

ECONOMIC MODERNIZATION IN THE INDONESIA–MALAYSIA BORDERLANDS: FROM INFORMAL BARTER SYSTEMS TO A DIGITAL TRADE ECOSYSTEM

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Abstract

This study aims to analyze the economic modernization of the Indonesia–Malaysia borderlands by transforming informal barter systems into integrated digital trade ecosystems. The research focuses on understanding how technological development, regional integration, and institutional change reshape cross-border economic activities in frontier communities. This study employs a qualitative approach using the library research method by analyzing secondary data from Scopus-indexed journal articles, books, policy reports, and official publications published between 2020 and 2025. The data were examined using descriptive-analytical and thematic analysis techniques to identify patterns of border economic transformation, digitalization trends, and challenges of regional economic integration. The findings reveal that border economies in the Indonesia–Malaysia frontier are experiencing a gradual transition from traditional barter-based trade toward digitalized commercial systems supported by fintech, mobile payments, e-commerce, and logistics integration. However, the transformation remains uneven due to disparities in digital infrastructure, technological literacy, and institutional capacity. Informal trade systems persist because they provide flexibility, social trust, and economic access for local communities. The study also finds that digitalization contributes positively to financial inclusion and market expansion but simultaneously creates digital inequality between urbanized and remote border regions. This study contributes theoretically by integrating Border Economic Transformation Theory, Digital Ecosystem Theory, and Regional Integration Theory to explain the coexistence of traditional and modern economic systems in borderlands. Practically, the research highlights the importance of inclusive border development policies that combine technological modernization with community empowerment and socioeconomic sustainability. The study concludes that sustainable border economic modernization requires adaptive governance, equitable digital access, and participatory regional integration strategies.

Keywords: border economy, digital trade ecosystem, informal barter trade, regional integration, Indonesia–Malaysia borderlands, economic modernization.

Introduction

Economic transformation in border regions has become an increasingly important issue in contemporary regional development studies, particularly in Southeast Asia, where cross-border interaction significantly shapes local economic structures. The borderlands between Indonesia and Malaysia have historically functioned as strategic spaces for the exchange of goods, labor, and culture through traditional barter systems and informal trade networks. In many frontier areas such as Kalimantan–Sarawak and Nunukan–Sabah, barter trade has long served as a socio-economic survival mechanism for local

communities with limited access to formal markets and infrastructure. However, globalization, digitalization, and regional economic integration have gradually altered the dynamics of border trade toward more formalized and technology-driven systems (Rahman et al., 2021; Abdullah & Yusof, 2022).

The acceleration of digital economic development in Southeast Asia has encouraged governments to modernize border trade governance through digital payment systems, logistics integration, e-commerce platforms, and customs digitization. Indonesia and Malaysia have both intensified efforts to strengthen border connectivity as part of regional competitiveness and ASEAN economic integration. Nevertheless, despite the expansion of digital trade infrastructure, many border communities still depend on informal economic practices due to institutional limitations, weak financial inclusion, and inadequate technological access (Suryadinata et al., 2023). This phenomenon reflects a dualistic economy in border regions, where modern digital ecosystems coexist with traditional barter-based transactions.

A significant phenomenon emerging in the Indonesia–Malaysia borderlands is the uneven transition from informal exchange systems toward formal digital trade ecosystems. While urban trade centers near border areas have experienced modernization through fintech adoption and digital marketplaces, remote communities continue to rely on face-to-face exchange and cash-based transactions. This disparity creates structural inequality in market participation and limits the integration of local microenterprises into broader regional value chains (Hassan et al., 2021). Furthermore, the persistence of informal trade often creates governance challenges related to taxation, customs regulation, smuggling, and data transparency.

From the perspective of regional economic development, border modernization is not solely about technological transformation but also about institutional adaptation and socioeconomic resilience. Recent studies emphasize that border economies require inclusive governance frameworks capable of balancing modernization with local socio-cultural practices (Lee & Syahza, 2020). However, many development policies still prioritize macroeconomic connectivity while overlooking the socioeconomic realities of local border communities. Consequently, modernization initiatives often fail to generate equitable economic outcomes and instead widen the gap between digitally connected actors and marginalized traditional traders.

The research problem addressed in this study arises from the limited understanding of how informal barter-based economies in border regions transition into integrated digital trade ecosystems while maintaining socioeconomic sustainability. Existing literature predominantly focuses on trade formalization, regional integration, or border security independently, without comprehensively analyzing the transformation process from traditional economic systems to digitalized cross-border commerce (Khalid & Mutalib, 2024). As a result, there remains insufficient theoretical explanation regarding the interaction between informal economic institutions, digital technology adoption, and regional economic modernization in border areas.

Previous studies have also shown several important research gaps. First, most border trade studies emphasize macroeconomic indicators and interstate relations, while micro-level community adaptation and informal trade resilience remain underexplored (Nuraini et al., 2022). Second, digital economy studies in Southeast Asia largely focus on urban commercial ecosystems and fintech adoption in metropolitan areas rather than peripheral border economies (Lim et al., 2023). Third, there is still limited integration between border trade studies and digital ecosystem theories, especially concerning how digital transformation reshapes local economic behavior, institutional trust, and cross-border socioeconomic interaction. Therefore, the intersection between informal trade systems and digital economic modernization remains theoretically fragmented.

This study offers novelty by proposing an integrated perspective that combines border economic transformation, informal trade systems, and digital trade ecosystem development within the Indonesia–Malaysia frontier context. Unlike previous studies that separately analyze barter trade or digital commerce, this research conceptualizes economic modernization as a multidimensional transition involving institutional change, technological adoption, financial inclusion, and regional integration simultaneously. The study also introduces an incremental contribution by emphasizing the coexistence of traditional economic culture and digital transformation in border societies, thereby extending contemporary discussions on inclusive regional economic modernization.

The urgency of this research is increasingly relevant in the era of digital economy expansion and ASEAN regional integration. Border areas are no longer peripheral spaces but strategic gateways for regional trade, investment, and economic resilience. Understanding the transformation from informal barter systems to digital trade ecosystems is essential for designing inclusive border development policies, strengthening MSME competitiveness, and improving financial accessibility among frontier communities. Moreover, this study contributes to the broader discourse on sustainable regional development by highlighting the importance of integrating technological modernization with local socioeconomic realities in cross-border economic governance (World Bank, 2023; ASEAN Secretariat, 2024).

Literature Review

Border Economic Transformation Theory

Border economic transformation refers to structural changes occurring in frontier regions as a result of globalization, regional integration, infrastructure expansion, and technological modernization. Traditionally, borderlands were often perceived as peripheral and economically underdeveloped spaces characterized by informal trade and weak institutional control. However, recent literature argues that border regions have evolved into strategic economic corridors connecting production networks, labor mobility, and regional supply chains (Martinez & Cumbers, 2021). In Southeast Asia, the Indonesia–Malaysia borderlands represent a unique case where traditional barter systems

coexist alongside emerging digital trade ecosystems, reflecting both economic modernization and socio-cultural continuity.

The modernization of border economies is closely associated with regional integration policies under ASEAN economic cooperation frameworks. According to ASEAN Secretariat (2024), enhanced connectivity, digital infrastructure, and trade facilitation mechanisms are expected to reduce transaction costs and improve cross-border competitiveness. Nevertheless, modernization processes in border regions remain uneven due to disparities in institutional capacity, infrastructure readiness, and digital literacy among local communities. Consequently, many frontier societies continue to depend on informal economic exchanges despite increasing state-led modernization initiatives (Hassan et al., 2021).

Informal Barter Trade Systems in Border Regions

Informal barter trade has historically played an essential role in sustaining livelihoods within remote border communities. In the Indonesia–Malaysia frontier, barter systems emerged as adaptive mechanisms to overcome geographical isolation, limited financial infrastructure, and weak market integration. Such informal trade practices often involve direct exchange of daily necessities, agricultural commodities, and fisheries products between neighboring communities across borders (Nuraini et al., 2022). Beyond economic value, barter systems also function as social institutions that strengthen kinship, trust, and cultural interaction among border populations.

Recent studies indicate that informal border trade contributes significantly to local economic resilience, particularly during periods of economic instability and supply chain disruption (Rahman et al., 2021). However, informal systems also generate governance challenges, including the absence of taxation mechanisms, weak transaction documentation, smuggling risks, and limited legal protection for traders. Governments increasingly attempt to formalize border trade activities through customs modernization and digital monitoring systems, yet these interventions often encounter resistance from communities that perceive informal systems as more flexible and accessible (Khalid & Mutalib, 2024).

Digital Trade Ecosystems and Economic Modernization

The concept of a digital trade ecosystem refers to an interconnected economic environment supported by digital infrastructure, fintech systems, e-commerce platforms, logistics networks, and data-driven governance mechanisms. The rapid expansion of digital technology in Southeast Asia has accelerated the transformation of traditional commerce into integrated digital economies. According to Lim et al. (2023), digital ecosystems improve market efficiency by reducing transaction costs, increasing financial inclusion, and enabling broader participation of micro and small enterprises in regional markets.

In border regions, digitalization offers opportunities to enhance trade transparency, improve customs efficiency, and facilitate cross-border financial transactions. Mobile banking, QR payment systems, and online marketplaces have

become important instruments for strengthening economic integration between neighboring countries (Suryadinata et al., 2023). Nevertheless, digital transformation remains highly dependent on internet accessibility, digital literacy, and institutional readiness. In many peripheral borderlands, technological adoption remains limited due to inadequate infrastructure and socioeconomic inequality, creating a digital divide between urban commercial centers and rural frontier communities.

Regional Integration and Cross-Border Trade

Regional integration theory emphasizes the importance of economic cooperation, trade liberalization, and institutional harmonization in promoting regional development. ASEAN has actively promoted cross-border connectivity through initiatives such as the ASEAN Economic Community (AEC), cross-border transport agreements, and digital economy frameworks. These policies aim to transform border regions into growth centers that facilitate trade, investment, and labor mobility (ASEAN Secretariat, 2024).

However, scholars argue that successful regional integration requires more than physical infrastructure development. Institutional trust, governance coordination, and inclusive economic participation are equally important in ensuring sustainable border development (Lee & Syahza, 2020). In the Indonesia–Malaysia borderlands, integration challenges persist because many local traders still operate outside formal financial systems and rely on traditional market networks. This condition indicates that modernization policies often overlook local socioeconomic realities and cultural trading practices.

Financial Inclusion and Digital Economy in Border Communities

Financial inclusion has become a central issue in discussions regarding digital economic transformation. Border communities frequently experience limited access to banking services, digital payment systems, and formal credit institutions. As a result, cash-based and informal economic transactions remain dominant in many frontier regions. Recent studies show that digital financial technologies can significantly improve economic participation among marginalized populations by providing easier access to transactions, savings, and microfinancing services (Ozili, 2022).

Despite these opportunities, the effectiveness of digital financial inclusion depends heavily on user trust, technological literacy, and policy support. In many developing border regions, barriers such as low education levels, poor internet connectivity, and cybersecurity concerns hinder the adoption of digital financial services (World Bank, 2023). Therefore, border economic modernization should not only focus on technological deployment but also prioritize community empowerment and inclusive institutional governance.

Theoretical Framework and Research Positioning

This study is positioned within the intersection of Border Economic Transformation Theory, Digital Ecosystem Theory, and Regional Integration Theory. Border Economic Transformation Theory explains the structural economic changes occurring in frontier regions driven by modernization and globalization. Digital Ecosystem Theory emphasizes the role of technological interconnectedness in shaping economic behavior, institutional

interaction, and market integration (Senyo et al., 2021). Meanwhile, Regional Integration Theory highlights the significance of policy coordination and cross-border cooperation in strengthening regional economic competitiveness. By integrating these theoretical perspectives, this research seeks to explain how informal barter systems evolve into digital trade ecosystems within the Indonesia–Malaysia borderlands. The study also attempts to bridge the gap between traditional socioeconomic structures and contemporary digital economic governance, thereby contributing to broader discussions on inclusive and sustainable border modernization.

Research Method

This study employs a qualitative approach using the library research method to examine the transformation of the Indonesia–Malaysia border economy from traditional barter systems toward a modern digital trade ecosystem. Library research is considered appropriate because the study focuses on conceptual analysis, theoretical synthesis, and critical evaluation of previous scholarly findings related to border economic modernization, informal trade systems, digital economy development, and regional integration. The research relies on secondary data derived from scientific journal articles, books, policy reports, conference proceedings, and official publications from international institutions such as the World Bank, ASEAN Secretariat, and government agencies. The use of library research enables the researcher to comprehensively analyze historical developments, policy dynamics, and theoretical perspectives regarding cross-border trade transformation in Southeast Asia.

The data collection process was conducted through systematic literature identification using academic databases indexed in Scopus, Google Scholar, ScienceDirect, SpringerLink, and Emerald Insight. The selection criteria focused on publications from 2020–2025 to ensure the relevance and recency of the literature. Keywords used in the literature search included “border economy,” “cross-border trade,” “informal barter trade,” “digital trade ecosystem,” “financial inclusion,” “ASEAN border development,” and “Indonesia–Malaysia borderlands.” The collected literature was then categorized based on thematic relevance, including border economic transformation, digitalization, regional integration, informal trade resilience, and digital financial systems. To improve research validity, the study prioritized peer-reviewed international journal articles and official institutional reports with strong academic credibility.

Data analysis in this study utilized descriptive-analytical and thematic analysis techniques. The descriptive approach was used to explain patterns of economic transformation in border regions, while thematic analysis was applied to identify recurring themes, conceptual relationships, and research trends within the literature. The researcher critically compared findings from previous studies to identify research gaps, theoretical inconsistencies, and emerging issues regarding digital modernization in border economies. Furthermore, the study synthesized various theoretical perspectives, including Border Economic Transformation Theory, Digital Ecosystem Theory, and Regional

Integration Theory, to construct a comprehensive analytical framework for understanding the transition from informal barter systems to digital trade ecosystems in the Indonesia–Malaysia border region.

Results and Discussion

Transformation of the Indonesia–Malaysia Border Economy

The findings indicate that the Indonesia–Malaysia borderlands have undergone significant economic transformation over the last two decades. Historically, border communities relied heavily on informal barter systems to fulfill daily economic needs due to geographical isolation, limited infrastructure, and weak formal market access. Commodities such as agricultural products, fisheries, household necessities, and fuel were commonly exchanged through non-monetary or semi-formal transactions between neighboring communities in Kalimantan–Sarawak and Nunukan–Sabah. These barter systems were deeply embedded within local socio-cultural relations and functioned as adaptive economic mechanisms for marginalized frontier populations (Nuraini et al., 2022).

However, increasing regional integration and digital economic expansion have gradually shifted traditional trade practices toward more formalized and technology-based systems. Infrastructure development, improved border connectivity, and digital financial services have accelerated the emergence of modern cross-border trade ecosystems. The introduction of digital payment systems, mobile banking, e-commerce platforms, and online logistics services has reduced transaction costs and expanded market accessibility for local traders (Lim et al., 2023). As a result, border economies are no longer solely dependent on informal exchanges but increasingly integrated into regional commercial networks connected through digital technologies.

Despite these developments, the transition toward digital trade ecosystems remains uneven across border regions. Urbanized border areas with better internet infrastructure and institutional support have adopted digital commerce more rapidly than remote rural communities. This condition creates a dual economic structure where modern digital transactions coexist alongside traditional barter systems. Many local traders continue relying on informal mechanisms because of limited digital literacy, weak banking access, and concerns regarding technological complexity (Suryadinata et al., 2023). Therefore, economic modernization in borderlands should be understood as a gradual and hybrid transformation process rather than a complete replacement of traditional systems.

Persistence of Informal Trade Systems

One of the major findings of this study is the persistence of informal trade despite modernization efforts. Informal barter systems continue to survive because they provide flexibility, social trust, and accessibility that formal institutions often fail to deliver. In many border villages, social relationships and kinship networks remain central to economic exchange. Traders frequently prefer informal arrangements because they involve lower

transaction costs, simplified procedures, and mutual trust compared to formal customs mechanisms (Hassan et al., 2021).

Furthermore, informal trade serves as an economic safety net for low-income communities facing unstable employment opportunities and limited financial inclusion. During periods of economic disruption, such as the COVID-19 pandemic, informal cross-border trade demonstrated resilience by maintaining the circulation of goods and basic necessities when formal supply chains experienced restrictions (Rahman et al., 2021). This finding supports the argument that informal economic systems in border regions should not merely be viewed as illegal or inefficient practices but also as socially embedded survival strategies.

Nevertheless, the persistence of informality also generates structural challenges for governments. Weak documentation systems complicate taxation, trade monitoring, and customs regulation. Informal trade networks are also vulnerable to smuggling activities and illegal commodity flows due to limited institutional supervision. Consequently, governments in both Indonesia and Malaysia increasingly seek to formalize border trade through digital customs systems, electronic transaction monitoring, and cross-border economic agreements (Khalid & Mutalib, 2024). However, excessive formalization without community adaptation risks marginalizing traditional traders and reducing local economic resilience.

Digitalization and the Emergence of a Cross-Border Trade Ecosystem

The findings further reveal that digitalization has become a major driver of border economic modernization. Digital trade ecosystems enable broader market integration through interconnected financial services, e-commerce platforms, transportation systems, and digital governance mechanisms. Mobile payment technologies and QR-based transactions have significantly improved transaction efficiency among small traders in strategic border markets. Digital platforms also facilitate product promotion and enable microenterprises to access consumers beyond local frontier areas.

The growth of fintech and digital banking services contributes positively to financial inclusion in border communities. Previously unbanked populations now gain easier access to savings systems, digital transfers, and online commercial activities. According to World Bank (2023), digital financial inclusion strengthens economic participation and improves regional economic productivity. In the Indonesia–Malaysia border context, digitalization has also increased transparency in trade transactions and reduced dependence on cash-based exchanges.

However, digital transformation remains constrained by several structural barriers. Internet inequality, limited technological infrastructure, low educational attainment, and cybersecurity concerns continue to hinder digital adoption among frontier populations. Older generations and traditional traders often experience difficulties adapting to digital platforms due to insufficient technological literacy. This condition creates a digital divide between modern commercial actors and traditional community-based traders (Ozili, 2022).

Therefore, digital modernization requires inclusive approaches that combine technological development with community empowerment and digital education.

Regional Integration and Border Development

The modernization of border economies is strongly influenced by ASEAN regional integration initiatives. Policies promoting cross-border connectivity, trade facilitation, and digital economic cooperation have increased the strategic importance of border regions within Southeast Asia. The ASEAN Economic Community (AEC) encourages member states to strengthen economic interoperability through customs harmonization, transportation connectivity, and digital trade agreements (ASEAN Secretariat, 2024).

In the Indonesia–Malaysia frontier, regional integration has stimulated infrastructure development, investment flows, and trade expansion. Border areas increasingly function as gateways connecting regional supply chains and economic corridors. Nevertheless, the findings suggest that regional integration policies often prioritize macroeconomic growth while insufficiently addressing local socioeconomic inequalities. Infrastructure projects and digitalization programs tend to benefit larger commercial actors more significantly than small-scale traditional traders.

This imbalance indicates the need for inclusive border development strategies that integrate local communities into modernization processes. Economic modernization should not only focus on efficiency and competitiveness but also emphasize social equity, cultural preservation, and community participation. In this regard, border economic transformation requires adaptive governance capable of balancing formal institutional modernization with local socioeconomic realities.

Theoretical Implications

This study contributes theoretically by integrating Border Economic Transformation Theory with Digital Ecosystem Theory and Regional Integration Theory. The findings demonstrate that border economic modernization is multidimensional, involving technological, institutional, cultural, and socioeconomic transformations simultaneously. Unlike conventional modernization perspectives that assume linear economic transition, this study shows that traditional barter systems and digital ecosystems can coexist within hybrid economic structures.

The study also expands the understanding of digital ecosystems in peripheral economies by emphasizing the importance of social trust, informal institutions, and local adaptation in technological transformation. Digital modernization in borderlands cannot be fully understood solely through infrastructure and technology adoption indicators; it must also consider cultural-economic relationships and community resilience. Therefore, inclusive digital governance becomes essential for ensuring sustainable and equitable border economic development.

Practical Implications

Practically, this study suggests that policymakers should design border modernization strategies that are inclusive, participatory, and community-oriented. Governments should strengthen internet infrastructure, digital literacy programs, and

financial inclusion initiatives in remote border areas to reduce technological inequality. In addition, informal traders should be gradually integrated into formal economic systems through supportive rather than punitive approaches.

Cross-border cooperation between Indonesia and Malaysia should also prioritize community empowerment, MSME development, and digital capacity building to ensure that modernization benefits local populations equitably. By integrating digital transformation with local socioeconomic realities, border regions can evolve into sustainable and competitive economic ecosystems while preserving social cohesion and cultural identity.

Conclusion

This study concludes that the economic modernization of the Indonesia–Malaysia borderlands reflects a complex transformation process from traditional informal barter systems toward integrated digital trade ecosystems. Historically, barter trade functioned as an adaptive economic mechanism for border communities facing geographical isolation, limited infrastructure, and restricted access to formal financial institutions. However, the expansion of regional integration, digital technology, and cross-border connectivity has gradually reshaped economic interactions in frontier areas through the adoption of digital payment systems, e-commerce platforms, fintech services, and modern logistics networks.

The findings demonstrate that border economic transformation does not occur uniformly. Instead, a hybrid economic structure emerges in which traditional barter systems continue to coexist alongside modern digital commerce. Informal trade persists because it remains socially embedded within local cultural relations, kinship networks, and community trust systems. At the same time, digitalization provides new opportunities for financial inclusion, market expansion, and regional economic integration. Nevertheless, disparities in digital literacy, technological infrastructure, and institutional readiness continue to create unequal modernization outcomes among border communities.

This study also identifies that border economic modernization is influenced not only by technological advancement but also by institutional adaptation, governance quality, and social resilience. ASEAN regional integration policies have strengthened the strategic role of border regions as economic gateways, yet development initiatives often prioritize macroeconomic growth while insufficiently addressing local socioeconomic realities. Consequently, modernization policies risk marginalizing traditional traders if they are implemented without inclusive and community-oriented approaches.

Theoretically, this research contributes by integrating Border Economic Transformation Theory, Digital Ecosystem Theory, and Regional Integration Theory to explain the coexistence of traditional and modern economic systems in frontier regions. The study emphasizes that digital modernization in border economies should be understood as a multidimensional process involving technological, institutional, cultural,

and socioeconomic transformation simultaneously. This finding enriches the contemporary discourse on inclusive digital economic development in peripheral regions. Practically, the study recommends that governments and regional policymakers strengthen digital infrastructure, financial inclusion programs, and digital literacy initiatives in remote border areas. In addition, formalization efforts should adopt participatory and adaptive approaches that support rather than replace traditional community-based economic systems. Sustainable border modernization requires balancing technological innovation with local socioeconomic realities to ensure equitable economic participation, social cohesion, and long-term regional resilience in the Indonesia–Malaysia borderlands.

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