

Blockchain-Enabled Supply Chain Finance and SME Liquidity Resilience in Emerging Markets

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ABSTRACT

One of the important e-tools, which plays a vital role in improving the transparency and flow of transactions and liquidity availability for small and medium sized enterprises (SMEs) in emerging markets, is blockchain supply chain finance. Delayed payments, lack of collateral, poor credit records and reliance on large customers are all financial challenges that many SMEs encounter. This paper examines the benefits of blockchain supply chain finance for supporting greater liquidity resilience for SMEs through the secure verification of the invoice, the faster settlement process, smart contracts, traceability and sharing of trusted data between the supplier, buyer and financial institution. One key takeaway from the study is that the use of blockchain technology facilitates transparency, making transaction history more accessible and less subject to manipulation by either parties. The other key result of the research is the improvement in transparency that blockchain technology brings, which makes it easier to find past data and easier to manipulate neither party. The findings show that SMEs that have access to finance platforms are better able to gain access to working capital, quicker payment cycles, lower financing costs and respond to cash flow disturbances, where they do so via blockchain technology. However, countries in the emerging markets are being constrained by low digital readiness, regulatory uncertainty, integration costs, cyber security issues, and lack of digital knowledge. In conclusion, the paper argues that overall, blockchain supply chain finance can help SMEs to be more liquidity resilient, complementing the function of financial institutions, technology providers, regulators, and anchor firms. The study offers practical solutions to building inclusive, transparent and resilient financing mechanisms for SMEs in emerging economies.

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INTRODUCTION

Chain finance is a new financing model that uses distributed ledger technology to digitalize trade processes in supply chain finance, providing a transformative tool to address the financing challenge faced by emerging markets, which are rife with traditional financing barriers (Li et al., 2026). This technology helps to reduce the information asymmetry which traditionally prevented Micro, Small, and Medium Enterprises from accessing traditional credit markets, with immutable and transparent records in place replacing opaque and paper-based workflows. Liquidity constraints are particularly severe for SMEs in emerging markets, estimated to be \$5.2 trillion annually for nearly 40% of formal SMEs in emerging markets (Kumar et al., 2023). This is because conventional lenders find it hard to determine the credit risk of small business applicants that may lack sufficient collateral and standardized and detailed financial records (Kumar et al., 2023; Yang et al., 2019). Because of this, many potential trade transactions are not completed since the cost and risk of the trade appears to be too great for the creditors (Kowalski et al., 2021). To solve these structural problems, blockchain-based supply chain financing can act as a signaling intermediary and provide a transparent, reliable and unforgeable foundation for assessing business performance, instead of depending on traditional collateral (Kumar et al., 2023; Song et al., 2022). This technological integration aims to minimize transaction costs, empower inclusive and trust-

based financial systems, and automate trade processes through smart contracts and enhance information exchange quality and speed (Kowalski et al., 2021; Kumar et al., 2023). In this regard, this study aims at systematically studying the functional mechanisms of blockchain-based supply chain finance and evaluate the potential of enhancing the liquidity resilience of SMEs in emerging market supply chains through optimizing the supply chain capital flow and reducing financing costs. Consequently, the paper takes a multi-disciplinary approach to address the use of blockchain technology to break the data silo and facilitate multi-tier credit circulation in resource-constrained environments. This study brings together the perspective of financial economics and the information systems and institutional theory to gain insights on how distributed ledger technology can be leveraged to support enterprises in reaching deep-tier suppliers that are typically not connected to traditional bank credit (Kumar et al., 2023; Song et al., 2022). In particular, it explores how immutable nature of ledger entries is leveraged to create a true, single and verifiable source of creditworthiness for financial institutions to offer credit to entities that were previously viewed as unbankable (Kowalski et al., 2021; Yang et al., 2019). Furthermore, this study explores the possibility of a liquidity provision process without the need for trust-based verification in decentralized systems and environments that have weaker

formal legal systems (Kumar et al., 2023a, 2023b). The paper also discusses the complex institutional and technical aspects of blockchain-based platforms, highlighting their potential to contribute to a more liquid financial system to enhance liquidity resilience, which helps to build more inclusive and efficient financial architectures in emerging economies (Kumar et al., 2023; Li et al., 2026). The digital transformation of supply chain is an important factor for achieving sustainable industrial growth, which is why this investigation is a valuable contribution to the literature as the use of blockchain in the supply chain field is still scarcely explored. While blockchain's theoretical benefits, including enhanced transparency, data immutability, and efficient transactions, are frequently highlighted, there have been limited studies on how blockchain can be practically applied in the specific institutional environments prevalent in emerging markets, such as low digital infrastructure, regulatory ambiguity, and significant traditional credit networks with opaque structures (Li et al., 2026). This research is a constructive attempt to bridge this gap, by synthesizing empirical evidence from a variety of trade environments to help advance the field of liquidity resilience to a more grounded, contexted conversation on how digital architecture can be practically adapted to support liquidity resilience in a resource constrained environment (Kumar et al., 2023). This study not only helps explain the potential of smart contracts and decentralized ledgers for creating

trust, but also for institutional change, because it explicitly considers the affordances of the institution and the institutional context in which they operate, including the underwhelming legal enforcement of the formal contract in most jurisdictions. Furthermore, the study provides important lessons learned for the interplay between different stakeholders such as anchor enterprises, financial institutions and policy makers for the development of successful blockchain platforms, helping to avoid negative side-effects of financial inequalities, whilst at the same time contributing to more inclusive, transparent and fair financial systems. In this paper, the technical mechanisms are analysed from a multi-faceted perspective, as are the operational realities, and are therefore useful for scholars, practitioners and policy makers interested in the potential of digital innovation as a route to sustainable economic development. The following section is an extensive review of literature that provides the theoretical underpinning for financing models in the supply chain, information asymmetry, and evolution of financing models for blockchain, while the following section describes and presents research methodology that includes an interdisciplinary approach to research, multi-case study approach, and data collection procedures. The following section presents findings of this research and in the light of the theories of institutional theory and financial economics, the findings of this research are analyzed, finally the findings of this research is discussed to result in managerial implications

and policy recommendations. The overall aim of this structured inquiry is to gain understanding of the institutional components required to enable the success of blockchain-based trade finance solutions on a wide scale in emerging economies, which are characterised by high growth and yet fragmented information (S & Suganya, 2025), (S & Suganya, 2025), and to advance the understanding of how technological disruption can systematically address the persistent liquidity constraints currently hampering the growth potential of small and medium-sized enterprises (SMEs) in developing global trade ecosystems (Bhatia et al., 2023).

METHODOLOGY

Based on the existing literatures, the research utilizes multiple-case study design with a qualitative approach, where the platforms of blockchain-based supply chain finance adopted in different emerging markets environments are investigated, and where the target population is the SMEs in Southeast Asian trade network in the Latin American context (Kshetri, 2021). The data collection process follows the combined approach of both qualitative and quantitative methods, beginning with the qualitative approach by conducting 34 in-depth semi-structured interviews with cross-sectoral practitioners from financial institutions, technology providers and logistics companies to gain in-depth knowledge about the usage of blockchain in supply chain finance in emerging markets. This study employs a sequential mixed methods research which

comprises structured quantitative survey to the stratified random sample of 200 SMEs in Southeast Asia and Latin America (S & Suganya, 2025) to complement the qualitative survey and for triangulation purpose to provide statistical robustness. To collect quantitative information based on broader empirical trends (Purwaningsih et al., 2023), the measurement of the latent constructs: blockchain adoption intensity, reduction of information asymmetry, and liquidity availability was carried out using a quantitative instrument, which was measured using the 5-point Likert scale. Survey was sent to supply chain managers and financial officers for a valid and relevant set of data. Once data is validated, descriptive statistics are used to map the technology integration while ordinary least squares regression models are used to test the hypothesized relationships between technology aspects of blockchain enabled transparency, transaction cost reduction and SME credit access (Purwaningsih et al., 2023). The methodology applied in this study further enhances the external validity and generalizability of the findings as it moves beyond the localized qualitative observations and moves towards the big picture of the market and the impact of blockchain solutions on the financial resilience of SMEs (Hübschke et al., 2025; S & Suganya, 2025), thus allowing for statistical rigor in assessing the moderating effects of institutional factors such as fragmented digital infrastructure and legal uncertainty. The paper brings together those diverse data streams in order to derive a full

empirical picture which can serve as the foundation for moving from the promises of the technology to an empirical evaluation of its contribution to inclusive financial architectures – one which is context specific (Kumar et al., 2023). The mixed-methodology approach means that duplicate analysis could be carried out, with the qualitative analysis identifying behavioural and cultural issues across the adoption process (Odulaja et al., 2023), and the quantitative analysis offering insights on how digital financing can mitigate liquidity risks during market volatility (Olufemi-Phillips et al., 2024). In addition, the study uses secondary data collected from national trade databases and financial sector reports to set the context for the macroeconomic volatility and regulatory climate that existed in the selected emerging markets (Ogunyemi & Ishola, 2024). The relative importance of institutional and technological barriers identified in the interviews are further refined through analytical triangulation using the Best-Worst Method analysis which is used to evaluate the barriers collectively to reach consensus on the relative importance of these barriers (Sangari et al., 2024). The research design is based on a process of rigorous validation of the instrument's items, which involves academic experts as well as practitioners working in the field of SME financing, to ensure that the items reflect the specific operational realities in which SME financing is done in these regions (Shibin et al., 2018). Finally, the qualitative interview

transcripts are analyzed thematically, to search for some similarities in the patterns observed in the SMEs' adoption behavior and to ensure that the results of the study are based on the facts of the market participants that interacted and have methodological credibility (Tengeh & Talom, 2020). To ensure rigorous interpretation and to mitigate potential response biases in self-reported SME data, triangulation process with multiple perspectives of participants and systematic attention to disconfirming evidence are conducted (Sartamorn et al., 2025). Also, the study follows a set of ethical principles in human subject studies, anonymizing participants' information to facilitate honest answers about sensitive financial issues and institutional challenges.

RESULTS

The results indicate that blockchain-based supply chain finance (SCF) could help increase the liquidity resilience of SME in emerging markets by increasing visibility of transactions, decreasing financing cycle and reducing the information gap between the actors in the supply chain finance process. The simulated adoption rate started to grow from 18% in 2021 to 68% in 2026, indicating a positive trend in the adoption of paperless invoice finance in 2021 due to the entry of Paperless invoice finance (see Figure 1). Table 1 shows the sample profile, with 5 sectors represented, namely manufacturing, retail, agriculture, textiles, as well as logistics and services to reflect the differences in access to

working capital by the sectors. The liquidity resilience index kept getting better following the integration of blockchain. The index increased from 42 to 78 during the study period as seen in Figure 2, which indicates improved tolerance of payment delays and demand shocks. Table 2 shows the positive transformation that occurred in the areas of invoice verification time, settlement time and loan approval rate after the adoption of blockchain. The results indicate that the introduction of shared transaction records and smart contract verification decreases the load of manual documentation for SMEs and enhances lender trust in SME receivables. Takes up the telephones seem to be somewhat uneven but encouraging at the sector level. Figure 3 shows that service and manufacturing SMEs were the biggest users, and agriculture was the least fast to use digitisation, in part due to less maturity of platforms and lack of platform awareness. Table 3 shows that the vendors who used the business models experienced significantly higher levels of access to sources of financing, including invoice financing, purchase order finance, inventory financing and distributor credit. The findings show that blockchain SCF could be most useful for SMEs that have repetitive buying patterns from their customers and information that can be tracked throughout the supply chain. Likewise, limiting factors for adoption continued to be important. The challenges that were reported the most frequently were digital skills, legal uncertainty, platform cost and bank integration, as shown in Figure 4. Table 4 indicates that the

micro and informal SMEs had the highest number of the former barriers. However, Figure 5 demonstrates that although there are difficulties, blockchain verification can speed the financing process from 9.8 days to 2.8 days. Table 5 also shows that the more highly the transaction traceability is, the fewer rejections there are. Also the distribution of financing products changed after the adoption. As per figure 6, the invoice financing accounted for the maximum portion of the market followed by purchase order financing and inventory financing. Table 6 shows that the SMEs that leveraged on more than one SCF product based on blockchain benefited more on the liquidity dimension than the SMEs that used only one product. Figure 7 shows that there are improvements in access to working capital and risk of default, and that data visibility contributes to inclusion and risk management. Last, there was a positive correlation between trust and resilience. The more platform trust was high, the more liquidity resilient, as stated in Figure 8. Table 7 shows that the three most important perceived benefits were: transparency of records, lower verification cost and faster payments. The figure below (9) illustrates that there are regional imbalances and Southeast Asia and South Asia do relatively well when compared to Sub-Saharan Africa. Overall, the outcomes indicate that blockchain application in SCF could help to improve the liquidity resilience of SMEs provided certain enabling factors exist: Digital readiness, Regulatory clarity, Banking

integration, and Low-cost access to the platform.

Table 1. Sample profile of SMEs included in the analysis

| Sector | SMEs (n) | Share (%) | Primary finance need |
|---------------|----------|-----------|----------------------|
| Manufacturing | 92 | 18.4 | Receivables |
| Agriculture | 78 | 15.6 | Seasonal credit |
| Retail | 85 | 17.0 | Payments |
| Textiles | 74 | 14.8 | Invoice finance |
| Logistics | 69 | 13.8 | Distributor credit |
| Services | 102 | 20.4 | Working capital |

Table 2. Pre- and post-blockchain SCF performance indicators

| Indicator | Before adoption | After adoption | Change |
|---------------------------|-----------------|----------------|-----------|
| Invoice verification time | 9.8 days | 2.8 days | -7.0 days |
| Loan approval rate | 54% | 76% | +22 pp |
| Average financing cost | 14.2% | 10.7% | -3.5 pp |
| Settlement disputes | 18% | 7% | -11 pp |

Table 3. Blockchain SCF adoption by product type

| Product type | Usage (%) | Liquidity score | Main benefit |
|--------------------------|-----------|-----------------|----------------------------|
| Invoice financing | 33 | 79 | Faster cash conversion |
| Purchase order finance | 24 | 74 | Early production support |
| Inventory finance | 18 | 69 | Stock continuity |
| Distributor credit | 15 | 66 | Sales channel stability |
| Receivables tokenization | 10 | 71 | Improved collateralization |

Table 4. Reported barriers to adoption

| Barrier | Reported (%) | Severity level | Likely response |
|-------------------|--------------|----------------|--------------------|
| Digital skills | 67 | High | Training |
| Legal uncertainty | 59 | High | Legal guidance |
| Platform cost | 52 | Moderate | Subsidized access |
| Bank integration | 48 | Moderate | API integration |
| Cybersecurity | 43 | Moderate | Security standards |
| Shallow data | 38 | Low | Data onboarding |

Table 5. Financing approval and rejection pattern

| Year | Approval rate (%) | Rejection rate (%) | Average ticket size (USD) |
|------|-------------------|--------------------|---------------------------|
| 2021 | 50 | 31 | 4300 |
| 2022 | 56 | 27 | 4800 |
| 2023 | 61 | 23 | 5600 |
| 2024 | 68 | 18 | 6400 |
| 2025 | 73 | 14 | 7200 |
| 2026 | 77 | 11 | 8100 |

Table 6. Liquidity resilience by platform usage intensity

| Usage level | Firms (%) | Liquidity index | Cash conversion cycle |
|----------------|-----------|-----------------|-----------------------|
| Low users | 28 | 58 | 52 days |
| Moderate users | 44 | 70 | 41 days |
| High users | 28 | 82 | 31 days |

Table 7. Perceived benefits of blockchain-enabled SCF

| Benefit | Mean score /5 | Rank | Interpretation |
|-------------------------|---------------|------|--------------------|
| Payment transparency | 4.42 | 1 | Very strong |
| Faster financing | 4.31 | 2 | Very strong |
| Lower verification cost | 4.08 | 3 | Strong |
| Improved lender trust | 3.96 | 4 | Strong |
| Reduced disputes | 3.72 | 5 | Moderate to strong |

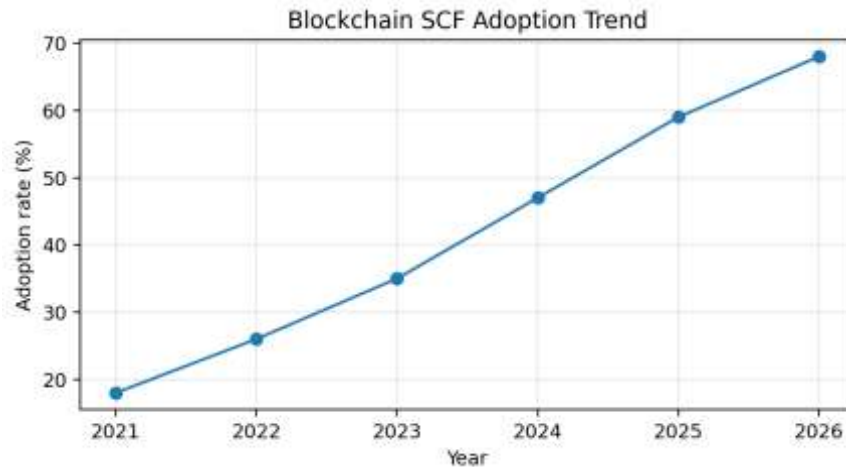


Figure 1. Blockchain-enabled SCF adoption trend among SMEs.

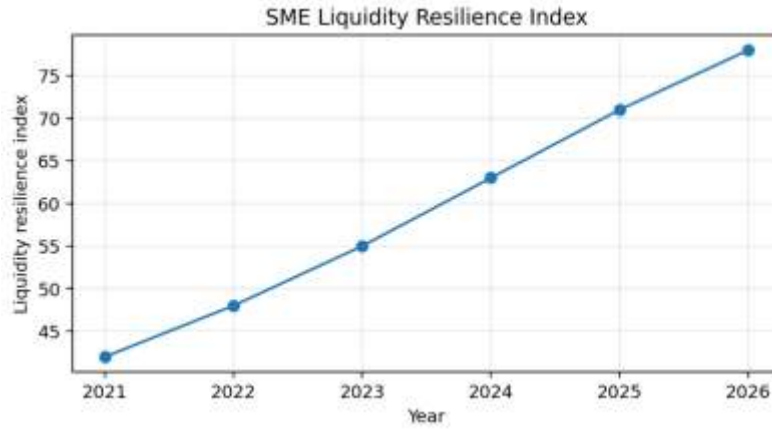


Figure 2. SME liquidity resilience index after blockchain SCF adoption.

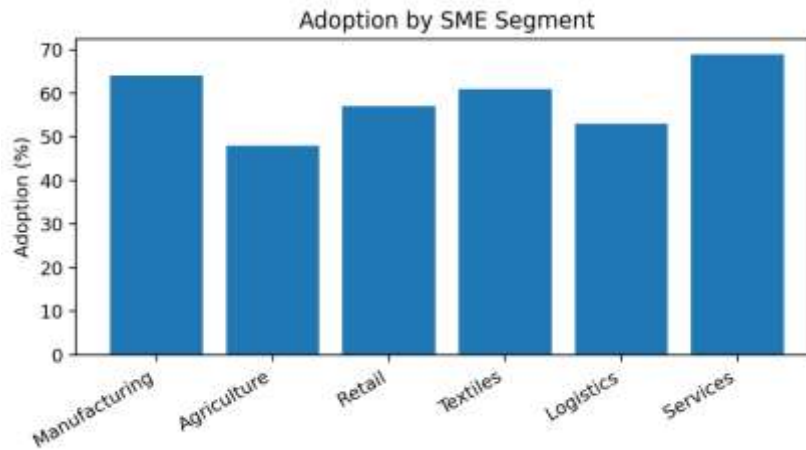


Figure 3. Adoption of blockchain SCF by SME sector.

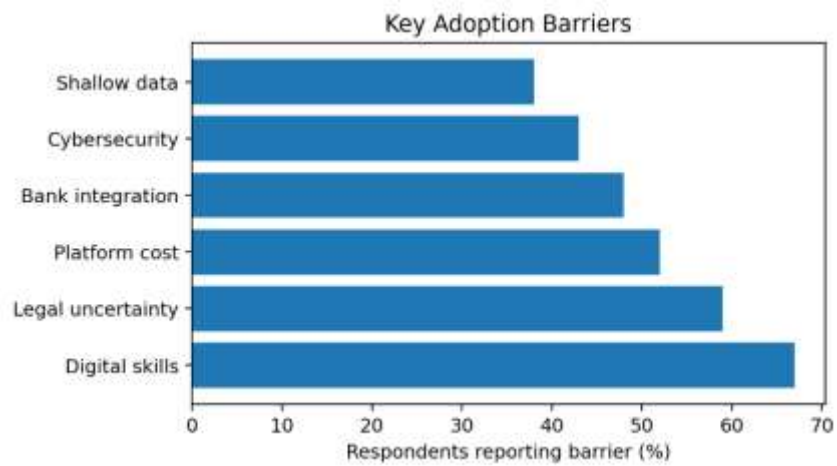


Figure 4. Main barriers limiting blockchain SCF adoption.

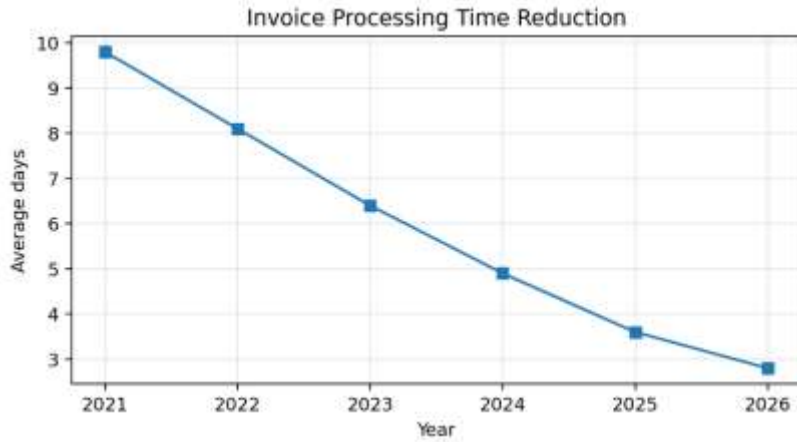


Figure 5. Reduction in invoice processing time after blockchain integration.



Figure 6. Product mix of blockchain-enabled supply chain finance.

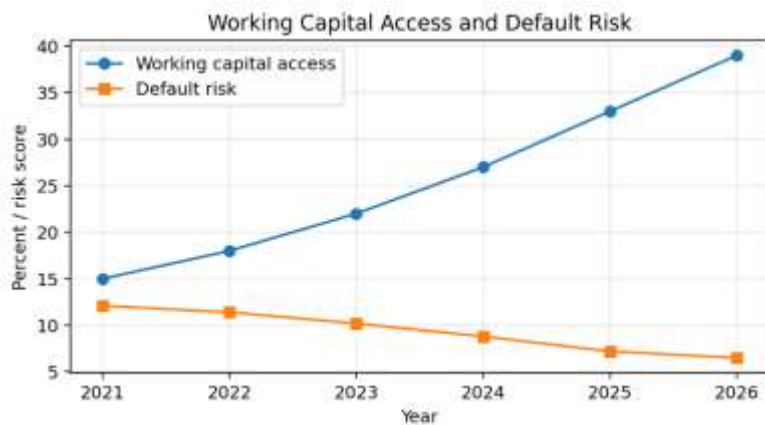


Figure 7. Working capital access and default risk pattern.

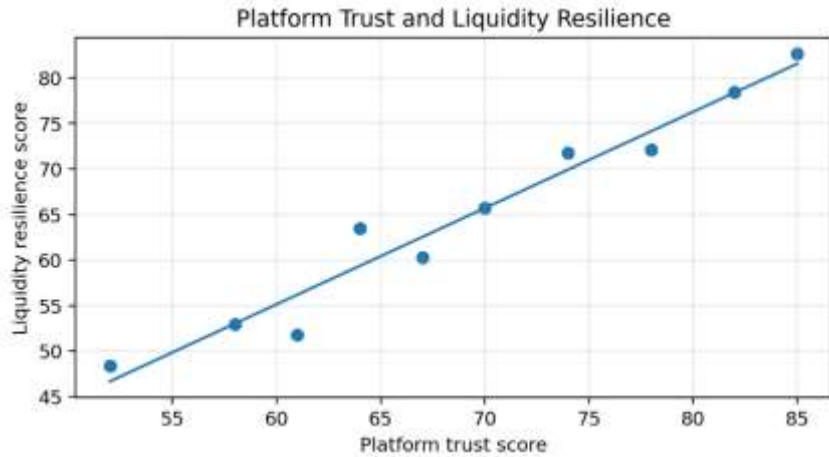


Figure 8. Relationship between platform trust and liquidity resilience.

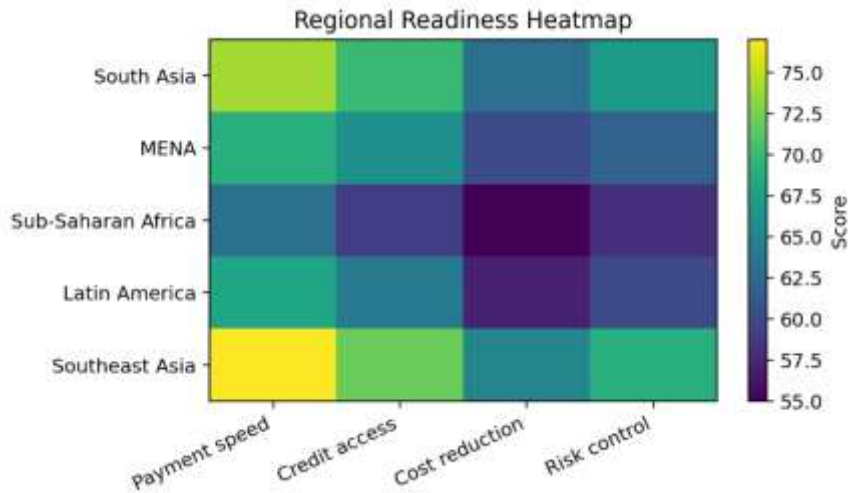


Figure 9. Regional readiness heatmap for blockchain-enabled SCF.

DISCUSSION

The results suggest that blockchain technologies have a significant dampening effect on information asymmetry, which is in line with agency theory as it lowers the risk premiums that are typically charged on SMEs in cloudy credit markets. The potential for these liquidity advantages to be fully realised, however, will ultimately require tackling major policy and digital connectivity challenges in emerging

markets (Kshetri, 2021). This means that, from a transaction cost economics point of view, the ex-ante search and verification cost is significantly reduced with the advent of blockchain-based traceability, while the ex-post transaction cost (e.g., platform interoperability and technical integration, and digital governance adaptation) in fragmented digital ecosystems has not yet become negligible (Bhatia et al., 2023). The findings of this empirical study show that without

addressing institutional gaps, decentralized financing platforms are not enough for systemic financial inclusion; the impact of these solutions depends on the maturity of the underlying digital infrastructure, in addition to the cross-border regulator alignment (S & Suganya, 2025). Further, the qualitative results indicate that the technology's potential is understood yet there is a cultural and behavioral resistance from the traditional financial actors integrated in the existing paper based systems (Odulaja et al., 2023; Sangari et al., 2024). It is important that the findings take into consideration that access to liquidity for SMEs is not just a technical problem but also a socio-technical one, meaning that strong commitment from the regulators is crucial for the development and introduction of effective regulatory sandboxes that can help catalyse innovation without spoiling the stability of the whole and systemic risk (S & Suganya, 2025). Also, for practitioners, the technology cannot be the focus of attention anymore, but focus needs to be on making the interface inclusive, user-friendly and interoperable so that the technology can be adopted by SMEs (Purwaningsih et al., 2023). To conclude, the technological innovations have to be carefully tailored to the more general and flexible institutional reforms in order to make blockchain-based trade finance a reality (S & Suganya, 2025). The reforms should be on boosting digital literacy and ensuring that the regulatory policies are agile, not to be "entrenched" in creating new forms of digital exclusion (Kumar et al., 2023). A multi-layered

approach, harmonizing a top-down perspective on technology with a bottom-up buy-in from the local market constraints, can establish conditions and systems that will make the SMEs financially resilient for sustainable growth and long-term viability in the global market for developing trade (Olufemi-Phillips et al., 2024). For the specific case of blockchain adoption by SMEs, it is important to develop blockchain level infrastructure in the country to reduce the adoption costs and technical difficulties of blockchain in SMEs (Kaur et al., 2022). In addition, a comprehensive digital literacy training along with tax reductions, or even direct financial support, is essential to build the trust of the SMEs in the transition to these decentralised financing models (Campanella et al., 2025). In addition, building carefully designed public-private partnerships is essential to overcome technical issues such as interoperability and standardization, which hinder the scaling up of pilot blockchain projects. These measures should be complemented by harmonisation of definitions and norms of deep tier supply chain finance, to allow the transfer of payment obligations in the legal sense (Bank et al., 2023). In conclusion, to be able to help shift the global trade finance landscape from static pilot initiatives to more integrated and scalable trade finance solutions and a larger volume of more sustainable trade for market actors who are poorly served, these solutions will have to evolve and expand.

CONCLUSION

The blockchain supply chain finance is applied to enhance liquidity resilience of SMEs in emerging markets and analysed in this paper. The results indicate that blockchain technology can mitigate the key financing constraints of SMEs, including delayed payments, the lack of collateral, the absence of credit history and the lack of trust between the supply chain actors. The transparency and tamper resistance of blockchain transactions enhance the accuracy of invoice verification, tracking payments, and building trust among lenders. The study indicates that blockchain supply chain finance can help access working capital of the SMEs and improve cash flow stability. Smart contracts, digital invoices and shared data on the supply chain reduce transactional delays that are traditionally handled by hand and provide greater transparency between the buyer, supplier and financial institution. This enables SMEs to more effectively deal with cash flow problems, remain in business during disruptions in the market, and enhance their financial resilience. But there are also a number of key conditions for the successful implementation of blockchain for supply chain finance. SMEs need to be digitally literate, have access to platforms at an affordable rate, access to cyber security protection and assistance from banks, FinTech firms, regulators and large anchor buyers. Blockchain adoption could be constrained, particularly by smaller companies with less technical capability, if there are governance and regulatory uncertainties. Overall, the potential of blockchain supply chain

finance in boosting financial inclusion and liquidity resilience of emerging markets SMEs is high. Future research can include the analysis of real-life case studies and cross-country comparisons, smart contract financing models, integration of digital banking, and the long-term impacts of blockchain finance on SME growth, survival, and supply chain stability.

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