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The Impact of Geopolitical Risks on Digital Innovation Among Small and Medium-Sized Enterprises in Beijing

Qingai Zhang [1, *], Han Zhang [1], Yunqian Cao [1], Yuxin Yang [1]

[1] School of Management, Beijing City University, Beijing 101309, China

*** Correspondence:**

Qingai Zhang

zhangqingai2006@qq.com

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Abstract

Against the backdrop of an increasingly complex geopolitical environment, geopolitical risks have become a key external variable influencing digital innovation among small and medium-sized enterprises (SMEs). Focusing on SMEs in Beijing, this study employs a questionnaire survey to explore the internal mechanisms through which geopolitical risks affect corporate digital innovation. The questionnaire survey of 102 SMEs in Beijing reveals that geopolitical risks exert a dual impact on corporate digital innovation-both inhibiting and driving it. Although enterprises have implemented self-help measures, their risk-resilience varies significantly. Enterprises have an urgent need for subsidy and financing policies, yet gaps remain in the current policy offerings. Based onfindings, these this paper develops a self-assessment tool for corporate geopolitical risks and offers practical insights from three dimensions: corporate risk assessment, government public services, and social science research and practice.At the same time, the paper objectively analyzes research limitations-such as sample distribution and analytical methods-to provide a reference for the digital development of Beijing's SMEs and for subsequent related empirical studies.

Keywords: Geopolitical Risk; Small and Medium-Sized Enterprises; Digital Innovation

1. Introduction

In recent years, international geopolitical conflicts, trade frictions, and technology embargoes have occurred frequently. The scope of geopolitical risks has continued to expand, and their impact is no longer limited to large multinational corporations but is gradually spreading along industrial chains to a vast number of domestic SMEs. Beijing is home to a large concentration of SMEs in manufacturing, internet and information technology, and cultural, creative, and media industries. Many of these enterprises are deeply involved in overseas supply chain collaboration, the procurement of imported hardware and software, and cross-border digital business operations,

leaving them directly or indirectly exposed to the impacts of geopolitical risks. Digital innovation is a key pathway for SMEs to achieve transformation and upgrading (He and Liang, 2025); however, digital innovation activities are highly dependent on external resources such as technology, capital, critical components, and high-end talent. Issues stemming from geopolitical risks-including technology supply disruptions, supply chain disruptions, and cross-border data compliance constraints-can directly or indirectly disrupt the innovation process of enterprises by increasing financing constraints and intensifying technology blockades (Feng et al., 2023; Hasan Feng et al., 2022; Lee et al., 2023), thereby affecting the level of digital innovation (Liu et al., 2020). Survey data from this study show that nearly half of the surveyed enterprises have been significantly affected by technology blockades and disruptions in the supply of core components; more than half have seen their capacity for digital innovation investment squeezed, with some innovation projects delayed or even shelved.

Existing research has largely focused on the impact of geopolitical risks on the financial behavior of listed companies, while micro-level empirical studies targeting local small and medium-sized enterprises (SMEs) in Beijing remain insufficient. Based on first-hand survey data, this paper clarifies the pathways through which geopolitical risks affect digital innovation among SMEs and identifies the practical challenges they face. The survey results indicate that more than 70 percent of the surveyed SMEs have a need for innovation subsidies and financing support. The study's conclusions provide empirical evidence for local governments to optimize support policies for SMEs and offer guidance for enterprises in implementing risk management and digital innovation practices. Furthermore, by conducting empirical analysis based on a Beijing-specific sample, this study bridges the theoretical gap in macro-level geo-economic research-which often lacks micro-level corporate evidence-and enriches the research scope on the relationship between geopolitical risks and SME innovation.

2. Research Methods

2.1. Selection of Typical Samples of Emerging Industrial Spaces

SMEs are a vital component of Beijing's real economy and key market entities driving the region's digital economic development. Beijing is home to a concentration of technology-based SMEs in fields such as artificial intelligence and cloud computing. According to data from the Beijing Municipal Development and Reform Commission, the city sees over 300 new technology enterprises established daily, with more than 60% of these enterprises currently in a critical phase of high-quality development. Driven by both national strategic guidance and rapid industry growth, the accounting and finance sector is undergoing a profound transformation toward digitalization, intelligentization, and value creation. Beijing is home to a large number of SMEs spanning sectors such as information technology, high-end manufacturing, modern services, and cultural and creative industries. The proportion of IT-related SMEs in Beijing exceeds the national average, with a significant concentration of market entities in software development, big data, and artificial intelligence. Geographically, these enterprises are highly concentrated in industrial parks such as Haidian, Chaoyang, and Yizhuang, where they benefit from a strong

foundation for innovation supported by Beijing's universities and research institutions.In terms of economic contribution, SMEs generate substantial employment and contribute significant operating revenue and tax revenue. However, compared to large enterprises, SMEs generally suffer from limitations such as limited scale, insufficient capital reserves, and weak resilience to external shocks (Zhang, 2020). Many enterprises specialize in niche markets, while some participate in cross-border supply chains, the introduction of overseas technologies, and international market expansion, making them more susceptible to shocks transmitted by shifts in the geopolitical environment. Against the backdrop of rising uncertainty in the external environment, Beijing's SMEs not only benefit from the capital's science and technology innovation resources but also face multiple pressures, including intensified market competition and rising operating costs, resulting in continuously increasing external operational constraints.

Digital innovation is a key direction for the transformation and upgrading of Beijing's SMEs. Guided by policies and driven by market demand, these enterprises have made some progress in their digital transformation. In terms of digital technology application, many enterprises have already digitized their offices and moved their operations online, utilizing cloud computing, big data, and management information systems to conduct business; science and technology-oriented SMEs have further engaged in the R&D of digital products, algorithm iteration, and the development of digital solutions, with digital innovation activities gradually becoming widespread. In terms of innovation investment, leveraging local science and technology policies, some enterprises have been able to secure subsidies for digital transformation and R&D support funds, thereby lowering the barriers to digital innovation. However, there is a marked divergence in the digital innovation performance of Beijing's SMEs: technology-based SMEs demonstrate a strong willingness to engage in R&D and continue to invest in digital technology breakthroughs; in contrast, SMEs in traditional industries show a weaker willingness to invest in digitalization, with most remaining at the level of applying digital tools and lacking the capacity for independent digital technology R&D. At the same time, high-end digital talent is concentrated in large enterprises, and SMEs generally face a shortage of R&D talent, which constrains in-depth digital innovation. Overall, Beijing's SMEs have a solid foundation for digital innovation, but the level of innovation varies widely, and reserves of independently controlled core technologies remain insufficient.

In a complex geopolitical environment, Beijing's SMEs primarily face technology-related geopolitical risks, supply chain geopolitical risks, and risks stemming from uncertainties in trade cooperation. First, technology-related geopolitical risks: Export controls on overseas digital hardware and software restrict enterprises'access to high-end technologies, core software, and development tools, raising the barriers to technology introduction; for enterprises heavily reliant on overseas technology licenses, the process of technological iteration is directly hindered. Second, supply chain geopolitical risks: Digital innovation relies heavily on chips, sensors, and specialized software and hardware components. Geopolitical conflicts and trade barriers cause fluctuations in the supply of critical hardware, leading to longer lead times and rising procurement costs, which directly constrain enterprises' digital transformation and digital product R&D.Third, risks stemming from trade and cooperation uncertainties: Fluctuations in overseas market demand

are shrinking the market space for digital products and services abroad; channels for cross-border industry-academia-research collaboration and international technology exchange are contracting, narrowing the pathways for small and medium-sized enterprises (SMEs) to access overseas innovation resources; and changes in cross-border trade rules are further increasing the systemic risks associated with cross-border digital business. These risks are transmitted through the industrial chain, profoundly affecting SMEs in Beijing's information technology and high-end manufacturing sectors.

According to preliminary research, under the impact of geopolitical risks, digital innovation among Beijing's SMEs has exposed multiple practical challenges. First, reliance on foreign sources for core digital technologies remains high; some enterprises base their R&D on overseas foundational technologies, and restrictions on external supply directly disrupt R&D progress, while reserves of independently controlled technologies are insufficient. Second, innovation costs are rising, intensifying financial pressures. With rising component prices and increased costs for technology introduction, SMEs have limited financial buffers, forcing some to cut their digital R&D budgets. Third, supply chain disruptions have caused delays in innovation projects, increasing the risk of failure in digital transformation and new product development. Fourth, channels for international innovation cooperation have narrowed, making it more difficult for SMEs to access overseas innovation resources. Fifth, enterprises lack resilience against geopolitical risks; most lack risk forecasting mechanisms and long-term digital innovation planning. When faced with external shocks, they prioritize survival over long-term digital innovation strategies.

2.2. Sample Standardization and Selection of Spatial Economic Parameters

Technology-based geopolitical risks primarily manifest through technology export controls. On the one hand, geopolitical barriers block technology spillovers resulting from technology imports, licensing, and international exchanges. Most SMEs have weak in-house R&D capabilities and originally relied on external technologies for rapid iteration and upgrades; the contraction of external technology channels directly slows the pace of technological iteration, while the cost of overseas technology licensing further drives up innovation expenditures. On the other hand, restrictions on the use of overseas software and development tools directly disrupt the R&D of digital products and algorithms, forcing enterprises to pursue technological substitutes. For SMEs with weak R&D foundations, the high cost and difficulty of technological substitution can easily lead to a stagnation in R&D. Overall, technology-based geopolitical risks constrict the supply of external technology, directly limiting enterprises'digital innovation activities.

Supply chain geopolitical risks impact digital innovation from the supply side. Geopolitical conflicts and trade barriers have led to shortages of critical digital components—such as chips and sensors-as well as extended lead times and rising procurement prices.SMEs'digital transformation and digital product R&D rely heavily on hardware components; supply chain disruptions lead to project delays and R&D cost overruns. Constrained by limited capital, some enterprises are forced to scale back their R&D efforts; supply chain uncertainty also heightens perceived innovation risks, dampening enterprises' willingness to invest in digital innovation projects and constraining digital innovation at the material foundation level. Risks stemming from trade and cooperation

uncertainties impact digital innovation through two dimensions: market returns and external collaboration. On the market side, changes in the geopolitical environment have caused fluctuations in overseas demand, leading to lower revenue expectations for digital products and services targeting international markets. As a result, enterprises have become more conservative in their investment in high-risk digital R&D to avoid the risk that innovation outcomes may fail to achieve commercialization. On the cooperation side, cross-border collaboration among industry, academia, and research institutions, as well as technical exchanges, has been hindered, further shrinking the already limited international innovation resources available to SMEs; rising institutional costs for cross-border digital business have also curbed the expansion of digital innovation strategies targeting international markets.

Geopolitical risks exert a dual mechanism on digital innovation in SMEs, simultaneously suppressing and driving it. Suppressive mechanism: Geopolitical risks raise the overall cost of digital innovation; access to external resources—such as technology, supply chains, and international cooperation-is hindered, and innovation uncertainty increases. With limited financial and talent reserves, SMEs become more risk-averse, leading them to reduce R&D investment, postpone innovation projects, and lower innovation activity. Catalytic mechanism: Restrictions on external supply prompt enterprises to recognize the vulnerability of their reliance on foreign sources, driving them to pursue domestic substitution, increase investment in local digital technology R&D, cultivate autonomous and controllable technological capabilities, and activate endogenous innovation momentum. However, the “compelling mechanism” effect is contingent on enterprises possessing the necessary R&D foundation, funding, and talent; a large number of small, medium, and micro enterprises lack sufficient resources and find it difficult to undertake large-scale independent R&D, leaving them more vulnerable to the risk-suppressing impact. Therefore, the dual effects of geopolitical risks exhibit significant heterogeneity across different types of enterprises.

3. Questionnaire Survey

3.1. Questionnaire Preparation

This project focuses on the research topic of how geopolitical risks affect digital innovation among small and medium-sized enterprises (SMEs) in Beijing. An online survey was designed consisting of 25 questions, including 22 single-choice questions and 3 multiple-choice questions. The survey was structured around four core dimensions, as follows:

The “Basic Enterprise Characteristics” dimension includes the enterprise’s industry, number of employees, years in operation, status as a “Specialized, Refined, Distinctive, and Innovative” enterprise, and primary operating region. This dimension is used to collect basic background information on the surveyed enterprises, create a sample profile, and facilitate subsequent comparative analysis of survey data across different types of enterprises.

The “Perception of Geopolitical Risks and Future Projections” , “ dimension includes enterprises” overall perception of risks associated with geopolitical conflicts and trade frictions; the degree of impact from four specific types of geopolitical risks-technology embargoes and

component supply disruptions, cross-border data compliance, supply chain volatility, and restrictions on access to overseas markets; and enterprises assessment of whether geopolitical risks will intensify over the next 1-2 years. This dimension is used to understand the actual impact levels and anticipated assessments of various geopolitical risks faced by Beijing's SMEs.

The "Current Status of Enterprise Digital Innovation and the Impact of Geopolitical Risks dimension covers the level of development of enterprises" digital infrastructure; digital innovation investments over the past two years; primary focus areas for digital innovation; outcomes of digital innovation; and self-assessments of digital innovation capabilities. It also measures the dual impacts of geopolitical risks, including the reduction of innovation investments, obstacles to acquiring key technologies and talent, and the delay or termination of innovation projects, as well as the forces driving localization and independent innovation. Additionally, it assesses enterprises' subjective views on whether geopolitical risks generally inhibit digital innovation. Analysis of the inhibitory and catalytic effects of geopolitical risks on digital innovation among small and medium-sized enterprises (SMEs).

The"Enterprise Risk Response and Policy Demands"dimension includes measures enterprises have already taken to address geopolitical risks; their self-assessment of their own risk-response capabilities; the types of government support they urgently need; and their evaluation of the effectiveness of Beijing's existing policy support for digital innovation among SMEs. This is used to identify enterprises' actual actions, weaknesses in risk resilience, and policy needs, providing a basis for formulating policy recommendations.

3.2. Questionnaire Distribution and Collection

The survey targeted SMEs in Beijing. Questionnaires were distributed online via the "Wenjuanxing" platform through targeted distribution, primarily reaching business leaders and managers of SMEs across various industries in the Beijing area. The survey took into account enterprises of different industries, sizes, years in operation, and those with "Specialized, Refined, Unique, and New" (SRUN) attributes, aiming to cover as many local Beijing-based, Beijing-Tianjin-Hebei region, nationwide, and cross-border SMEs as possible to ensure the diversity and representativeness of the sample.

During the distribution process, questionnaires were targeted and pushed to corporate communities, industry discussion groups, and business matching channels for distribution to target enterprises. A total of 102 questionnaires were distributed, and 102 were actually returned.Upon verification, all questionnaires were found to have all questions fully answered; there were no invalid samples due to missing responses, incorrect answers, or excessively short response times. There were 102 valid questionnaires, resulting in a 100% response rate, and all samples are suitable for subsequent statistical analysis.

3.3. Key Findings

Descriptive statistics were performed on the 102 valid questionnaires, and analysis was conducted across five dimensions: sample structure, perception of geopolitical risks, current status of digital innovation, risk transmission effects, and corporate needs. The core findings of the survey are interpreted in conjunction with statistical charts.

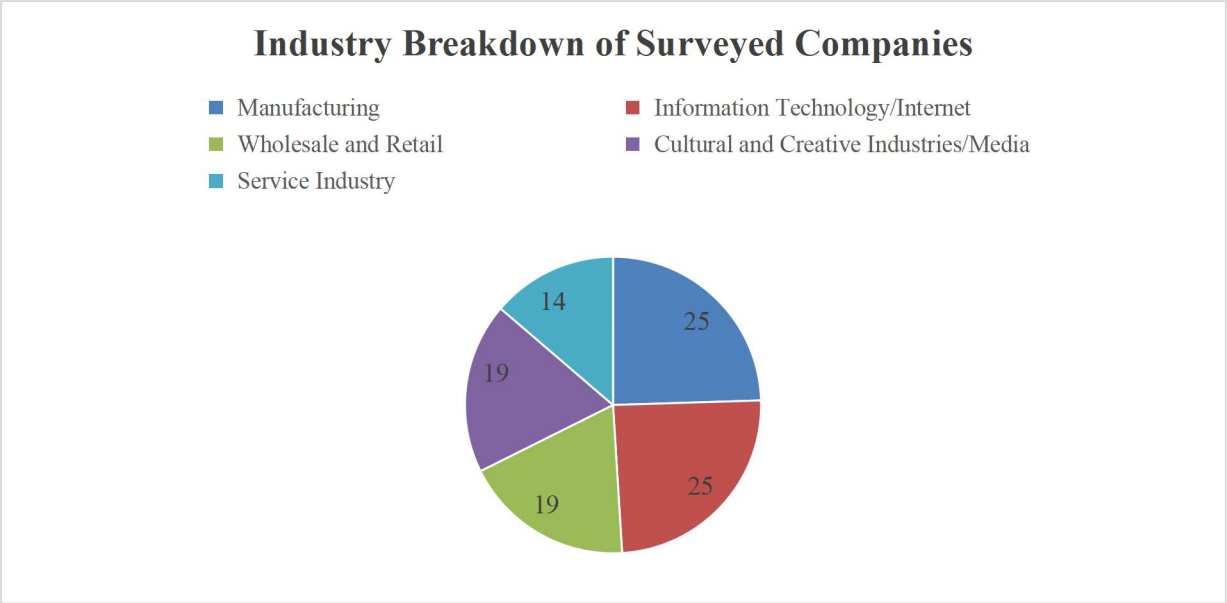


Figure 1. Pie Chart of Responding Enterprises

As shown in Figure 1, the industries represented in this survey sample are concentrated in manufacturing and the information technology and internet sectors, which tied for the highest share at 24.51% each; these were followed by wholesale and retail, and cultural, creative, and media industries, while the service sector accounted for a relatively low proportion. The sample is concentrated in the real economy and core digital industries, aligning with the industrial layout of Beijing's small and medium-sized enterprises.Among the sample, 98.04% were micro and small enterprises with fewer than 300 employees, and 39.22% were "specialized, refined, distinctive, and innovative" (SEDi) enterprises. More than 60% of the enterprises have expanded their business scope beyond Beijing, and some engage in cross-border operations. The sample includes both high-quality SEDi entities that receive priority policy support and a large number of ordinary SME market entities, demonstrating good stratified representativeness and making it suitable for analyzing the impacts of geopolitical risks.

A comparison of the intensity of different geopolitical risks in Figure 2 reveals that technology blockades and disruptions in the supply of critical components are the geopolitical risks with the strongest impact on Beijing's SMEs, with more than half of the enterprises significantly affected by these risks. Cross-border data compliance risks follow closely behind, as constraints on data compliance have become increasingly prominent amid the development of digital businesses; the impact of international supply chain volatility and restrictions on access to overseas markets is slightly lower. Overall, the impact of risks follows a gradient: technology>data compliance>supply chain>overseas markets. 50.98% of enterprises anticipate that geopolitical risks will intensify further over the next 1-2 years; enterprises hold a generally pessimistic view of the external business environment, and this outlook will directly influence their long-term investment decisions regarding digital innovation.

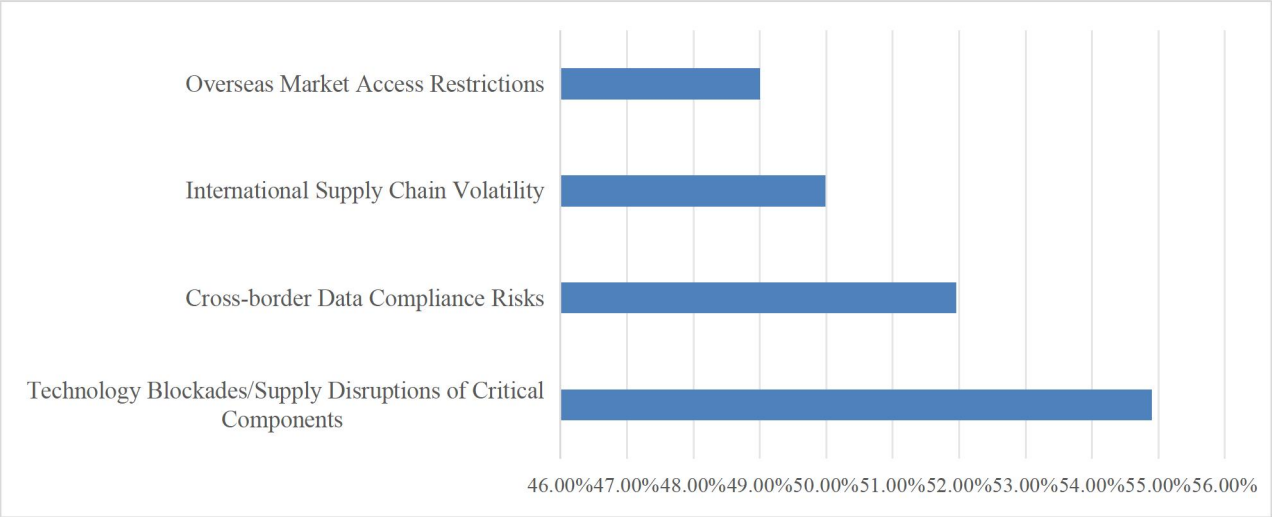


Figure 2. Bar Chart Showing the Proportion of Various Geopolitical Risks

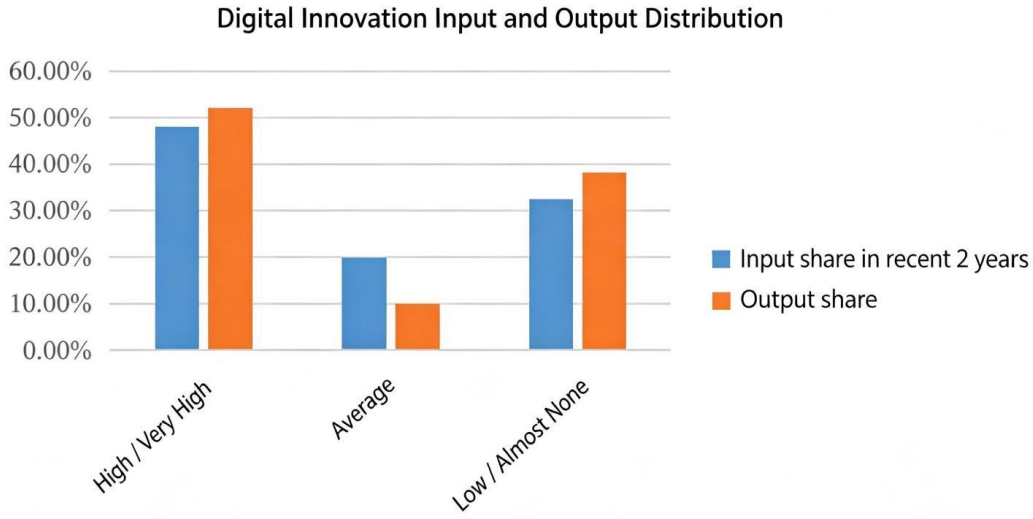


Figure 3. Bar Chart of Digital Innovation Input and Output Distribution

Observing in Figure 3the distribution of innovation inputs and outputs , the overall pattern of inputs and outputs is largely aligned. Nearly half of the enterprises are able to maintain a high level of investment in digital innovation, and correspondingly, 51.96% of enterprises are able to achieve substantial or significant innovation outcomes. However, it should also be noted that approximately one-third of enterprises still have relatively weak innovation investment, and nearly 40% have insufficient innovation output.Combined with the multiple-choice results from Question 14 of the survey, enterprises' digital innovation efforts are concentrated at the application level-such as data management and analysis (72.55%), digital marketing, and the digital upgrading of products and services-with relatively little focus on underlying core technologies. This indicates that Beijing's small and medium-sized enterprises have a solid foundation in digital infrastructure, but innovation largely remains at the business application level; core technology R&D remains a weak point, and enterprises' self-assessments of their innovation capabilities also show a marked polarization.

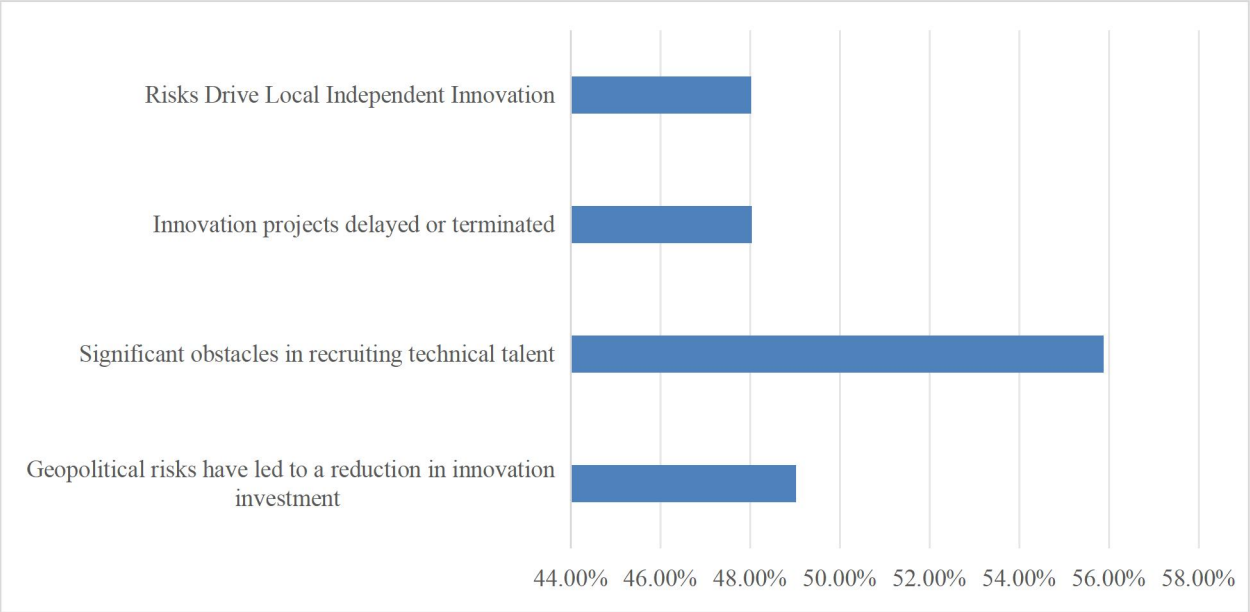


Figure 4. Bar Chart Comparing the Inhibitory and Catalytic Effects of Geopolitical Risks

Figure 4 illustrates the dual impact of geopolitical risks on digital innovation. From the perspective of suppression, 55.88% of enterprises believe that access to technology and talent has been significantly hindered, representing the most prominent constraint; nearly half of the enterprises have experienced squeezed innovation investments or delays and cancellations of digital projects. Geopolitical risks exert pressure on digital innovation across the entire chain-from funding and talent to project implementation.

At the same time, 48.02% of enterprises indicated that geopolitical risks have compelled them to pursue localization and independent innovation, demonstrating the positive incentive effect of these risks. It is evident, therefore, that geopolitical risks do not merely exert a one-way inhibitory effect but rather produce a dual effect where inhibition and compulsion coexist. However, the compulsion effect is not universally applicable; it requires enterprises to possess sufficient capital and a solid R&D foundation. A large number of small, medium, and micro enterprises, with their limited resources, are more likely to bear the brunt of the negative impacts caused by these risks. In the survey, 50.98% of enterprises generally agreed that geopolitical risks inhibit digital innovation, confirming that the inhibitory effect is the more widespread perception.

Further analysis based on group characteristics reveals that 62.7% of surveyed enterprises engaged in cross-border digital business have been impacted by geopolitical risks; some have reduced their R&D budgets or terminated cross-border digital projects, while others have scaled back overseas operations to focus on the domestic market. As a result, the pace of innovation has been disrupted by the external environment, creating a disruptive effect. In summary, geopolitical risks exert a threefold impact on digital innovation among Beijing's SMEs: suppression, disruption, and catalysis.

According in Figure 5 to the statistical results on policy demands, financial policies represent the most urgent practical need for enterprises, with subsidies for digital innovation and financing support far outpacing other categories. These are followed by support for technology substitution, public data platforms, and supply chain integration and support services. While enterprises have

generally adopted self-help measures such as increasing domestic R&D and diversifying supply chains, 32.35% of them still have relatively weak risk-response capabilities .In contrast to these policy demands, only 45.08% of enterprises rate the strength of existing policies as "strong," indicating a gap between current policy provision and enterprises'actual needs. There remains room for improvement in the practical implementation and targeting of policies. Providing public services related to geopolitical risks for small and medium-sized enterprises (SMEs) is a practical necessity, and lightweight risk self-assessment tools can fill the gap in existing market solutions.

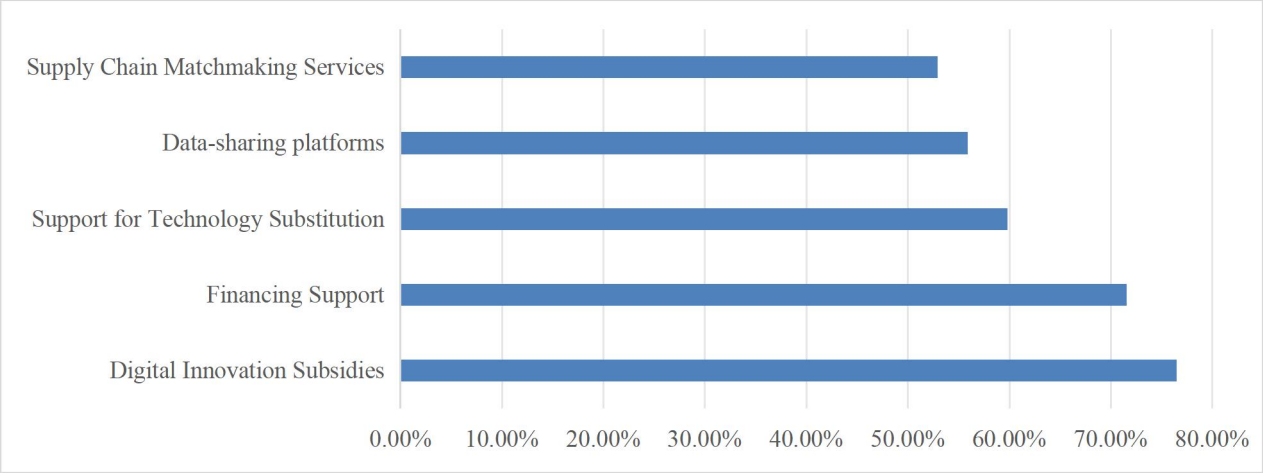


Figure 5. Bar Chart of Enterprises' Policy Support Demands

Existing mainstream digital transformation solutions for SMEs focus on optimizing internal factors but lack guidance on addressing external geopolitical risks. Most transformation guidance and business consulting assume a stable and controllable international business environment, focusing on internal issues such as funding, talent, internal management, and policy applications, while overlooking external shocks such as technology controls, supply chain disruptions, and overseas digital trade barriers. Export-oriented small and medium-sized technology enterprises and cross-border e-commerce companies in Beijing generally lack dedicated risk control teams and cannot afford expensive commercial risk consulting services; there is a real market demand for streamlined, low-cost tools for assessing geopolitical risks. The "Geopolitical Risk Digital Innovation Self-Assessment Checklist" developed in this paper addresses this gap. Enterprise managers can complete the self-assessment in 10-15 minutes and identify corresponding digital innovation adjustment strategies, aligning with the streamlined organizational structures typical of small and medium-sized enterprises.

Geopolitical risks exhibit significant industry-specific variations. SMEs in sectors such as software and information services, cross-border e-commerce, and precision manufacturing-which are deeply integrated with overseas supply chains, foreign customers, and international technology partnerships-are significantly more vulnerable to such shocks than enterprises focused on the domestic market. A large number of Beijing-based "Specialized, Refined, Unique, and New"(SRUN) enterprises are deeply involved in the international division of labor and actively engaged in digital innovation; they are therefore key targets of geopolitical risks and the primary beneficiaries of the findings presented in this paper.

Establishing a "business-side + government-side" two-way value-output model is feasible.At the enterprise level, self-assessment tools can identify geopolitical risks during the project initiation phase of digital transformation initiatives, thereby reducing sunk costs associated with digital investments; at the government level, the analysis of micro-level primary data can provide empirical support for the development of digital support policies for SMEs and the construction of risk early-warning systems. The research findings not only serve enterprise management decision-making but also provide a reference for policy formulation, thereby transforming academic research into social service. Align with the orientation of serving the local real economy.

4. Conclusions and Implications

4.1. Conclusions

Against the backdrop of intensifying global geopolitical conflicts, this paper focuses on the practical challenges facing digital innovation among Beijing's SMEs. It systematically analyzes the impact of enterprises' basic characteristics, geopolitical risk conditions, the current state of digital innovation, the effects of geopolitical risks, corporate responses, and policy demands on SME digital innovation, leading to the following main conclusions:

First, geopolitical risks have become an external factor that cannot be ignored in influencing the digital innovation of export-oriented SMEs in Beijing. More than 60 percent of SMEs engaged in cross-border digital business have been impacted by geopolitical risks; some enterprises have reduced their R&D budgets or even terminated digital projects. Geopolitical risks exert a threefold effect-suppression, disruption, and forced adaptation-with the intensity of the impact varying by industry. Software and information services, cross-border e-commerce, and specialized, refined, distinctive, and innovative manufacturing enterprises have been most significantly affected. Traditional digital transformation solutions generally overlook geopolitical external variables, creating an urgent practical need for low-cost risk assessment tools tailored to SMEs.

Second, a two-way "enterprise-government" pathway for the application of research findings can maximize the social value of social science research. For enterprises, this involves providing self-assessment tools and innovative adjustment strategies as a public service; for the government, it entails submitting policy recommendations based on first-hand research data, thereby providing micro-level evidence to optimize digital public services and industrial support policies for Beijing's SMEs. After localization and adaptation, the research findings have the potential to be replicated in other export-oriented cities across China.

Third, this paper still has shortcomings, such as an uneven geographic distribution of the sample, the need to upgrade the tool platform, and insufficient cross-regional comparisons. Future research should expand the survey sample to include industrial parks in the suburbs of Beijing, iterate on the self-assessment tool platform, conduct cross-regional comparative studies, and refine the risk assessment framework to further enhance the generalizability of the conclusions.

4.2. Implications

This article offers the following policy implications. First, from a corporate perspective, Beijing-based small and medium-sized enterprises (SMEs) engaged in cross-border digital business should incorporate geopolitical risks into their feasibility assessment frameworks when evaluating digital innovation projects, in addition to internal factors such as funding, technology, and talent. SMEs do not need to establish large-scale risk control departments; instead, they can rely on streamlined self-assessment tools to conduct basic risk screening. Based on risk levels, they can then select strategies to proceed with, postpone, or adjust the direction of their projects, thereby avoiding sunk costs resulting from blind investment. Second, from the perspective of government industrial services, existing digital support policies focus on subsidies and technological empowerment. It is recommended to address the gap in public services for external risk early warning for SMEs. Universities should be partnered with to conduct routine geopolitical risk surveys targeting export-oriented SMEs; risk identification tools should be integrated into public service platforms for SMEs to provide enterprises with public-interest risk guidance; and supporting policies to mitigate risks should be introduced for severely impacted industries to enhance the resilience of Beijing's SMEs in the real economy. Third, from the perspective of social science innovation in higher education: undergraduate innovation and entrepreneurship projects in business and economics should move beyond purely theoretical simulations and conduct in-depth field research at enterprises. By applying classroom knowledge from accounting, statistics, and international economics to real-world issues in local industries, these projects can promote the integration of scientific research, talent development, and social service, thereby providing a viable pathway for innovative practice among undergraduate students in the social sciences.

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All authors contributed equally. All authors have read and agreed to the published version of the manuscript.

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