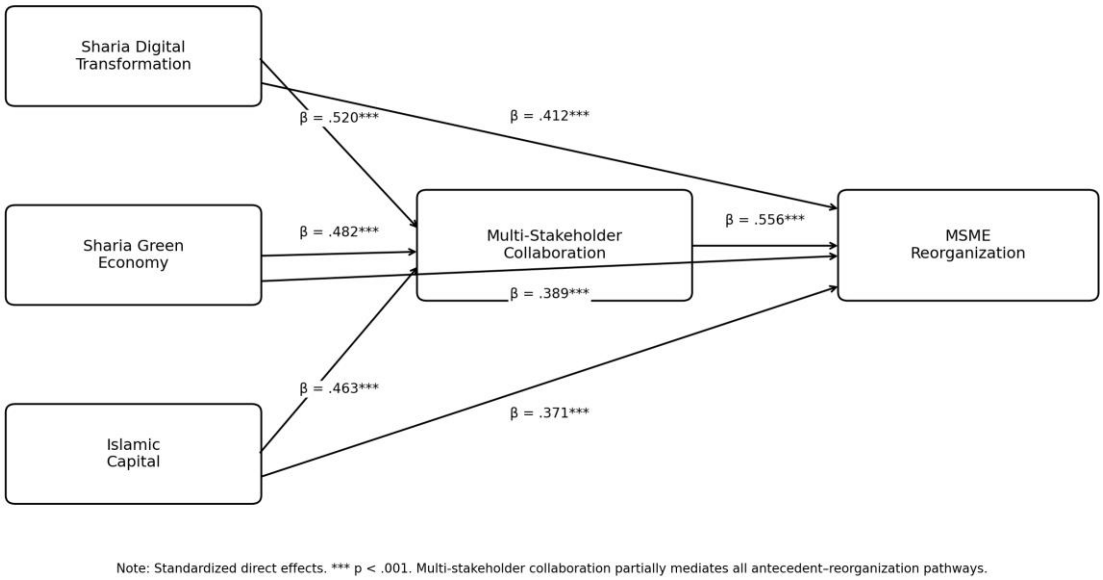

Figure 1. Synchronized Sharia Reorganization Model with Standardized Direct Effects

Indirect Effects and Mediation

Multi-stakeholder collaboration partially mediated all three antecedent–reorganization relationships. The indirect effect of Sharia digital transformation was .289 (.520 × .556), the indirect effect of Sharia green economy was .268 (.482 × .556), and the indirect effect of Islamic capital was .257 (.463 × .556). Each indirect effect was reported as significant by the bootstrap procedure ($p < .001$). Because the corresponding direct effects remained significant, the mediation is partial. The VAF values were approximately 41%, indicating that collaboration is an important, but not exclusive, transmission mechanism.

Table 6. Partial Mediation Through Multi-Stakeholder Collaboration

Antecedent	Direct Effect	Indirect Effect	Total Effect	VAF	Mediation Conclusion
Sharia digital transformation	.412	.289	.701	41.2%	Partial mediation
Sharia green economy	.389	.268	.657	40.8%	Partial mediation
Islamic capital	.371	.257	.628	41.0%	Partial mediation

Multi-Group Analysis by Digital Platform Readiness

Partial measurement invariance was established before group comparison. Digital readiness differentiated two pathways. The relationship between Sharia digital transformation and collaboration was stronger in the high-digital group (β = .603) than in the low-digital group (β = .421; permutation $p = .041$). Likewise, the direct association between Sharia digital transformation and reorganization was stronger in the high-digital group (β = .479) than in the

low-digital group (β = .318; permutation p = .038). The effects of Sharia green economy, Islamic capital, and collaboration were statistically similar across groups.

Table 7. Multi-Group Comparison by Digital Platform Readiness

Path	Low-Digital Group	High-Digital Group	Difference	Permutation p	Conclusion
Digital transformation → Collaboration	.421	.603	−.182	.041	Different
Sharia green economy → Collaboration	.476	.495	−.019	.712	Not different
Islamic capital → Collaboration	.502	.437	.065	.288	Not different
Digital transformation → Reorganization	.318	.479	−.161	.038	Different
Collaboration → Reorganization	.589	.533	.056	.421	Not different

Discussion

The findings show that digital transformation is not merely a marketing add-on. Its direct association with reorganization and its indirect association through collaboration indicate that digital practices become consequential when they are embedded in operating routines. This pattern is consistent with scholarship that conceptualizes SME digital transformation as a change in value creation, organizational structure, capabilities, and management processes [1], [2], [3], [4], [5], [6]. The present findings also extend technology-acceptance logic [7] by suggesting that, in a coastal Islamic business setting, usefulness and ease of use are complemented by perceived Sharia compatibility, transaction transparency, and trust. Thus, technology is operationally meaningful only when it supports accountable interaction with customers, suppliers, financial institutions, and public-support systems.

The multi-group results add an important qualification. Platform readiness amplifies the pathways from digital transformation to collaboration and reorganization. Enterprises already familiar with digital platforms are better positioned to transform online tools into stakeholder linkages and internal routines. In contrast, low-readiness enterprises require foundational support before advanced e-commerce, data use, or digital supply-chain interventions can generate sustained organizational change. This interpretation corresponds with organizational-change and dynamic-capability perspectives: firms must first recognize opportunities, then mobilize resources, and finally reconfigure routines [8], [10], [11]. It also cautions against one-size-fits-all digitalization programs, which can unintentionally widen the

capability gap between relatively prepared firms and enterprises still navigating basic platform access.

The positive paths from Sharia green economy to collaboration and reorganization show that environmental responsibility has practical organizational consequences. For food MSMEs, resource efficiency, hygienic production, packaging choices, and waste management require routine-level changes rather than symbolic environmental messages. This result converges with research that treats sustainability as a redesign of business models, supply chains, and product innovation [12], [13], [14], [15], [16]. The Sharia framing adds a distinctive normative layer: halal-thayyib production connects product permissibility, cleanliness, safety, quality, and avoidance of harm. In a coastal food ecosystem, responsible production can protect both product legitimacy and local resource conditions. Consequently, waste-oil handling, packaging improvement, sanitation, and responsible sourcing should be treated as livelihood-protecting business practices rather than as optional compliance activities.

Islamic capital was positively associated with collaboration and reorganization. This result must be interpreted according to the construct's operationalization: the empirical indicators measure social networks, trust and commitment, and Islamic values. The present evidence therefore supports the role of relational-ethical capital rather than quantifying the effects of financing volumes or specific Islamic contracts. This is congruent with social-capital theory, which explains that networks and norms reduce coordination barriers and enable collective action [27], [28]. It also aligns with the literature on halal assurance, Sharia cooperatives, and financial inclusion, which highlights how institutional trust and accessible support can improve the opportunity structure facing small enterprises [25], [26], [29], [30], [31], [32]. In practice, a Sharia-compliant finance facility is likely to be more transformative when it is coupled with mentoring, recordkeeping, product-quality advice, and credible referral pathways.

The dominance of multi-stakeholder collaboration is the central empirical finding. Collaboration had the strongest direct association with MSME reorganization ($\beta = .556$) and carried about 41% of the total association between each antecedent and reorganization. This supports collaborative-governance research showing that trust, shared motivation, institutional design, and complementary resources are central conditions for cross-sector performance [20], [21], [22], [23]. It also reinforces innovation-system reasoning that transformation becomes more likely when government, academia, enterprises, communities, and financial institutions work through coordinated roles rather than isolated interventions [24]. The contribution of the Synchronized Sharia Reorganization Model lies precisely here: digital capability, green routines, and Islamic capital are not treated as independent drivers but as mutually reinforcing resources whose organizational value is unlocked through collaboration.

This model also makes a social-welfare contribution. The substantial R^2 for MSME reorganization (.712) suggests that livelihood upgrading in coastal household industries should be addressed as an ecosystem process. For women-participatory, household-based enterprises, clearer roles, more reliable bookkeeping, higher product quality, and better market connectivity can broaden livelihood opportunities and reduce vulnerability. However, the study does not claim that organizational improvement automatically produces women's empowerment. As empowerment scholarship emphasizes, resources must be connected to agency and achievements before empowerment can be inferred [17], [18]. This boundary is important for

strengthening, rather than overstating, the relevance of MSME research to women's development and social welfare.

The practical implication is that local policy should move beyond disconnected programs. A one-off digital training session is unlikely to produce durable change without mentoring, food-safety and product-standard support, finance access, and coordinated follow-up. Table 8 translates the empirical model into an action matrix for a coastal MSME transformation ecosystem. The model also points to a differentiated implementation strategy: low-readiness firms should receive basic digital literacy, product photography, marketplace onboarding, digital-payment, and simple recordkeeping support, whereas high-readiness firms can progress toward e-commerce optimization, data use, digital inventory, and supply-chain integration. In contrast, green halal-thayyib production, relational-ethical capital, and collaboration should be strengthened across all firms because their contributions were stable across digital-readiness groups.

Table 8. Action Matrix for Inclusive Coastal MSME Reorganization

Intervention Pillar	Lead and Supporting Actors	Operational Priorities	Inclusive Livelihood Rationale
Digital readiness	Local government, universities, platform providers	Basic digital literacy, product photography, marketplace onboarding, digital payments, recordkeeping	Reduces entry barriers and enables gradual formalization for micro enterprises.
Green halal-thayyib production	MSME agencies, food-safety and environmental services, universities	Hygiene, resource efficiency, waste-oil handling, packaging improvement, product-standard guidance	Protects product quality, consumer trust, and local environmental conditions.
Islamic capital	Islamic banks, Sharia cooperatives, zakat and community institutions	Financial literacy, mentoring-based capital access, trust-building, cooperative networks	Builds accountable access to resources while reducing exclusion from formal support.
Institutionalized collaboration	Cross-sector transformation forum	Regular coordination, referral pathways, joint branding, monitoring, shared problem-solving	Converts isolated assistance into an ecosystem of support for household livelihoods.
Differentiated digital pathways	All collaborating actors	Basic support for low-readiness firms; advanced e-commerce and data use for high-readiness firms	Avoids widening capability gaps between enterprises.

CONCLUSION

Coastal food MSME reorganization in Sibolga is strengthened by Sharia digital transformation, Sharia green economy orientation, Islamic capital, and multi-stakeholder collaboration. Collaboration is the strongest direct predictor and partially mediates every antecedent–reorganization relationship. The model explains 71.2% of MSME reorganization, while multi-group analysis shows that digital readiness amplifies the contribution of digital transformation. The Synchronized Sharia Reorganization Model therefore frames inclusive livelihood upgrading as the alignment of digital capability, environmentally responsible production, relational-ethical capital, and coordinated institutional support. For women-participatory household enterprises, this approach offers a practical pathway toward more organized, trusted, resilient, and market-connected livelihoods, while recognizing that future evaluation must directly test empowerment and social-welfare outcomes.

LIMITATIONS

Several limitations guide interpretation. First, the cross-sectional design supports theory-consistent associations but does not establish temporal causality. Second, all constructs were measured through self-reported perceptions, creating a possibility of common-method bias. Third, Islamic capital was measured as relational-ethical capital rather than transaction-level financing access. Fourth, the study did not model gender, income change, agency, or well-being directly; its relevance to women's economic participation is therefore contextual rather than causal. Fifth, the available documentation did not retain category-level demographic frequencies or a complete HTMT matrix. Future studies should use longitudinal, mixed-method, and gender-disaggregated designs; directly measure household welfare, agency, income control, workload, and well-being; and test whether particular Islamic-finance instruments and environmental practices have distinct effects.

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AUTHOR CONTRIBUTION

D.S.T. conceptualized the study, developed the research design, coordinated data collection, conducted the PLS-SEM analysis, interpreted the findings, and prepared the initial manuscript. A.A.T. contributed to the theoretical framing, instrument review, data interpretation, and critical revision of the manuscript. Z.M.N. provided methodological and Islamic-economic guidance, contributed to the refinement of the discussion and policy implications, and critically reviewed the manuscript for important intellectual content. All authors read and approved the final version and agree to be accountable for all aspects of the work.

CONFLICT OF INTEREST

"The authors declare no conflict of interest."

DECLARATION OF USE OF AI IN SCIENTIFIC WRITING

During the preparation of this manuscript, the authors used ChatGPT (OpenAI) for language refinement and structural editing. After using this tool, the authors reviewed, verified, and revised the content as necessary and assume full responsibility for the final manuscript.

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