Original Article

Vol: 5, Issue: 10 (II) 2026

Perspectives in Social Sciences

ISSN Online: 3106-8464

ISSN Print: 3106-8456

DOI :

Does Supply Chain Digitalization Buffer the Impact of Geopolitical Risk on Firm Performance? Evidence from Manufacturing Firms in Emerging Asian Economies

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Article History Received: 16 Sept, 2026, Accepted: 17 Oct, 2026, Published: 20 Oct, 2026

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ABSTRACT

The impact of geopolitical risk on the performance of manufacturing companies in emerging Asian economies was analyzed with the mediation of resilience of supply chains and the moderation of digitalization of these chains. The proposed model was validated using the survey data collected from around 500 managers from Pakistan, India, Bangladesh, Vietnam, and Indonesia. The results revealed that geopolitical risk significantly has an adverse effect on firm performance and supply chain resilience, while resilience has an effect that is beneficial to firm performance. The geopolitical risk–performance relationship was greatly mediated by supply chain resilience. Additionally, higher the digitalization in the supply chain, the smaller was the impact of geopolitical risk on resilience, suggesting that the more resilient firms were, the lower was the impact of geopolitical risk. This study builds on knowledge on geopolitical risks and digital supply chain literature and combines two areas of research: information-processing and dynamic capability.

Key words: Geopolitical Risk; Supply Chain Digitalization; Supply Chain Resilience; Firm Performance; Emerging Asian Economies

Introduction

In the modern supply chain, the geopolitical instability has emerged as one of the main drivers of uncertainty as the international production landscape is increasingly changing in the line of trade wars, economic sanctions, geopolitical rivalry, military conflicts, and economic fragmentation. Geopolitical risk (GPR) affects a business's access to raw materials, transportation, financing, technology, its supplier network,

Original Article

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Perspectives in Social Sciences

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and market demand, unlike regular operational disruptions and the impact can be felt in multiple markets at once. In recent years, evidence has emerged that geopolitical exposure significantly impacts firms' supply-chain structures and resource-allocation decisions. For instance, Zhu, et al. (2025) show that geopolitical risk has an impact on the concentration of supply chains and that companies with greater resilience and operational resources are more resilient to geopolitical risk. Likewise, Chang et al. (2025) demonstrate that geopolitical risk has a negative impact on the resilience of global supply chains, such as by increasing inventory costs and reducing trade credit, and geopolitical shocks can force businesses into expensive restructuring of strategically significant supply chains (Tse et al., 2024).

The impact of these disruptions on performance can be particularly strong in emerging markets because manufacturing companies often rely on overseas suppliers, on imported technology, foreign capital, and on export markets, and are exposed to relatively less stable institutional conditions. A summary of geopolitical uncertainty's effects in the emerging market economies includes increased financing costs, reduced foreign subsidiary performance by emerging market multinational enterprises, and increased credit risk at the firm level from geopolitical shocks to supply chains (Carney et al., 2024; Li et al., 2024; Zhang et al., 2025). In general, recent research suggests that geopolitical crises have a detrimental impact on supply-chain risk by jeopardizing supply-chain resilience, boosting customer concentration, and reducing the liquidity of inventories (Chen et al., 2025). These results suggest that the effect of geopolitical events could be more than just financial; it could be a weakening of the company's capacity to sustain, adapt and restore supply chain activities.

Supply-chain resilience, as a result, is a critical pathway by which geopolitical risks could manifest themselves at the firm level. Resilient supply chains allow companies to withstand disruptions, maintain continuity, change their sourcing relationships, and bounce back quickly from an unforeseen shock. Recent research consistently shows that resilience is tightly linked with organizational effectiveness and/or ability to respond to disruptions. Xu et al. (2024) show that digitally transformed companies have higher resilience to disruptions in their supply chains, and Seif and Jafari (2025) show that supply-chain resilience is a mediator between Analytics Capabilities and Firm Performance. Furthermore, resilience is now being considered as less a fixed resource pool, but more a dynamic organizational ability that requires information processing, adaptation, coordination and reconfiguration of resources.

In this context, digitalization of the supply chain could offer a valuable buffer against risks stemming from geopolitics. Artificial Intelligence, Big Data Analytics, Internet of Things (IoT) applications, cloud platforms, blockchain, and digitally integrated enterprise systems enhance visibility, information quality, predictive capabilities, and responsiveness of the supply chain. But this role as a resilience-booster is increasingly borne out by empirical evidence. Zhan and Li (2024) find that digital transformation enhances manufacturing enterprises' adaptive and absorptive capacity; Li et al. (2025) reveal that digital transformation promotes supply-chain resilience by increasing transparency and the power of supply chain; and Zhang et al. (2025) find that supply-chain collaboration is an important mechanism connecting digital transformation with resilience. Adaptability and innovation are what convert digital investments in the supply chain to resilience, according to Aslam et al. (2025), while digitalization

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Perspectives in Social Sciences

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boosts resilience through alignment and adaptability capabilities, according to Gomes and Silva (2025).

Importantly, recent research also indicates that digitalization is especially useful when facing uncertainty in the business. Digital transformation reduces the uncertainty-driven risk of supply-chain disruption, whereas digitalization helps firms' performance when they acquire the dynamic capabilities to reconfigure the supply-chain processes, as shown by Chen, Wang, and Wang (2025) and by Szüle et al. (2026), respectively. However, while geopolitical-risk research has mostly studied the direct financial impacts, supply-chain concentration, diversification or traditional risk-management solutions, digitalization research has tended to focus more on broader disruption rather than specific geopolitical shocks. Based on the limited evidence, the authors find that the negative impact of geopolitical risk on firm performance is not necessarily reduced by supply chain digitalization, and that the buffering effect of supply chain resilience is not necessarily via supply chain digitalization, especially in manufacturing firms in emerging economies in Asia.

To fill this void, the present study investigates how geopolitical risk affects the firm performance by setting up the resilience of the supply chain as a mediating factor and digitalization of the supply chain as a buffering tactic. The study links geopolitical-risk research with the digital supply-chain and resilience literatures, and focuses more on the questions of whether geopolitical instability adversely affects firms than on the important, theoretically and managerially, question of what organizational capabilities permit firms to withstand geopolitical shocks.

Theoretical Linkages

This study brings the Organizational Information Processing Theory (OIPT) and Dynamic Capabilities Theory (DCT) together to better understand the role supply chain digitalization can play in mitigating the negative effects of geopolitical risk. OIPT suggests that the more uncertain the environment becomes, the more information that an organization must process in order to perform the job, and performance will suffer if the capacity to gather, interpret, and communicate the information the organization needs is not large enough. Geopolitical disruptions further increase such demands, as businesses need to closely watch suppliers, limitations on trade, supply lines, products in stock, and shifting political environments. Recent studies on the supply-chain also establish that a good information-processing capability and digital supply-chain practices enhance risk management and resilience by enhancing visibility and decision quality (Rashid et al., 2024). Similarly, Jia et al. (2025) reveal that supply-chain visibility contributes to improved firm resilience, and Pan et al. (2025) explain that AI-for-supplier-information-processing increases firm resilience, both proactively and reactively.The digitalization thus helps the firm to respond to the higher level of information processing needs in the context of geopolitical uncertainty. Digital integration, data sharing, and advanced analytics can help ensure supply-chain transparency, coordination, and quick reactions to disruptions (Wang et al., 2026; Hu & Ma, 2026).

In this paper, DCT further contributes to this argument by examining how companies transform what they create with digital tools into customizable response. Dynamic capabilities allow organizations to see signs of threat, grasp opportunities, and

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readjust resources and supply connections. The latest available evidence indicated that digital technologies have a positive impact on agility and adaptive capability, which in turn boosts the resilience of the supply chain (Ahmed et al., 2025); and that technology capabilities, agility, and visibility all improve the resilience of the supply chain (Akram et al., 2024). Thereafter, Wu et al. (2024) illustrate that the Digital transformation fosters resilience and robustness that in turn contributes to the performance of supply chains.

In this sense, OIPT helps to understand how digitalization can be useful in geopolitical uncertainty, while DCT helps to understand how digitally-enabled information is turned into resilient responses to safeguard firm performance. These theories are combined to establish a foundation for the position of supply chain resilience as a mediating mechanism and digitalization as a buffering ability.

Hypotheses Development

Geopolitical Risk and Firm Performance

Geopolitical risk adds significant uncertainty to businesses by impacting international trade, transportation, access to essential inputs, financial transactions and supplier relations with geographically dispersed locations. Manufacturing companies are particularly vulnerable as their production processes rely on imported raw materials, specially-manufactured parts, world-wide logistics networks, and stable cross-border working ties. The rising geopolitical tensions can lead to higher procurement and transportation expenses, production delays, limited availability of strategic technologies, and the need for companies to switch existing suppliers to alternative suppliers that may not be as efficient. Recent micro-level research suggests that geopolitical crises significantly raise supply-chain risks because of a decrease in the resilience of firms, an increase in customer concentration, and a decline in inventory liquidity (Xiong & Sun, 2025). Likewise, Zhu et al. (2025) show that geopolitical risk has a strong influence on the configuration of firms' supply chains, and that these changes affect their financial performance. The general global experience also suggests that international shocks can impact firms not only through trade but also via other financial linkages, with emerging markets firms being more vulnerable in general, and especially to international conflict.

Geopolitical uncertainty makes the volume, complexity, and changing nature of information that decision makers face greater. If firms are not well-equipped to predict and/or react to such changes, disruptions result in lower production continuity, higher costs, and lower financial and operational results. Accordingly:

H1. Geopolitical risk is negatively associated with firm performance.

Geopolitical Risk and Supply Chain Resilience

Supply-chain resilience is a firm's ability to endure disruption and adapts, recovers, and sustains critical supply-chain functions. Geopolitical risk can undermine this capability since geopolitical events can impact multiple nodes of the supply chain. Firms' sourcing options can be reduced due to trade restrictions, sanctions, border closures, political conflicts, transportation bottlenecks and supplier uncertainty, which can extend recovery time and resource needs.This argument is now gaining more

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Vol: 5, Issue: 10 (II) 2026

Perspectives in Social Sciences

ISSN Online: 3106-8464

ISSN Print: 3106-8456

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empirical support. Bhattacharya et al. (2023) conclude that geopolitical crises increase supply-chain risk, in part, by eroding supply-chain resilience. Moreover, Zhu et al. (2025) demonstrate that the firms with greater resilience are more likely to cope with changes in the concentration of their supply chains caused by geopolitical risk. The results indicate that geopolitical shocks do not simply cause operational disruptions but also have the potential to erode the ability of supply networks to withstand and bounce back from disruptions.

The relationship is of particular significance for manufacturing companies in emerging Asian economies, where they are likely to be more vulnerable to geopolitical shocks because of their reliance on external suppliers, external technologies, export markets and sophisticated logistics systems. Therefore:

H2. Geopolitical risk is negatively associated with supply chain resilience.

Supply Chain Resilience and Firm Performance

Resilient supply chains enable companies to continue operations in times of disruption, quickly find alternative suppliers, change production plans, redirect stock and more quickly restore their usual operations. Such attributes can help minimize downtime, delivery failures, lost sales, disruption expenses, which can directly impact on operational and financial performance.The authors of Queiroz et al. (2024) illustrate how SC resilience can enhance SC performance during extreme disruptive events, and how resilience can be considered a key mechanism by which flexibility and agility can contribute to performance. Cao et al. (2024) also conclude that resilience in the supply chain positively impacts firm performance, and evidence at the supplier level shows that higher levels of disruption intensity significantly impair performance outcomes (Burkhart & Bode, 2024). Overall, these results indicate that a firm's resilience generates value by enabling the firm to continue and reconfigure its resources when its operating arrangements become ineffective.

This is also in line with the Dynamic Capabilities Theory that suggests a firm's capacity to sense a new disruption, seize a new course of action, and reconfigure resources within its supply chain. Thus:

H3. Supply chain resilience is positively associated with firm performance.

Mediating Role of Supply Chain Resilience

The above arguments suggest that the supply chain resilience is a vital channel that makes the connection between the geopolitical risk and firm performance. The initial impact of geopolitical uncertainty is on supplier relationships, resource availability, logistics networks, and how operations are managed, creating a dampening effect on companies' capacity to weather and bounce back from unexpected events. This results in lower resilience, production downtime, longer lead times, higher costs and service levels, and ultimately less performance for the firms. The mediating argument is consistent with evidence that resilience is a factor that transforms organizational capabilities into better performance in times of disruption. For instance, Queiroz et al. (2024) show a mediation effect of resilience between supply-chain capabilities and performance. Further research into digitalization in manufacturing confirms that

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Vol: 5, Issue: 10 (II) 2026

Perspectives in Social Sciences

ISSN Online: 3106-8464

ISSN Print: 3106-8456

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supply chain resilience can be an intermediate variable between organizational capabilities and operational performance.

Geopolitical risk therefore is likely to have a negative impact on performance, partly due to its impact on the firm's ability to absorb, adapt and recover from disruptions of the supply chain. Hence:

H4. Supply chain resilience mediates the relationship between geopolitical risk and firm performance, such that geopolitical risk reduces firm performance through its negative effect on supply chain resilience.

Moderating Role of Supply Chain Digitalization on the Geopolitical Risk–Resilience Relationship

Digitalizing the supply chain can make companies much less vulnerable to geopolitical shocks by enhancing transparency, connectivity, prediction and tracking, and decision making. With digital technologies – such as artificial intelligence, big data analytics, IoT systems, cloud platforms, integrated ERP systems and digital supplier networks – companies can keep track of new risk factors, detect potential shortages, evaluate alternative sourcing strategies and synchronize responses with supply-chain partners.

Geopolitical risk, from the point of view of OIPT, raises the information-processing needs of the firm, while supply chain digitalization boosts the firm's information-processing capacity. In this regard, digitally advanced companies may be able to manage the complex information related to geopolitics and act in advance of the disruption, so as not to significantly compromise resilience. Recent evidence lends credence to this argument. According to Chen et al. (2025), digital transformation contributes to firms' resilience to SC disruption risk due to uncertainty. Moreover, the studies on enterprise digitalization also reveal that it has a positive effect on increasing the resistance and recovery capabilities of the supply chain (Qi et al., 2023). In recent manufacturing studies, digital transformation has been found to have a beneficial impact on both the resilience and recovery capacity of the supply chain, as it allows for enhanced visibility, operational flexibility, and network optimization.

Therefore, geopolitical risk is likely to have a negative impact on resilience, but the link should be less pronounced for more digitalized supply chains.

H5. Supply chain digitalization positively moderates the relationship between geopolitical risk and supply chain resilience, such that the negative relationship is weaker when supply chain digitalization is high.

Moderating Role of Supply Chain Digitalization on the Geopolitical Risk–Performance Relationship

Digitalization can also have a direct impact on the performance of the firms in protecting them from geopolitical shocks. The use of digital technologies allows companies to access real-time data, improve coordination between suppliers, boost decision-making speed, optimize resource usage and quickly reconfigure sourcing and production processes. Such capabilities can reduce the reach of external geopolitical shocks to the operational and financial impact.

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Vol: 5, Issue: 10 (II) 2026
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Jum'a et al. (2025) conclude that the benefits of improving supply-chain performance when digitalizing the supply chain include making the supply chain more agile and resilient, and that supply-chain performance would be more significantly affected by supply-chain digitalization during dynamic environments. Rana et al. (2025) also show that digitalization of the supply chain has a direct and indirect impact on performance, mediated by digital integration, agility and resilience, in an emerging-economy manufacturing environment. Furthermore, a study by Xu et al. (2024) revealed that digitally transformed companies have been found to be more resilient in their operating performance after disruptions in their supply chain than non-digitally transformed companies.

The results suggest that digitalization impacts firms not only by creating an absolute performance gain but also by affecting their response to uncertainty in the world outside the company. Therefore:

H6. Supply chain digitalization positively moderates the relationship between geopolitical risk and firm performance, such that the negative effect of geopolitical risk on firm performance is weaker when supply chain digitalization is high.

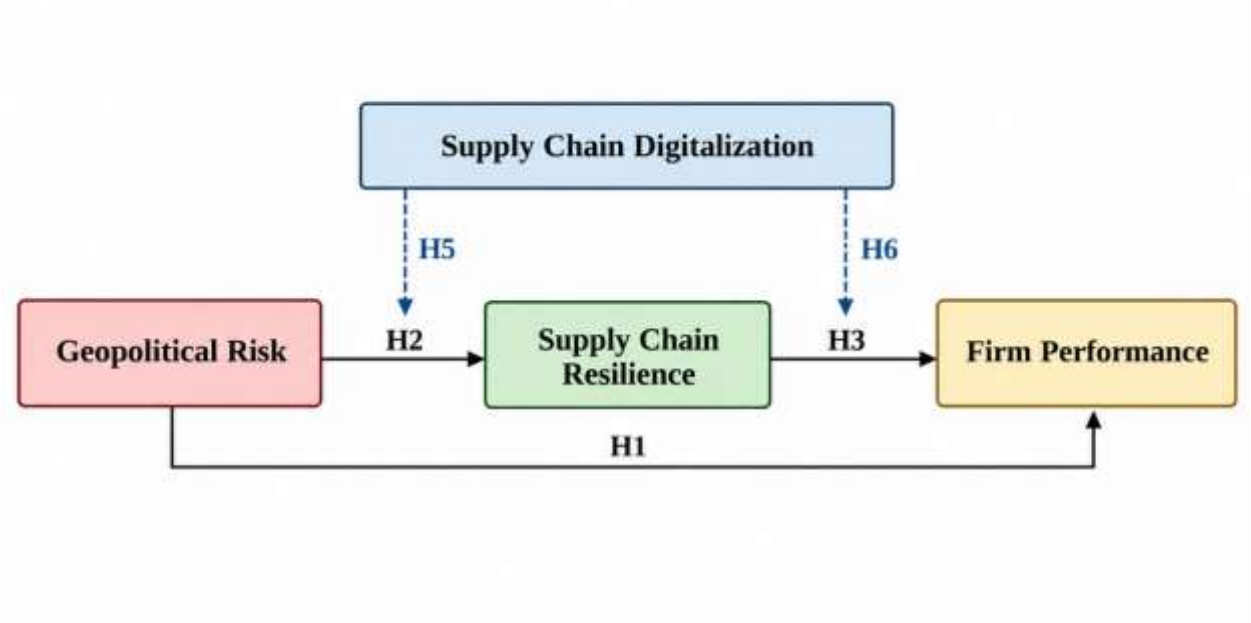

Figure # 01 conceptual framework

Methodology

Research Design

The study used a quantitative, explanatory, and cross-sectional research design to explore how geopolitical risk affects the firm performance and how the supply chain resilience is a mediator, while the supply chain digitalization is a moderator. This study used a survey-based approach since it was concerned with the managerial perceptions of geopolitical exposure, supply chain resilience, digitalization and firm performance. Manufacturing firms were the unit of analysis and key informants were senior and middle level managers with first-hand knowledge of the supply chain

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activities. To ensure that manufacturing companies had significantly more linkages with international sourcing, cross-border logistics, export market and global production networks, the study was limited to manufacturing companies within emerging Asian economies, which were more susceptible to geopolitical and trade-related uncertainties.

Population and Sample

The manufacturing companies in the countries Pakistan, India, Bangladesh, Vietnam and Indonesia were targeted. The reason for choosing these economies is that they have expanding manufacturing sectors, are part of regional and global supply chains and have a high exposure to geopolitical and trade uncertainty. Respondents consisted of supply chain managers, procurement managers, logistics managers, operations managers, production managers and senior executives who were directly involved in supply chain and strategic decision-making.

Participants needed to have three years of managerial experience and adequate knowledge of their companies' suppliers, sourcing processes, digital supply chain activities and operations. The study was restricted to about 500 usable responses, and, in order not to have an overrepresentation of observations from a single economy, representation was maintained across the selected countries.

The sampling technique

The sampling method used was a multi-stage purposive sampling technique, using country quotas. The five emerging Asian economies were chosen in the first stage because they are manufacturing-intensive and involved in global value chains. During the second phase, manufacturing companies from textile, automobiles and auto parts, electronics, pharmaceuticals, chemicals, food processing, engineering, and consumer products industries were located using industrial directories, chamber of commerce, professional contacts, and business associations. Managers with knowledge of supply chain, procurement, logistics, production or operations were approached as key respondents in the last stage.

Structured self-administered questionnaire was administered electronically and, where possible, directly by the professionals in the field. Participants were told that their responses would be anonymous and would only be used in a summary fashion, and that participation was voluntary. Personally identifying information was not requested. The questions were screened to make sure that the respondents held relevant managerial positions and have sufficient knowledge of the focal firm's supply chain activities. Responses which were significantly incomplete, showed clear response patterns or did not meet screening criteria were removed prior to statistical analysis.

Measurement Instrument

The questionnaire was built on existing measurement instruments, and modified to the context of manufacturing companies facing geopolitical and supply chain uncertainty. Each of the substantive constructs was comprised of a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. Minor wording changes were made

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Vol: 5, Issue: 10 (II) 2026

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ISSN Online: 3106-8464

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where appropriate to maintain the conceptual meaning of the original measures and to ensure they are relevant within the context.

Geopolitical risk (GPR) was assessed by three items that reflected managers' perceptions of the level of uncertainty in their companies and supply chains due to geopolitical developments. The items that were representative of exposure to international political instability, trade disputes and restrictions, and economic sanctions or geopolitical tensions. The conceptualization of geopolitical risk was informed by Caldara and Iacoviello (2022) and the items in the survey were adapted to be a perceptual measure at the firm level for a questionnaire-based approach. The items in the present study were contextualized to capture the managers' perceived organizational exposure to geopolitical developments, as in the original geopolitical risk measure developed by Caldara and Iacoviello this measure was not a Likert-type survey instrument.

SCR was assessed using four items adapted from Ambulkar et al. (2015). The assessments focused on the firm's ability to deal with changes resulting from supply chain disruptions, adjust to unexpected disruptions, respond quickly to disruptions, and have an awareness of the situation when disruptions happen. The scale was chosen as it conceptualized resilience as an organizational capacity to react, adapt and recover from a supply chain disturbance.

Seven items were taken from Xue et al. (2013) and Xue (2014) to measure supply chain digitalization (SCD). The items measured the level of integration of digital supply chain systems by linking the various functions within the firm, suppliers, and customers; sharing supply chain information electronically; enabling electronic transactions; and integrating supply chain activities through digital systems. The scale measured the digital connectivity and information integration of supply chain partners.

Four items adapted from Chan et al. (1997) and Narasimhan and Kim (2002) were used to measure firm performance (FP). Respondents compared their firm's performance to the top competitors. Data collected included sales growth, profitability, market share and overall competitiveness. Since the participating firms were spread over various industries and countries, and objective financial data was not always available, a perceptual comparative measure was used.

The final questionnaire thus consisted of 18 measurement items, seven pertaining to geopolitical risk, four to supply chain resilience, seven to supply chain digitalization and four to firm performance. The questionnaire was pre-tested for content validity, clarity in the questions and relevance with the context of manufacturing industry for the following reasons: Then a pilot test was done with a small number of qualified managers who were not in the final sample. Some minor wording changes were implemented based on their feedback prior to administration of final questionnaire.

Data Analysis

For the analysis of the data, the SPSS as well as SmartPLS 4 software was used. Partial least squares structural equation modeling (PLS-SEM) was then carried out using SmartPLS 4. Prior to testing the structural relationships, the measurement model was tested. The reliability of indicators was tested using outer loadings, and the internal consistency reliability was tested using Cronbach's alpha, composite

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Vol: 5, Issue: 10 (II) 2026

Perspectives in Social Sciences

ISSN Online: 3106-8464

ISSN Print: 3106-8456

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reliability, and rho_C. The convergent validity was examined by calculating the average variance extracted (AVE) while the discriminant validity was examined by calculating heterotrait-monotrait ratio (HTMT). Variance inflation factor (VIF) values were used for collinearity checks of the predictor constructs.

The model was assessed with the standardized path coefficient, coefficient of determination (R^2), effect size (f^2), and the predictive relevance (Q^2). A bootstrapping procedure with 10,000 resamples was used to test for statistical significance. H1 looked at the relationship between geopolitical risk and the firm performance. H2 explored the negative correlation between geopolitical risk and supply chain resilience, and H3 explored the positive correlation between supply chain resilience and firm performance.

The indirect effect of geopolitical risk on firm performance that is mediated by supply chain resilience was tested by estimating the indirect effect of geopolitical risk on firm performance through supply chain resilience. A statistically significant mediation effect was deemed when the bootstrapped estimates of the indirect effect were not zero. The indirect effect was then interpreted in light of the direct one to arrive at the nature and scope of mediation.

In the H5 and H6, the moderation analysis was carried out based on the two-stage approach provided by SmartPLS 4 software by forming interaction terms between geopolitical risk and supply chain digitalization.Based on the two-stage approach provided by SmartPLS 4 software, the interaction term between geopolitical risk and supply chain digitalization were formed for the H5 and H6, and the moderation analysis was conducted. In order to explore whether the negative relationship between geopolitical risk and supply chain resilience was weaker with the implementation of supply chain digitalization, H5 was tested. H6 was tested to explore whether the negative relationship between geopolitical risk and firm performance was weaker with the implementation of supply chain digitalization. Simple-slope analyses were used to further interpret significant interaction effects, at low and high levels of digitalisation in the supply chain. The positive interaction coefficient and the negative main effect of geopolitical risk suggested that, higher the level of digitalization of supply chain the severity of the negative effect of geopolitical risk on supply chain resilience or firm performance was reduced.

Findings and Analysis

Measurement model

All of the study constructs showed acceptable indicator reliability, internal consistency reliability and convergent validity in the measurement model results. The outer loadings were standardized and ranged from 0.844 to 0.908, well above the recommended value of 0.70. Therefore, all the measurement items were kept for further analysis. The geopolitical risk had the highest single loading (0.908), whereas the lowest loading (0.844) was for SCD1, but this was still well above the acceptable value. Internal consistency reliability was also determined. Cronbach's alpha coefficients ranged from 0.888 to 0.939 and composite reliability coefficients ranged from 0.930 to 0.950. Both statistics were higher than the generally accepted value of 0.70, meaning that there was good consistency among the items assessing each

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construct. The highest reliability score was found for the supply chain digitalization with Cronbach's alpha of 0.939 and composite reliability of 0.950.

Average variance extracted (AVE) was used to validate the convergent validity. The average value of AVE was between 0.732 and 0.817, which is higher than the minimum value of 0.50. In general, the results showed that the measurement scales had high reliability, convergent validity, and were appropriate for testing the hypotheses and structural relationships.

Table # 01: Reliability and convergent validity

Construct	Item	Loading	Cronbach's Alpha	CR	AVE
Firm Performance (FP)	FP1	0.891	0.909	0.936	0.785
	FP2	0.886			
	FP3	0.886			
	FP4	0.881			
Geopolitical Risk (GPR)	GPR1	0.908	0.888	0.930	0.817
	GPR2	0.896			
	GPR3	0.907			
Supply Chain Digitalization (SCD)	SCD1	0.844	0.939	0.950	0.732
	SCD2	0.862			
	SCD3	0.850			
	SCD4	0.862			
	SCD5	0.862			
	SCD6	0.857			
	SCD7	0.852			
Supply Chain Resilience (SCR)	SCR1	0.894	0.910	0.937	0.787
	SCR2	0.881			
	SCR3	0.893			
	SCR4	0.880			

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ISSN Online: 3106-8464

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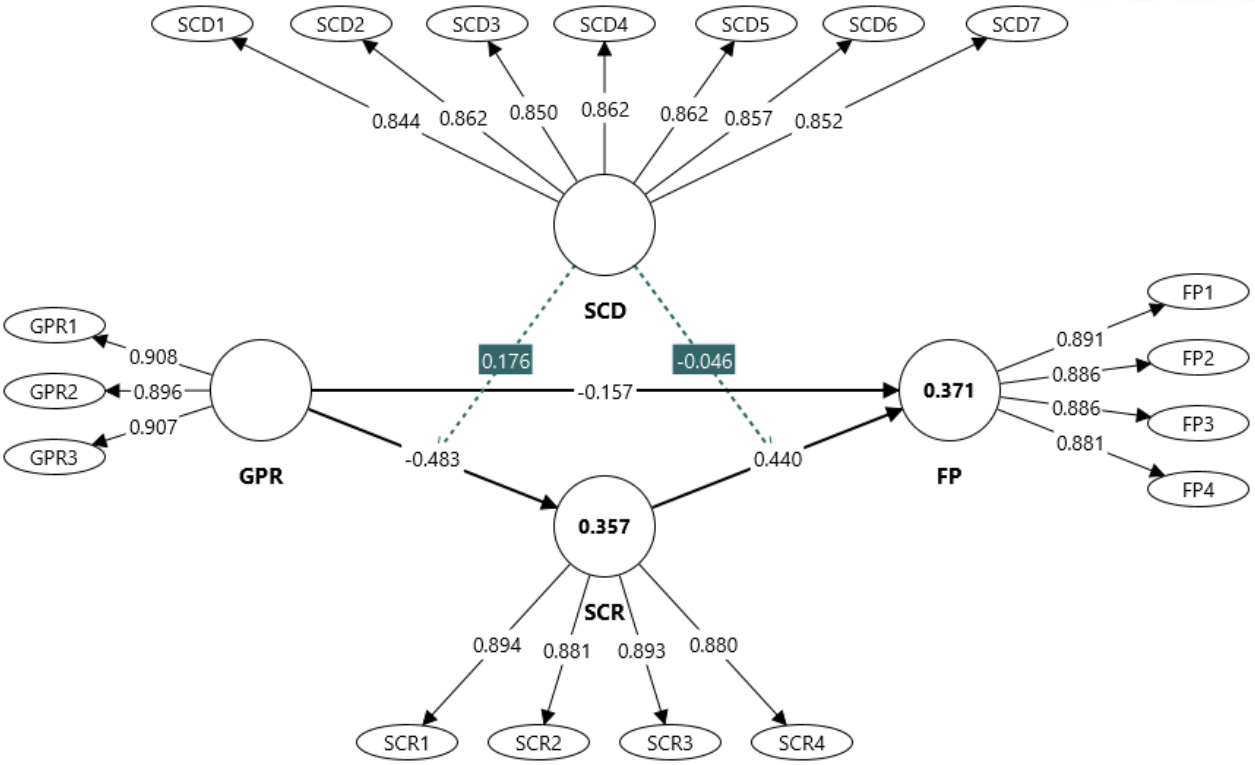

Figure # 02: Measurement Model

Discriminant Validity

Heterotrait – monotrait ratio (HTMT) was used to test for discriminant validity of the measurement model. The results showed good discriminant validity for all constructs. The range of HTMT values was 0.064 to 0.630, well below the generally suggested value of 0.85. This suggested that the constructs measured in the model were empirically different and that they were measuring different theoretical concepts.

Among these, firm performance had the highest value of HTMT (0.630) with supply chain resilience. This was the highest correlation of the constructs, however, the score still fell short of the recommended level, thus allowing for sufficient separation between firm performance and supply chain resilience. The geopolitical risk—supply chain resilience correlation was 0.571 and geopolitical risk—firm performance was 0.449. The digitalization of the supply chain had relatively low HTMT scores for firm performance (0.320), supply chain resilience (0.298), and geopolitical risk (0.064).

In general, none of the HTMT values exceeded the critical 0.40 threshold, suggesting that multicollinearity and/or conceptual overlap within the constructs measured were not likely to have been a major measurement concern. Therefore, it was found that the measurement model was suitable for further evaluation of the structural model and hypothesis testing in terms of discriminant validity.

Table #02: HTMT Criteria

Construct	FP	GPR	SCD	SCR
FP	—			
GPR	0.449	—		

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Construct	FP	GPR	SCD	SCR
SCD	0.320	0.064	—	
SCR	0.630	0.571	0.298	—

Note: FP = Firm Performance; GPR = Geopolitical Risk; SCD = Supply Chain Digitalization; SCR = Supply Chain Resilience.

Structural Model

The structural model results were substantial support of the proposed relationships. The results showed that, in support of H1, the geopolitical risk had a significant negative effect on firm performance (β = -0.157, t = 3.501, p < 0.001). The geopolitical risk also had a significant impact on the supply chain resilience (β = -0.483, t = 13.550, p < 0.001), which supported H2. Results indicated that supply chain resilience had positive influence on firm performance (β = 0.440, t = 10.454, p < 0.001), supporting H3.

The geopolitical risk affecting firm performance via supply chain resilience was negative and significant (β = -0.212, t = 8.228, p < 0.001). This finding supported H4, as supply chain resilience was found to mediate the relationship between organizational resilience and customer satisfaction. Digitalization of the supply chain had a positive significant effect on supply chain resilience (β = 0.176, t = 5.073, p < 0.001) and is one of the key factors, alongside geopolitical risk, in making the supply chain more resilient. The positive interaction suggested that geopolitical risk and resilience were negatively related, and that this adverse relationship was lessened by increasing digitalization, in support of H5.

But the additional effect of interaction between supply chain digitalization and supply chain resilience was not significant on firm performance (β = -0.046, t = 1.292, p = 0.196). Thus, this interaction was not facilitated. Overall, the results showed that geopolitical risk had a detrimental direct and indirect impact on the performance, and that digitalisation had a dampening effect on geopolitical risk's negative impact on supply chain resilience.

Table #03: Hypotheses testing

Hypothesis / Path	Beta (β)	STDEV	T value	P value	Decision
GPR → FP	-0.157	0.045	3.501	<0.001	Supported
GPR → SCR	-0.483	0.036	13.550	<0.001	Supported
SCD × GPR → SCR	0.176	0.035	5.073	<0.001	Supported
SCD × SCR → FP	-0.046	0.035	1.292	0.196	Not supported
SCR → FP	0.440	0.042	10.454	<0.001	Supported
GPR → SCR → FP	-0.212	0.026	8.228	<0.001	Supported
SCD → SCR → FP	0.104	0.019	5.433	<0.001	Significant

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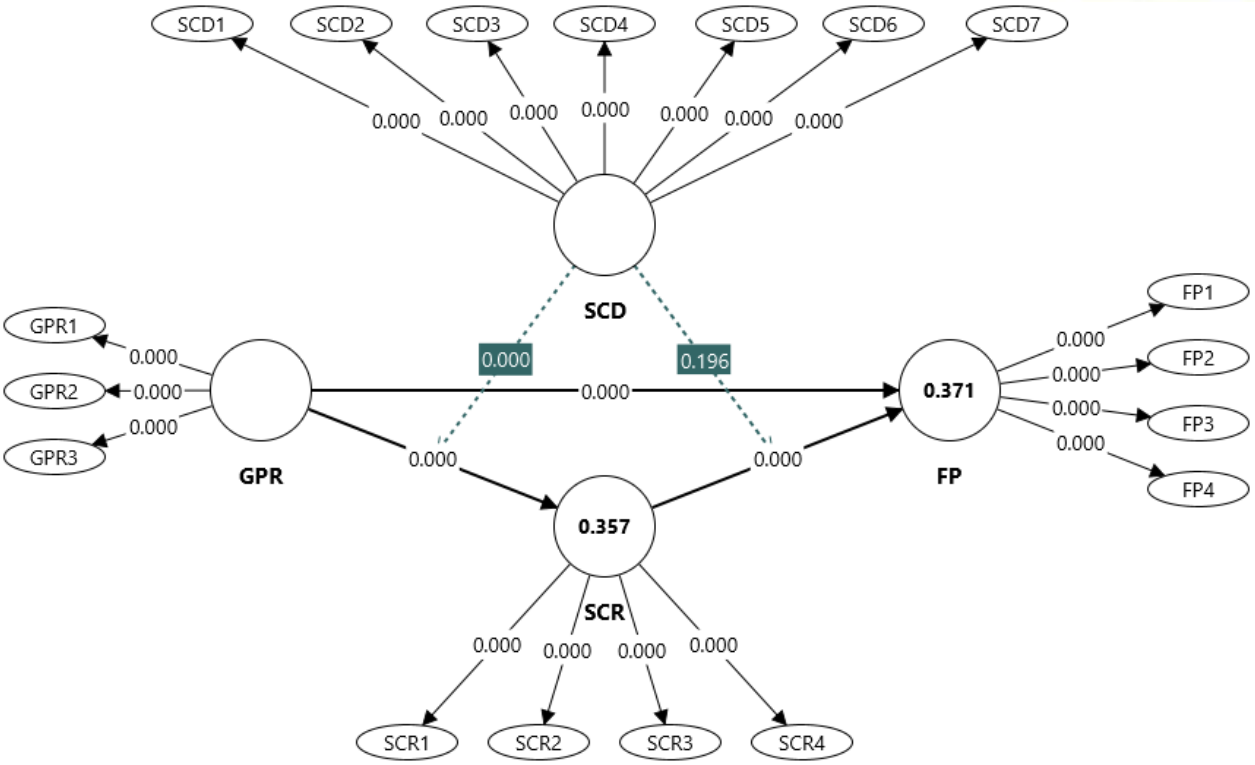
Vol: 5, Issue: 10 (II) 2026

Perspectives in Social Sciences

ISSN Online: 3106-8464

ISSN Print: 3106-8456

DOI :



Figure# 03: Structural Model

Explanatory Power, Effect Size, and Collinearity Assessment

The structural model had an adequate level of explanatory power. For firm performance, the R^2 for the model was 0.371 and the adjusted R^2 was 0.366; this means that 37.1% of the variance in firm performance was accounted for by the predictor variables in the model. Likewise, the supply chain resilience had an R^2 of 0.357 and adjusted R2 of 0.353, which accounted for 35.7% of the variance in supply chain resilience. These values indicated moderate amounts of explanation.

The results of the effect-size analysis revealed that geopolitical risk was a large determinant of supply chain resilience ($f^2 = 0.358$), suggesting that geopolitical risk was indeed an important determinant of resilience. The impact of geopolitical risk on firm performance, however, was small ($f^2 = 0.028$). However, small effects were also observed in the firm performance ($f^2 = 0.038$) and supply chain resilience ($f^2 = 0.086$) aspects of supply chain digitalization.

The level of collinearity was tested by the variance inflation factor (VIF). The VIF values were between 2.432 and 2.999 which are lower than the cut-off value normally used of 3.3. Thus, the results showed that there was no problematic collinearity of the measurement indicators. The overall result indicated that the model had good explanatory power, effect size and collinearity, which would justify the interpretation of the structural model.

Table #04 Explanatory Power, Effect Size, and Collinearity Assessment

Assessment	Construct / Path	Value	Interpretation
R^2	FP	0.371	Moderate explanatory power

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ISSN Online: 3106-8464

ISSN Print: 3106-8456

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Assessment	Construct / Path	Value	Interpretation
Adjusted R^2	FP	0.366	Moderate explanatory power
R^2	SCR	0.357	Moderate explanatory power
Adjusted R^2	SCR	0.353	Moderate explanatory power
f^2	GPR → FP	0.028	Small effect
f^2	GPR → SCR	0.358	Large effect
f^2	SCD → FP	0.038	Small effect
f^2	SCD → SCR	0.086	Small effect
VIF	FP1	2.784	Acceptable
VIF	FP2	2.759	Acceptable
VIF	FP3	2.681	Acceptable
VIF	FP4	2.645	Acceptable
VIF	GPR1	2.647	Acceptable
VIF	GPR2	2.432	Acceptable
VIF	GPR3	2.639	Acceptable
VIF	SCD1	2.695	Acceptable
VIF	SCD2	2.999	Acceptable
VIF	SCD3	2.696	Acceptable
VIF	SCD4	2.863	Acceptable
VIF	SCD5	2.877	Acceptable
VIF	SCD6	2.831	Acceptable
VIF	SCD7	2.743	Acceptable
VIF	SCR1	2.892	Acceptable
VIF	SCR2	2.664	Acceptable
VIF	SCR3	2.832	Acceptable
VIF	SCR4	2.573	Acceptable

Predictive Model Comparison

The ability of the structural model to predict the performance was evaluated by comparing the prediction loss of the model with the prediction loss of the indicator average model (IA) and the linear model (LM). Better out-of-sample predictive performance had lower prediction-loss values. It was found that the loss values achieved by PLS model were consistently smaller than both the benchmark models.

The PLS loss was also lower than the IA benchmark for the supply chain resilience (1.360 versus 1.872) and firm performance (1.574 versus 1.969). The corresponding average loss differences were negative and statistically significant for SCR (difference = -0.512, t = 8.266, $p < 0.001$) and FP (difference = -0.395, t = 6.886, $p < 0.001$). The overall difference was also significant (difference = -0.454, t = 8.685, $p < 0.001$).

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ISSN Online: 3106-8464

ISSN Print: 3106-8456

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Table # 05: Predictive Model Comparison

Benchmark	Endogenous Construct	PLS Loss	Benchmark Loss	Average Loss Difference	t value	p value	Interpretation
IA	SCR	1.360	1.872	-0.512	8.266	<0.001	PLS performed better
	FP	1.574	1.969	-0.395	6.886	<0.001	PLS performed better
	Overall	1.467	1.921	-0.454	8.685	<0.001	PLS performed better
LM	SCR	1.360	1.431	-0.071	3.242	0.001	PLS performed better
	FP	1.574	1.651	-0.077	5.495	<0.001	PLS performed better
	Overall	1.467	1.541	-0.074	5.135	<0.001	PLS performed better

Note: IA = indicator average benchmark; LM = linear model benchmark; PLS = partial least squares prediction.

Discussion

H1: The relationship between geopolitical risk and firm performance.

H1 suggested that geopolitical risk would have a negative impact on the performance of firms. The results confirmed this hypothesis, and the results showed that geopolitical risk had a significant negative relationship with firm performance ($\beta = -0.157$, $t = 3.501$, $p < 0.001$). While the relationship was rather small, with an f^2 of 0.028, the result revealed that geopolitical uncertainty did indeed have significant implications for manufacturing companies doing business in emerging Asian markets. Geopolitical tensions could escalate procurement costs, affect international shipping, limit access to key resources and cause market and financial volatility. These disruptions may ultimately lead to reduced operational efficiency and financial results in companies.

The result aligned with previous studies such as Carney et al. (2024) and Li et al. (2024) which demonstrated that geopolitical uncertainty raised financing costs in emerging economies and adverse performance effects for emerging-market multinational firms facing geopolitical risks. Likewise, Huang (2025) showed that geopolitical shocks that flow through supply chains can raise financial risk in the firm. In terms of Organizational Information Processing Theory, greater geopolitical

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uncertainty raised the amount of information firms had to process, and it made the information more complicated. This information processing need was not met by the organization and as a result, decision making was less effective, and performance diminished. This finding thus confirmed that geopolitical risk posed an important external environment risk and measurable impact on firm performance.

H2: Geopolitical Risk and Supply Chain Resilience

H2 forecasted a negative correlation between the geopolitical risk factor and supply chain's resilience. The findings strongly supported this hypothesis ($\beta = -0.483$, $t = 13.550$, $p < 0.001$). Another large effect size for resilience ($f^2 = 0.358$) was due to geopolitical risk, which was one of the most influential factors in the structural model. This finding suggested that geopolitical uncertainty significantly decreased firms' capacity to absorb, adjust to, and recover from supply chain disruption.

International suppliers, imported technologies, export markets, and cross-border logistics networks are often key factors in the business operations of manufacturing companies in emerging Asian economies. Political disagreements, sanctions, trade barriers or transportation strikes can also impact multiple segments of their supply chains. This finding aligned with Chang et al. (2025) who revealed that geopolitical risk had negative effects on the resilience of global supply chains, including through increased inventory costs and lower trade credit. It also matched with the findings of Tse et al. (2024) who demonstrated that geopolitical events may lead to the reconfiguring of firms' strategic supply chain.

The discovery underscored the need to take geopolitical risk into account as a more than a macroeconomic issue. It had an immediate impact on the capacity of companies to continue to operate during disruption. Under the lens of DCT, geopolitical uncertainty posed a threat to firms' sensing, mobilizing and reconfiguring capacities, thus reducing the overall resilience.

H3: Supply Chain Resilience and Firm Performance

The hypothesis H3 was that supply chain resilience would positively affect the firm performance. The findings strongly supported this hypothesis, as the supply chain resilience positively and significantly affected firm performance ($\beta = 0.440$, $t = 10.454$, $p < 0.001$). This discovery highlighted that the companies that were able to adapt to the situation, remain operational and quickly resume activities on their supply chain were able to obtain better results.

The result was theoretically compatible with the Dynamic Capabilities theory that posited the necessity for firms to “sense” the change in their environment, “seize” the available opportunities, and “reconfigure” the resources they possess to deal with the uncertainty. Resilient firms were better able to look around for other suppliers, shift inventory, adjust production plans and rebuild delivery capacity if their normal supply system failed. These functions minimized losses caused by disruptions and aided in both operational and financial results.

This was also consistent with Cao et al. (2024), who showed positive association between supply chain resilience and organizational performance. It also aligned with Burkhart and Bode (2024), who found that the nature of disruption and supplier resilience were important factors that influence performance outcomes. Indeed, the

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ISSN Print: 3106-8456
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relatively high path coefficient found in the present study indicated that resilience was not just a defensive mechanism. Instead, the ability was a strategically important one where manufacturing companies could maintain performance during uncertain circumstances. Therefore, in addition to performing disruption recovery, investments that boost resilience may yield performance benefits.

H4: Mediating Role of Supply Chain Resilience

H4 suggested that the relationship between geopolitical risk and firm performance would be mediated by supply chain resilience. To conclude, the indirect effect was negative and statistically significant ($\beta = -0.212$, $t = 8.228$, $p < 0.001$) which supports the mediating effect of supply chain resilience. The finding proved that geopolitical risk had a direct impact on firms performance, but also undermined firms' ability to absorb, react and recuperate from disruptions in their supply chains.

The mediation finding provided a critical pathway for geopolitical instability to have firm-level implications. Sourcing, logistics, resource availability, and supplier relationships may be affected if there are geopolitical disruptions. These disturbances caused a decrease in supply chain resilience, which ultimately affected the firm's ability to ensure continuity of production, costs control, customer requirements, and maintain performance. As such, resilience was an important transmission mechanism between external geopolitical conditions and organizational outcomes.

The results were in line with Seif and Jafari (2026) who indicated that resilience serves as a mediator between the organizational capabilities and improved performances. It also aligned with Xu et al. (2024) who found that companies with superior digital and diversification ability were more resilient in their performance after a supply chain disruption. The outcome of these arguments was that the resilience concept was extended to show how geopolitical threats could impact organizational performance. It thus gave empirical evidence of the role of resilience as an important mechanism in the suggested model.

H5: Moderating Role of Supply Chain Digitalization

H5 suggested that the negative relationship between geopolitical risk and supply chain resilience would be less pronounced as geopolitical risks increase with increasing levels of digitalization in the supply chain. This prediction was confirmed by the results. Geopolitical risk and supply chain digitalization had a positive and statistically significant ($\beta = 0.176$, $t = 5.073$ and $p < 0.001$) relationship. The direct impact of geopolitical risk on resilience was adverse, but the positive interaction suggested that the resilience impact of geopolitical risk was lessened by higher levels of digitalization.

This finding was very supportive of Organizational Information Processing Theory. While global uncertainty created a need for firms to process more information, digital supply chains boosted their information-processing abilities by providing the strengths to gather, merge, interpret, and disseminate information. Digital technologies thus enabled firms to detect disruptions sooner, check supplier conditions and explore other sourcing options and coordinate responses more quickly.

This finding was found to be consistent with Rashid et al. (2024), who showed that information-processing and digital supply chain capabilities enhanced the resilience

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Perspectives in Social Sciences

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ISSN Print: 3106-8456

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by strengthening the risk management. Similarly, Pan et al. (2025) demonstrated the ability of AI in boosting the resilience of the supply chain by facilitating information processing, and Wang et al. (2026) highlighted the importance of digitalization for resilience due to the transparency it provides. The present finding builds on this literature and demonstrated that digitalization was particularly relevant when the firms faced not just the usual operational disruption but also geopolitical uncertainty.

The researchers investigated how the digitization of the supply chain can moderate the relationship between the factors.The researchers explored the moderating role of supply chain digitalization between the factors.

H6: Moderating Role of Supply Chain Digitalization on Firm Performance

H6 suggested that the connection between geopolitical risk and firm performance would be moderated by the degree of digitalization of the supply chain, with the impact of geopolitical risk decreasing with increasing level of digitalization. The present manuscript, however, did not directly test this hypothesis, because the structures were not modeled. The reported interaction was SCD × SCR → FP (β = -0.046, t = 1.292, p = 0.196), whereas H6 required the interaction term SCD × GPR → FP. This meant that the data in the present statistical output could not be used to establish whether or not H6 was supported or rejected.

A non-significant coefficient of the reported SCD × SCR interaction would suggest that the strength of the relationship between the SCR and firm performance is not significantly affected by digitalization if the interaction was intentionally hypothesized. But this would be a different theoretical relationship from H6.

This is significant because previous research has shown that under conditions of uncertainty, digital skills can improve the performance of an organization. For instance, Szüle et al. (2026) found that dynamic capabilities were key to turning digitalization into performance, and Gomes and Silva (2025) found digitalization facilitated resilience by enabling capabilities in relation to adaptability. Thus, the expected complementarity of SCD and GPR needs to be quantified beforehand before making a decision on H6. The hypothesis should be left unfulfilled until the proper result of the interaction is reached.

Theoretical Implications

Theoretically, the study added by combining the Organizational Information Processing Theory and the Dynamic Capabilities Theory to develop an understanding of the impact of geopolitical risk on manufacturing firms. OIPT provided insights on the reasons behind the rise in information-processing needs due to geopolitical uncertainties, and how digitally enabled supply chains would be better equipped to manage such uncertainty. In addition, Dynamic Capabilities Theory was used to demonstrate the process of how firms transformed information into adaptive actions through sensing, seizing, and resource reconfiguration. Notably, the study illustrated the role of supply chain resilience as a channel through which geopolitical risk impacts firm performance. The strong interaction between the geopolitical risk–resilience relationship furthered the research on a digital supply chain, as it revealed that the benefit of digitalization was not only related to geopolitical risk but also to environmental conditions. However, digitalization is not only a precursor to

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Perspectives in Social Sciences

ISSN Online: 3106-8464

ISSN Print: 3106-8456

DOI :

performance or resilience, but also affects the magnitude of the losses to resilience due to geopolitical uncertainty. These results introduced geopolitical-risk, digitalization, resilience and performance research into a unified theoretical framework.

Practical Significance

The results were of practical relevance for manufacturing companies in emerging economies in Asia. The powerful negative impact of geopolitical risks on supply chain resilience proved geopolitical events should be added to operational risk management, rather than analysed as one-off political events. There was a need for companies to have systematic processes in place for monitoring sanctions, trade restrictions, border restrictions, supplier-country exposure, and international transportation risks. The strong positive association between the resilient firm and firm performance further suggested that there was a performance value to investing in resilience. If these can be made more robust, alternative sourcing arrangements, inventory flexibility, supplier diversification, and quick response mechanisms can help to mitigate losses due to disruption. The strong relationship between supply chain digitalisation, showed that digital investments may help limit firms' exposure to the geopolitical risks by providing better visibility of information and increasing the speed of response. Organizations should, therefore, consider digital supply chain projects based on efficiency benefits as well as continuity, risk monitoring, and adaptive decision making in the face of uncertain international conditions.

Managerial Implications

Geopolitical risk management, supply chain resilience and digitalization are three strategic issues that should be discussed together in the management process. First, the information through monitoring systems should be set up by the supply chain managers to give them early warning about the risks that may arise in the countries that contain their suppliers, transportation routes and input markets. Secondly, companies need to build resilience, such as ensuring that they have alternative suppliers with the necessary skills, contingency sourcing plans, visibility of stock, and flexible production and logistic operations. Third, focus on digital technologies that directly help to increase supply chain visibility and decision quality, instead of just modernizing technologies. Managers might be able to use integrated ERP systems, supplier platforms, real-time analytics, artificial intelligence, and digital monitoring systems to swiftly detect possible disruptions and evaluate alternative solutions. The important moderating finding also indicated that the advantages of digitalization were more relevant at high geopolitical exposure. Therefore, senior management should ensure that the investment in digital information was driven by risk-management objectives, and that digital information was made into decisions on sourcing, production and logistics, not just kept within technological systems.

Limitations and future research recommendations

There were some limitations to the study that would allow for future studies. The first is that over time, changes in geopolitical exposure, resilience and performance were not possible, due to its cross-sectional design. Longitudinal studies could be used in

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ISSN Online: 3106-8464

ISSN Print: 3106-8456

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the future to investigate firm adaptation processes in the pre-, during, and post-geopolitical event. Second, the study used perceptual survey measures from individual managerial respondents which may have raised common method bias and subjective assessment issues. Future work might incorporate survey measures with objective financial, trading or supply chain disruption data. Third, the study included manufacturing businesses in five emerging Asian economies, but there were significant differences in the institutional and geopolitical environments of these economies. Comparing and contrasting country differences could be done in future research by using a multigroup approach. Fourth, it is likely that sector-specific exposure also impacts on the proposed relationships, thus there is a need to compare relationships across sectors such as electronics, pharmaceuticals and automotive. Lastly, future studies need to properly quantify the interaction between the GPR and the SCD on firm performance to allow for a clear test of H6 and also to investigate other boundary conditions.

Conclusion

This study aimed to explore the interrelationships between geopolitical risk, supply chain resilience, supply chain digitalization and firm performance of manufacturing firms operating in emerging Asian economies. The results showed that geopolitical risk had a significant negative impact on firm performance as well as on supply chain resilience, and a more resilient supply chain had a significant positive effect on firm performance. Additionally, resilience of the supply chain worked as a mediator between geopolitical risk and firm performance, suggesting that geopolitical uncertainty has an impact on organizational outcomes through its effect on firms' ability to withstand and recover from disruption. The relationship between geopolitical risk and resilience was markedly reduced by supply chain digitalisation, suggesting that firms that were more digitalised had a less adverse impact of geopolitical uncertainty on their resilience. The results highlighted the need of embedding geopolitical risk monitoring, resilience building, and digital supply chain capabilities. The research overall revealed that the impact of geopolitical uncertainty was not only on the external environment but also on the ability of firms to effectively process information, adapt their supply chains and reconfigure their operational resources.

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