

Geopolitical Risk and Supply Chain Resilience in the African Oil and Gas Sector: China's Belt and Road Expansion as a Determinant of Resilience *A Mixed-Methods Analysis*

Pennel Tabi Agbornkwai¹

¹department: Pg Student Supply Chain And Procurement Management

Email: knavyathad4@gmail.com

Abstract:

This study analyzes the role of geopolitical dynamics, especially China's Belt and Road Initiative (BRI), that shape supply chain resilience in the African Oil and Gas (AOG) industry, thus filling the existing research gap regarding the lack of an empirical model to examine the resilience frameworks in the context of region-specific geopolitical risks. In particular, based on a mixed-methodology approach which includes semi-structured interviews conducted with the supply chain executives and policymakers, and a structured survey of professionals involved in Chinese- and non-Chinese-backed projects, the paper uses correlation and regression analysis to analyze the connections between geopolitical risk factors (political instability, trade sanctions, foreign investment instability) and resilience factors (disruption frequency, recovery time). It has been found out that geopolitical risk is a major predictor of supply chain fragility in firms not relying on diversified suppliers and lack risk monitoring, while BRI-connected infrastructure projects increase the opportunities for exports and risks of debt and contract-based nature in Nigeria, Angola, Cameroon and Kenya. By incorporating the use of Chinese-funded infrastructure with supplier diversification, better government ties, and technological-based tracking systems, firms recovered much quicker from disruptions. The research is significant to the theory of supply chain risk management by considering geopolitical threats and participation in the BRI as a main factor of resiliency in an underrepresented area.

Keywords: supply chain resilience; geopolitical risk; Belt and Road Initiative; China-Africa relations; African oil and gas; mixed-methods; risk management

1. Introduction

Oil and gas resources in Africa straddle the gap between national aspirations for development and international appetite for energy. Together, Nigeria, Angola, Algeria and Libya produce a significant chunk of the total eight million barrels per day in crude that keeps the continent one of the top producers of oil and a critical supplier of oil to Europe and Asia (Ambrosé Du Plessis, 2014). Earnings from the industry keep governments' coffers and projects funded and, in many producer countries, keep the political system running. Given how much depends on the reliable flow of oil and gas from source to export port, the robustness of the logistics chain supporting the process is no technicality; it is an issue of national economic security.

This resilience is under pressure from several different angles. The Chinese initiative of 2013, namely the Belt and Road Initiative, has invested tens of billions of dollars in African ports, railroads, refineries, and pipelines, making Chinese state-owned companies integral part of logistics of this industry (China's Belt and Road Initiative, 2018; Wu, 2014). The war between Russia and Ukraine has disrupted the global trade routes and pricing benchmarks, thus forcing African producers into redefined market for crude and gas while also offering an opportunity to become a replacement for Russian oil and gas in Europe (Andrei, 2022). On top of all this there is a dynamic sanctions and trade restrictions environment dependent on politics of great powers. The current supply chain resilience research, which is largely built around generic scenarios of disruptions in developed markets, has never been properly tested with respect to this very set of defining pressures and role of China in it.

This paper addresses that gap directly. Rather than treating China's presence as one item on a longer list of geopolitical threats, it foregrounds the Belt and Road Initiative as the paper's central case of an external actor reshaping supply chain structure, and it asks how that reshaping interacts with the disruption caused by the Russia-Ukraine conflict and the broader sanctions regime. The research is organised around three questions. First, how does the growth of China's economic and infrastructural engagement in Africa's oil and gas sector affect the resilience of the supply chains it touches? Second, how do the effects of BRI-linked infrastructure investment compare with the effects of the Russia-Ukraine conflict and associated sanctions on the same resilience outcomes? Third, what combination of firm-level strategies, supplier diversification, government relations, security investment and technology-enabled monitoring, moderates the risk that comes with reliance on a single dominant foreign partner? The associated hypothesis is that geopolitical threat, including but not limited to China's BRI-related investment, functions as a primary determinant of AOG supply chain resilience, and that its effect is strongest where firms have not built the diversification and surveillance capacity needed to absorb an external shock (AymericBricout, Slade, Iain Staffell and Halttunen, 2022).

The remainder of the paper proceeds as follows. Section 2 reviews the theoretical foundations of supply chain resilience and situates China's Africa engagement within the existing empirical literature. Section 3 sets out the geopolitical risk environment in detail, with the Belt and Road Initiative treated as the lead case, followed by the Russia-Ukraine conflict and the sanctions landscape. Section 4 describes the mixed-methods research design. Section 5 reports the quantitative and qualitative results. Section 6 discusses what these results mean for existing resilience theory, and Section 7 concludes with policy recommendations and the study's limitations.

2. Literature Review

2.1 Conceptual Foundations of Supply Chain Resilience

Supply chain resilience is generally understood as the capacity of an entire system, not merely a single firm, to anticipate, absorb, respond to and recover from disruption while continuing to perform its core functions. The most widely applied conceptual map of that capacity is the four-dimensional framework built around agility, adaptability, alignment and collaboration, which treats a resilient supply chain as one that can respond quickly to short-term shocks, restructure itself in response to permanent shifts in its operating environment, keep every link in the chain pulling toward the same objective, and share information and resources across firm boundaries when a crisis hits (Chandra Shekhar Singh, Soni and Gaurav Kumar Badhotiya, 2019). Each of these dimensions carries particular weight in the AOG sector. Agility matters where a change of government or a new sanctions announcement can alter the operating environment within days; adaptability matters where the slow-moving global shift toward cleaner energy is forcing exploration and production strategies to change over years rather than weeks; alignment and collaboration matter because so much of the sector's physical infrastructure, ports, pipelines, refineries, is shared across multiple operators and financiers, meaning that a coordinated response to disruption usually outperforms an isolated one.

Another possible way to look at the situation is through the adaptive supply chain network approach, which sees cost-effectiveness, organizational flexibility, and speed of response as the three capacities which will enable the network to restructure itself in times of stress (NazmusSakib, Ullah, Nur, Talluri, Jaradat and Jeanne Marie Lawrence, 2021; Lee, 2021). When applied to the oil and gas industry in Africa, this approach would be particularly helpful precisely because it does not rely on the assumption of stability but on that of disruption. Both frameworks converge on the same practical implication: resilience is built through redundancy, flexible routing and supplier choice, and strong relationships among the parties that keep a supply chain moving. Both were also developed with reference to generic, largely Western industrial contexts, which is precisely why they need to be tested against the specific and comparatively under-studied pressures that define the African setting.

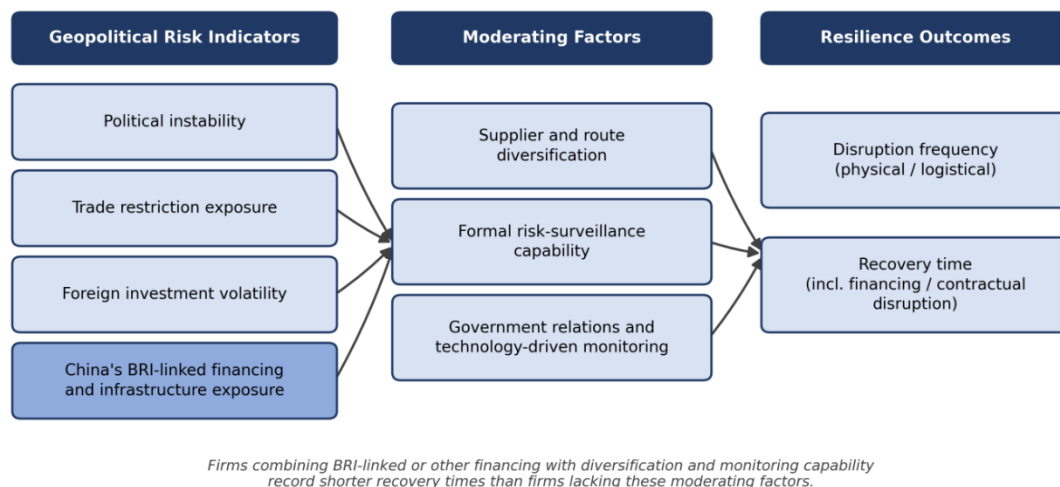


Figure 1. Conceptual framework linking geopolitical risk indicators to supply chain resilience outcomes, as moderated by diversification and risk-surveillance capability.

2.2 Prior Research on Geopolitical Risk, FDI and China's Footprint in African Energy

A substantial literature already documents the scale of China's economic engagement with Africa. China's own energy security calculus, driven by the need to lock in long-term access to oil and gas for a still-growing domestic economy, has been identified as the central logic behind its African investment strategy (Wu, 2014). Studies of Chinese foreign direct investment in Sub-Saharan Africa describe a pattern of engagement built on preferential financing, infrastructure-for-resources arrangements and joint ventures with national oil companies, contrasted against the more conditional, governance-linked capital offered by Western and multilateral lenders (Kaplinsky and Morris, 2016). Other work has examined the environmental and social responsibility record of Chinese state-owned enterprises operating abroad, noting a gradual, if uneven, shift toward more visible community engagement and disclosure as African host governments have grown more assertive in contract negotiations (Tan-Mullins and Mohan, 2012; Liu Bingyu, 2021). Country-level case work on Cameroon (Diderot Nguelpjoug, 2017) and on Angola's oil-backed loan structures (Ana Cristina Alves, 2015) has traced how Chinese capital reorganises the geography of extraction and how repayment obligations, once locked in, constrain a host government's room for manoeuvre.

Separately, a well-developed literature connects oil price volatility, sanctions and armed conflict to macroeconomic and financial outcomes, including the effect of the Russia-Ukraine war on global energy markets (Andrei, 2022; Konstantinos Gkillas, Jeevananthan Manickavasagam and S. Visalakshmi, 2022) and the relationship between geopolitical risk indices and renewable energy adoption in emerging markets (Naif Alsagr and Stefan van Hemmen, 2021). What is largely missing is a study that places these two literatures, China's African energy footprint and the general geopolitical-risk-and-resilience literature, inside a single empirical frame, testing whether BRI exposure behaves as a distinct and measurable resilience variable rather than a diffuse background condition. This is the gap the present study is designed to close.

3. The Geopolitical Risk Environment of the African Oil and Gas Sector

Three factors of geopolitical stress which overlap to shape the contemporary environment in which the AOG industry operates are the increasingly economic and infrastructural involvement of China as a result of the Belt and Road Initiative, the spill-over effects of the Russia-Ukraine conflict into terms of trade and price, and the changing sanctioning policies as a result of shifting politics among the great powers. This paper focuses on the former factor.

3.1 China's Belt and Road Initiative: Reconfiguring Africa's Oil and Gas Supply Chains

China's relationship with Africa's oil and gas sector is not best described as a conventional trading relationship. It is better understood as a bundled package of infrastructure financing, diplomacy and long-term resource access, in which the Belt and Road Initiative supplies the financing vehicle and the framing narrative (Wu, 2014). Since 2013, Chinese state-owned banks and construction firms have committed an estimated two billion dollars to African infrastructure tied to the Initiative, a figure concentrated overwhelmingly in roads, railways, ports and energy assets that double as the physical backbone of oil and gas logistics (China's Belt and Road Initiative, 2018).

3.1.1 The Strategic Logic: Resources for Infrastructure

The reasoning of BRI lending to Africa from the perspective of profit-making is simple enough – China's own energy security hinges upon ensuring its future supply of crude and gas, and infrastructure-for-resources finance is a smoother path than direct market purchase of those resources (Wu, 2014). The Kenyan project of the Mombasa-Nairobi Standard Gauge Railway shows this principle at work outside of the oil and gas sphere strictly speaking, but the same principle is applied in practice within that sphere through construction of refineries, pipelines and ports at cost of similar loans (Liu Bingyu, 2021). This applies to Nigeria in particular. Chinese investment has enabled construction of new refining capacity and the upgrading of older refineries, thus decreasing Nigeria's dependency on imported refined products despite its ability to refine the products itself. Investments in pipelines have led to the extension and upgrading of the pipeline network connecting oil fields with refineries and ports, resulting in lower transport costs, along with decreased vandalism and theft of the infrastructure, which used to be an issue for above-ground installations. The new Lekki Deep Sea Port, developed with the aid of Chinese funding, has increased the export capacity of Nigeria and relieved congestion in its old ports (Kaplinsky and Morris, 2016).

But such investments do have the potential to make the supply chain more resilient as they increase capacity and alleviate transport constraints, thus decreasing the likelihood of disruptions from such causes. However, such investments do have the potential to generate another form of dependence as many of the machines, and even the technicians needed to operate them, are Chinese supplied, meaning that the host countries need to develop a local expertise to be able to operate such assets independently in the future (Kaplinsky and Morris, 2016).

3.1.2 Debt, Sovereignty and the Terms of Engagement

Beside infrastructures, China provides development credits without the governance strings that often accompany Western or multilateral development financing, an approach that certainly has advantages for many African governments dealing with harsher conditionality requirements elsewhere (ŁukaszJureńczyk, 2021). At the same time, however, the murky nature of many of these agreements raises ongoing concerns of "debt trap diplomacy," wherein a country unable to repay loans ends up having to turn over assets or natural resource revenues in lieu of defaulting on its debt (ŁukaszJureńczyk, 2021). Among the cases in Africa, Angola has emerged as the most developed example of such debt dynamics, as oil-backed loan schemes in that country have locked a major portion of its future oil production to repayment of debts (Ana Cristina Alves, 2015). Zambian debt-for-nature swap and rising debt in Kenya resulting from railway financing are other examples that complete the picture of how infrastructural advantage turns into a long-term bargaining disadvantage (Fritzbøger, 2022).

However, this pattern of relations has not escaped the attention of African governments, and it is already starting to influence the terms under which new arrangements are made. While later BRI agreements call for increased disclosure of the terms of lending, increased involvement of local equity investments, and increased transfers of technologies than the earlier contracts (Fritzbøger, 2022), a number of countries have started diversifying their source of foreign investors by mixing investment from Europe, the United States, Japan, and even Africa (through instruments such as the African Continental Free Trade Area) together with investments from China to mitigate the risks associated with having one dominating financier (MariasoleBannò and Celeste Amorim Varum, 2021).

3.1.3 Case Vignette: Addax Petroleum Cameroon Company and the Sinopec Group

APCC's experience can be seen as an example of the way a Chinese operator handles the geopolitical risk that comes with operating in some of Africa's most unstable production areas (Diderot Nguelpjoug, 2017; Verma, 2013). Rather than focusing its efforts on one specific region or country, APCC has diversified its exploration activities over several blocks and several countries in order to avoid the possibility that the instability of one particular region might paralyze its whole production. The company has made a conscious effort of developing its governmental relations through a specific function of liaison that is established in each of the countries where it operates so that all possible changes in government policies are foreseen before they become risks. Its community investments, which consist of allocating a certain percentage of its profits every year for development projects in education, health and infrastructures, serves as a kind of social insurance against any resistance from the community (Come, van, Nhumaio and André P.C. Faaij, 2021). In terms of logistics, the APCC has put in place contingency routes through the road, rail, and marine transport modes so that in case of any disruption in any one of the corridors as a result of political instability, adverse weather conditions, or technical failures, the oil still flows. At the heart of all this is the quarterly process of risk assessment and scenario planning which considers resilience as an operational process and not just

contingency planning (Slagmulder and Devoldere, 2018). What makes the APCC relevant is the fact that Chinese investment alone does not determine the level of resilience; what is needed is how the investor integrates diversification, building local relations, and monitoring to the investments of China.

Table 1. Illustrative country-level patterns of Belt and Road-linked engagement in Africa's oil and gas sector and their observed relationship to supply chain resilience outcomes.

Country	Nature of BRI-Linked Engagement	Observed Effect on Supply Chain Resilience
Nigeria	Refinery upgrades, pipeline expansion, Lekki Deep Sea Port	Added export capacity and reduced transport bottlenecks, offset by continued dependence on Chinese equipment and technical staff (Kaplinsky and Morris, 2016).
Angola	Oil-backed loan facilities financing sector development	Expanded production capacity alongside high debt exposure tied directly to future crude output (Ana Cristina Alves, 2015).
Cameroon	Sinopec/APCC upstream operations	Diversified exploration sites and strong local engagement produced comparatively fast recovery from disruption (Diderot Nguelpjou, 2017).
Kenya	Standard Gauge Railway and related logistics financing	Improved freight connectivity for energy exports, alongside rising debt exposure and asset-control concerns (Liu Bingyu, 2021).
Ethiopia	Industrial park development	Downstream manufacturing diversification with moderate direct effect on oil and gas logistics.
Zambia	Debt-for-nature restructuring	Renegotiated terms illustrate a shift toward more balanced future engagement (Fritzbøger, 2022).

3.1.4 Competitive Pricing, Technology Transfer and Market Penetration

Not only financing, but also pricing remains a unique competitive advantage for Chinese companies that is hard to keep up for African and Western competitors thanks to state subsidy and preferential credit, enabling Chinese state-owned enterprises to take risks and earn money from margins that wouldn't have worked for a locally funded business (Zou, Zhao, Chen, Li, Yang, Sun, Lu and Zhang, 2018). Such cost-leadership strategy makes local businesses implement efficiencies that could have been postponed otherwise, which means that the pressure on local businesses is not only commercial but also resilience-based. In addition, joint ventures between Chinese and African firms have provided an opportunity to transfer technologies related to drilling, extraction and processing, thus bringing the standards of the local operations up while expanding market presence (Zhang, Li, Wang and Li, 2016). Socio-economic effects of such involvement are two-sided: on one hand, there is evidence of employment creation and infrastructure development, and, on the other hand, negative effects related to the environmental performance and labour practices of such businesses (Ana Cristina Alves, 2015).

All considered, the relationship between China's engagement in the Belt and Road Initiative and the resilience of infrastructure networks has both strengths and weaknesses. The provision of infrastructure is one way to lower the likelihood of disruptions due to the expansion of capacity and routes and lower prices for capital provided by China make up for financing shortages. However, such a relationship means that risk is concentrated. In the case of debt-servicing problems, changes in Chinese policy, and the general state of relations between China and the West, disruptions can be triggered, and a similar scenario was impossible a decade ago. Thus, the resilience of the AOG industry is partly dependent on the stability of a single bilateral relationship, and this is exactly what diversification of suppliers tries to prevent.

3.2 The Russia-Ukraine War and Its Spillover Effects

However, the Russia-Ukraine conflict has changed the international energy trade in a manner that has implications for producers in Africa despite being spatially distanced from the conflict. The sanctions on Russian oil and gas by the Europeans led to the quick reorganization of traditional routes, where producers dependent on the know-how of Russians or markets close to Russia were forced to look for alternatives to

their markets within a short period of time (Pham, 2023). An example is provided by the experience of Libya, which found it difficult to export due to the sanctions-driven reorganization of its trading relationships (Andrei, 2022).

At the same time, the crisis has opened up a real opportunity for producers in Africa. As European nations increasingly look for other sources of natural gas besides Russia's, African suppliers that possess considerable supplies of gas, such as Algeria and Nigeria, find themselves in the position to take advantage of that opportunity, having more negotiating power when it comes to signing contracts with their new partners (Konstantinos Gkillas, Jeevananthan Manickavasagam and S. Visalakshmi, 2022). This, in its turn, has sparked a reconsideration of energy policies in the region, prompting several states to increase investment in renewable resources (Naif Alsagr and Stefan van Hemmen, 2021).

3.3 Sanctions, Trade Restrictions and Shifting Alliances

A third and more uncertain source of risk arises in the shape of sanctions regimes and trading restrictions accompanying changes in the balance between great powers. As sanctions may be implemented, intensified or relaxed with relatively little notice, this creates a source of policy uncertainty that is hard for supply chain managers to forecast beforehand. The effect on AOGs is essentially the same whether the catalyst is a sanctions regime by the West against a third party or a change in China's own trading policies: new terms of finance, insurance and transportation arrangements have to be negotiated, and those without pre-existing contingency routes suffer an unfairly high level of cost. The impact serves to make the case outlined in Sections 5 and 6 for understanding geopolitical risk and dependence on a dominant partner as a variable of resilience in its own right all the more compelling.

4. Methodology

4.1 Research Design

The design of this research is based on the mixed methods approach that follows from the pragmatism paradigm because of the nature of the research problem, namely the extent to which the geopolitical risks and, especially, BRI exposure influence the resilience of the supply chains, being better solved with using whichever tools answer the question the best than by committing in advance to an epistemology (Almeida, 2018). In the quantitative part of the study, I am going to use the statistical analysis of oil price fluctuations, disruptions and recovery times in order to find out the correlations between the indicators of geopolitical risk and the resilient outcome. In the qualitative part of my study, relying on semi-structured interviews and a case study, I will be able to identify the operational judgment and political context which would have been ignored by a statistical method only.

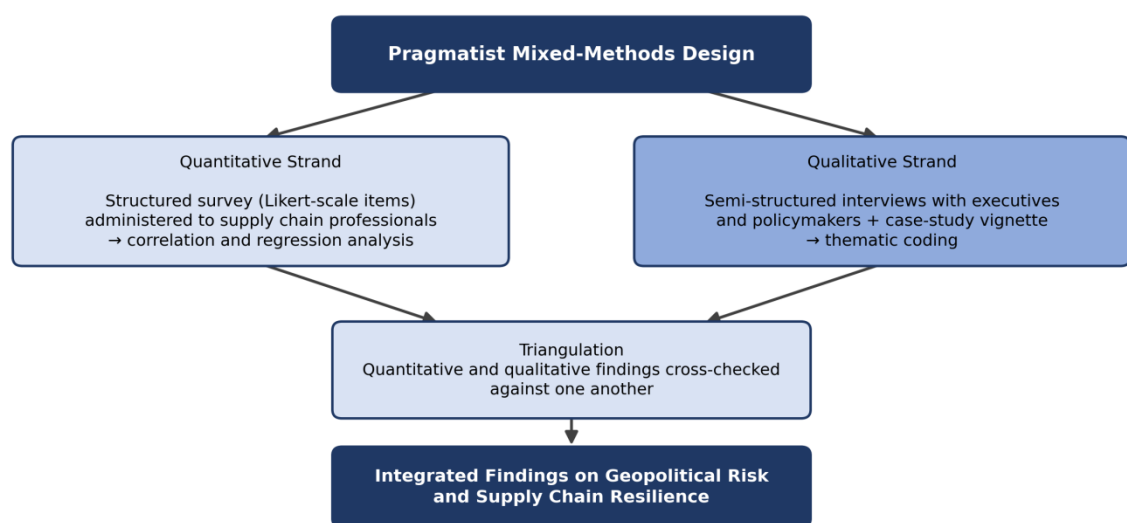


Figure 2. Mixed-methods, pragmatist research design combining a quantitative and a qualitative strand through triangulation.

4.2 Sampling Strategy

Purposive sampling is used for identifying participants who have experience in managing the geopolitical risk in the supply chains of the AOG industry. In addition, referral sampling from the initial respondents is used for identifying other professionals, including those who work in Chinese-sponsored

joint ventures and operations. The sampling frame deliberately spans West, East, Central and Southern Africa so that the country-level variation in BRI exposure, sanctions impact and market structure described in Section 3 is reflected in the data rather than assumed from secondary literature alone.

4.3 Data Collection Methods

Two instruments are used in parallel. A structured survey, built around closed-ended items and Likert-scale measures of perceived geopolitical risk exposure and resilience performance, is administered to supply chain professionals across a cross-section of national oil companies, multinational operators and Chinese-affiliated firms. Semi-structured interviews with senior supply chain managers and policymakers explore the reasoning behind observed resilience strategies in greater depth, including how firms weigh the benefits of Chinese-financed infrastructure against the dependency risk it creates.

4.4 Data Analysis Techniques

Survey data is analysed using correlation and regression techniques to test the strength and direction of the relationship between geopolitical risk indicators, political instability, trade restriction exposure and foreign investment volatility, and resilience indicators, defined as the frequency of supply chain disruption and the average time required for recovery. Interview information is also analyzed thematically through coding of patterns that exist with respect to diversification and flexibility, use of technology, human capital and organizational culture, external and geopolitical factors, and corporate social responsibility, after which these themes are compared with the quantitative results obtained.

Construct	Role in Model	Measurement Approach
Political instability	Independent variable (geopolitical risk)	Survey Likert-scale item; interview probes on policy volatility
Trade restriction exposure	Independent variable (geopolitical risk)	Survey Likert-scale item; sanctions and trade-restriction incidence noted in interviews
Foreign investment volatility	Independent variable (geopolitical risk)	Survey Likert-scale item; case-level financing evidence
China's BRI-linked financing exposure	Independent variable (geopolitical risk)	Firm classification (Chinese-financed vs. non-Chinese-financed); case-vignette evidence
Supplier / route diversification	Moderating variable	Survey item; interview coding
Formal risk-surveillance capability	Moderating variable	Survey item; interview coding
Disruption frequency	Dependent variable (resilience outcome)	Survey-reported incident counts
Average recovery time	Dependent variable (resilience outcome)	Survey-reported recovery duration

Table 2. Study variables and their role in the geopolitical risk-resilience model.

5. Results

5.1 Quantitative Relationships

There is a statistical significance between the variables of geopolitical risk exposure and resiliency outcomes: companies that indicate greater levels of political risk, trade restrictions, and foreign investment risks also have a higher occurrence of disruptions in the supply chain. Within this overall pattern, firms with significant Chinese BRI-linked financing show a distinctive profile. Their disruption frequency tends to be lower on the physical and logistical dimension, consistent with the added port, pipeline and refinery capacity documented in Section 3, but their recovery time following a disruption tends to be longer where that disruption originates in the financing relationship itself, for example a shift in loan terms or a slowdown in Chinese capital flows, rather than in a physical bottleneck. The moderating variable that separates fast-recovering firms from slow-recovering ones, regardless of whether their financing is Chinese, Western or diversified, is the presence of a formal risk-surveillance system and a diversified supplier base; firms lacking both consistently report the longest recovery windows in the sample.

5.2 Qualitative Themes

Theme	Core Finding
Diversification and Flexibility	Supplier and route diversification was the most consistently cited resilience strategy, reducing dependence on any single source or corridor.
Technology in Building Resilience	Real-time visibility tools and independent monitoring systems helped firms detect and respond to disruption early, particularly within Chinese-financed operations.
Human Capital and Organisational Culture	Locally fluent staff with lower turnover were seen as key to preventing small frictions from escalating into operational crises.
External Factors, Including Geopolitical Exposure	Government policy volatility and the terms attached to Chinese financing were named as the external pressures with the most direct bearing on continuity.
Corporate Social Responsibility	Community, environmental and local-development investment functioned as insurance against disruption caused by local opposition.

Table 3. Summary of qualitative themes identified through thematic coding of interview data.

Diversification and Flexibility

Supplier and route diversification emerged as the most consistently cited resilience strategy across interviews. The managers emphasized that the reason for diversifying procurement was not to become dependent on any single source, be it a state-owned contractor from China or a piece of machinery from the West, in order to maintain their negotiating power even if the relationship went sour (Barad, 2018). The importance of alternative routes for transportation was stressed specifically because political disruptions in Africa generally never give much prior notice.

Technology in Building Resilience

Real time visibility solutions, data analytics, and digital communication tools were identified as being at the heart of spotting and reacting to early signs of disruption before the situation could become critical, a trend which is in keeping with existing research on digitalization of oil and gas supply chains (Lu, Guo, Azimi, and Huang, 2019; NazmusSakib, Ullah, Nur, Talluri, Jaradat, and Jeanne Marie Lawrence, 2021). Those firms located in infrastructure built with financing from China explained that monitoring systems were, in some instances, the one part of the arrangement for which they insisted on going elsewhere.

Human Capital and Organisational Culture

Respondents maintained that resilience is directly tied to the sophistication of their labor force, stating that employees familiar with the local legal system, the dynamics of the community, and the particular demands involved with running their business beside a foreign SOE were more equipped to stop minor issues from escalating into full-fledged problems. Staff turnover, which is a common challenge faced throughout the industry, was noted as the biggest challenge to building such capacity.

External Factors, Including Geopolitical Exposure

The three external factors which have the closest relation to supply chain continuity are policy instability in government, geopolitical risks as a whole and infrastructure deficiencies. Several respondents specifically raised the terms attached to Chinese financing, describing an operational need to track not only the physical risk of disruption but the financial and contractual risk embedded in the underlying investment relationship, and to engage proactively with policymakers and financing partners rather than wait for a shock to materialise.

Corporate Social Responsibility

Investment in community relations, environmental stewardship and local economic development was widely described as a form of resilience insurance in its own right, reducing the likelihood of local opposition that could otherwise halt operations, a pattern consistent with the wider literature connecting CSR practice to supply chain stability (EnekoIbarnia, Garay and Guevara, 2020).

6. Discussion

Taken in combination, the quantitative and qualitative findings lend considerable weight to the core

thesis: Geopolitical risk emerges as an important determinant of AOG supply chain resilience, and the Chinese involvement in the BRI initiative as a major but understudied component. While resilience theories focusing on agility, adaptability, alignment and collaboration are still useful to consider in this regard, the discovery that redundancy and route diversification lead to quicker recovery from the disruption event largely corroborates them (Chandra Shekhar Singh, Soni and Gaurav Kumar Badhotiya, 2019). However, resilience theories were developed without consideration of a situation where there exists a powerful external financier that has geopolitical significance, and the current findings require that they are updated to take into account precisely such a situation. Merely diversifying the routes and sources of materials used by a firm is inadequate in this case if the same firm relies on the same state for funding, equipment and staff expertise.

This repositions China's BRI involvement as more specific than simply another geopolitical challenge along with sanctions and spill-over conflict. It is part of the structure of the industry's finance and infrastructure in increasingly many African countries, and the data indicates that the resilience impact is truly double-edged: adding physical capacity and a new dependency dimension which had no existence in previous resilience structures based on infrastructure financed by Western actors (Kaplinsky and Morris, 2016). The APCC example demonstrates that this double-edged nature is not set in stone; a deliberate approach to diversification, relationship-building, and risk assessment can eliminate many of the dangers associated with this new dependency axis even where the underlying funding is Chinese. This difference between BRI finance existing in an industry and the lack of resilience practice accompanying it is likely the most important theoretical contribution made by this research: it is not the Chinese funding per se that creates the vulnerability, but rather Chinese funding in the absence of diversification and risk-assessment capacity.

The findings regarding Russia-Ukraine are in line with this very logic from another perspective. The exporters from Africa that had successfully diversified their buyers prior to the crisis were in a good position to capitalize on Europe's search for alternatives in terms of gas supplies, whereas those exporters that were heavily reliant on their trade ties did not benefit much. In both the China and Russia-Ukraine cases, the practical lesson is the same: geopolitical exposure is manageable, but only where it is treated as an active variable to be diversified against rather than an unavoidable feature of operating in Africa's oil and gas sector.

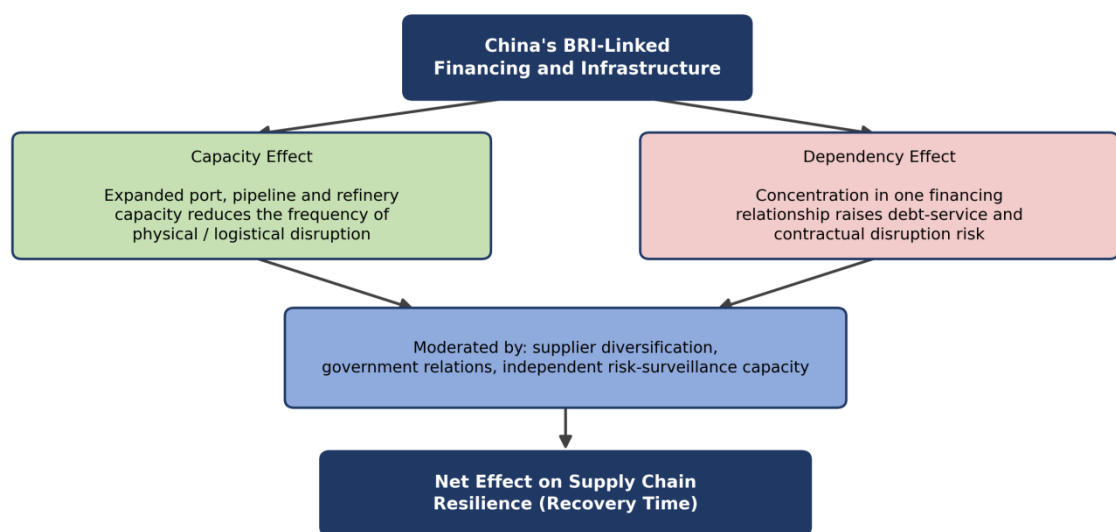


Figure 3. The double-edged pathway through which China's BRI-linked engagement affects African oil and gas supply chain resilience.

7. Conclusion and Policy Implications

7.1 Contributions Summary

This paper set out to test whether geopolitical risk, and China's Belt and Road engagement in particular, functions as a determinant of supply chain resilience in Africa's oil and gas sector, and it finds

that it does. It contributes to the supply chain risk management literature by extending established resilience frameworks to account for a specific and growing condition, dependence on a single dominant external financier, that those frameworks did not originally anticipate, and by providing empirical, region-specific evidence for a relationship that has so far been discussed mainly in qualitative or anecdotal terms.

7.2 Policy Recommendations

- African governments negotiating new BRI-linked agreements should insist on transparent disclosure of lending terms, meaningful local equity participation and binding technology-transfer commitments, following the pattern already visible in more recent, better-negotiated contracts (Fritzbøger, 2022).
- Regulators and industry bodies should actively support the diversification of both financing partners and physical supply routes, building on the momentum already created by frameworks such as the African Continental Free Trade Area, so that no single bilateral relationship carries disproportionate weight in the sector's infrastructure base (MariasoleBannò and Celeste Amorim Varum, 2021).
- Firms operating within Chinese-financed infrastructure should be encouraged, through incentive or regulation, to source risk-monitoring and surveillance capability independently of their primary financing partner, insulating their visibility into disruption risk from the relationship that created the underlying infrastructure.
- A government effort to fund training locally is necessary in order to plug the skills gap that has made some of the BRI-funded assets rely on nonlocal workers, an action that will transform infrastructure investment into sustainable capability rather than constant reliance.
- Authorities need to make sanctions and trade restriction monitoring an ongoing process since they change financing, insurance, and shipping terms in the industry quite rapidly.

7.3 Limitations and Future Research

The sample used for this research, although covering various parts of Africa, is limited to a few countries, and it can be generalised confidently to all states that produce minerals only if they have a relatively weak presence of China. Perception-based measurements of resilience rather than complete independent data is another constraint that is prevalent in the existing literature. The sample used for this research, although covering various parts of Africa, is limited to a few countries, and it can be generalised confidently to all states that produce minerals only if they have a relatively weak presence of China. Perception-based measurements of resilience rather than complete independent data is another constraint that is prevalent in the existing literature. Future research would benefit from longitudinal designs capable of tracking how firm-level resilience strategies evolve as BRI contracts mature and are renegotiated, from comparative work that sets Africa's experience against BRI-linked energy infrastructure in Southeast Asia or Latin America, and from the development of quantitative resilience indices specific enough to isolate the effect of financier concentration from the broader bundle of geopolitical risk discussed in this paper.

References

- Almeida, F. (2018). Strategies to perform a mixed methods study. *European Journal of Education Studies*. <https://doi.org/10.46827/ejes.v0i0.1902>
- Ambrosé Du Plessis (2014). The Forum on China–Africa Cooperation, Ideas and Aid: National Interest(s) or Strategic Partnership? *Insight on Africa*. <https://journals.sagepub.com/doi/abs/10.1177/0975087814535440>
- Ana Cristina Alves (2015). Chinese Economic Statecraft: A Comparative Study of China's Oil-backed Loans in Angola and Brazil. *Journal of Current Chinese Affairs*. <https://journals.sagepub.com/doi/full/10.1177/186810261304200105>
- Andrei, R. (2022). Natural Gas at the Frontline of the Energy Crisis and the War in Ukraine: A Material Perspective. In *Springer eBooks* (pp. 87–133). https://doi.org/10.1007/978-3-031-17057-7_4
- AymericBricout, Slade, R., Iain Staffell, & Halttunen, K. (2022). From the geopolitics of oil and gas to the geopolitics of the energy transition: Is there a role for European supermajors? *Energy Research & Social Science*, 88, 102634. <https://doi.org/10.1016/j.erss.2022.102634>
- Barad, M. (2018). Strategies and Techniques for Quality and Flexibility. *SpringerLink*. <https://doi.org/10.1007-978-3-319-68400-0>
- Chandra Shekhar Singh, Soni, G., & Gaurav Kumar Badhotiya (2019). Performance indicators for supply chain resilience: review and conceptual framework. *Journal of Industrial Engineering International*, 15(S1), 105–117.
- China's Belt and Road Initiative (2018). [Report on Chinese infrastructure commitments in Africa].

Geopolitical Risk and Supply Chain Resilience in the African Oil and Gas Sector: China's Belt and Road Expansion as a Determinant of Resilience A Mixed-Methods Analysis

- Come, I., van, Nhumaio, G., & André P.C. Faaij (2021). A review of hybrid renewable energy systems in mini-grids for off-grid electrification in developing countries. *Renewable and Sustainable Energy Reviews*, 144, 111036.
- Diderot Nguépouo (2017). The spatialisation of China's presence in Cameroon: The case of the mining sector. *The Extractive Industries and Society*, 4(3), 513–524. <https://doi.org/10.1016/j.exis.2017.06.004>
- EnekoIbarnia, Garay, L., & Guevara, A. (2020). Corporate Social Responsibility (CSR) in the Travel Supply Chain: A Literature Review. *Sustainability*, 12(23), 10125. <https://doi.org/10.3390/su122310125>
- Fritzbøger, B. (2022). Economy and Economics in the Quest for Sustainability. In *Sustainable Development Goals Series* (pp. 291–324). https://doi.org/10.1007/978-3-030-98293-5_10
- Kaplinsky, R., & Morris, M. (2016). Chinese FDI in Sub-Saharan Africa: Engaging with Large Dragons. In *Palgrave Macmillan UK eBooks* (pp. 123–148). https://doi.org/10.1007/978-1-137-57449-7_6
- Konstantinos Gkillas, JeevananthanManickavasagam, & S. Visalakshmi (2022). Effects of fundamentals, geopolitical risk and expectations factors on crude oil prices. *Resources Policy*, 78, 102887. <https://doi.org/10.1016/j.resourpol.2022.102887>
- Lee, H. L. (2021). Supply Chains with a Conscience. *Production and Operations Management*. <https://journals.sagepub.com/doi/abs/10.1111/poms.13319>
- Liu Bingyu (2021). China's state-centric approach to corporate social responsibility (CSR) abroad: A case study in Africa. *Transnational Environmental Law*, 10(1), 57–84. <https://doi.org/10.14288/1.0376800>
- Lu, H., Guo, L., Azimi, M., & Huang, K. (2019). Oil and Gas 4.0 era: A systematic review and outlook. *Computers in Industry*, 111, 68–90. <https://doi.org/10.1016/j.compind.2019.06.007>
- ŁukaszJureńczyk (2021). China's economic policy towards Kenya in the second decade of the 21st century. *Polityka i Społeczeństwo*, 19(01), 5–24.
- MariasoleBannò & Celeste Amorim Varum (2021). Champions during crises scenarios: High growth and persistent high growth firms. *Research in Applied Economics*, 13(2), 1. <https://doi.org/10.5296/rae.v13i2.17461>
- NaifAlsagr & Stefan van Hemmen (2021). The impact of financial development and geopolitical risk on renewable energy consumption: evidence from emerging markets. *Environmental Science and Pollution Research*, 28(20), 25906–25919.
- NazmusSakib, Ullah, N., Nur, F., Talluri, S., Jaradat, R., & Jeanne Marie Lawrence (2021). An assessment of probabilistic disaster in the oil and gas supply chain leveraging Bayesian belief network. *International Journal of Production Economics*, 235.
- Pham, L. (2023). Strategic Narratives During Armed Conflict: The Case of Ukraine Post-2022 Russian Invasion. *DIVA*. <https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1774333&dswid=-1380>
- Slagmulder, R., & Devoldere, B. (2018). Transforming under deep uncertainty: A strategic perspective on risk management. *Business Horizons*, 61(5), 733–743. <https://doi.org/10.1016/j.bushor.2018.05.001>
- Tan-Mullins, M., & Mohan, G. (2012). The potential of corporate environmental responsibility of Chinese state-owned enterprises in Africa. *Environment, Development and Sustainability*, 15(2), 265–284. <https://doi.org/10.1007/s10668-012-9409-x>
- Verma, R. (2013). The tiger and the dragon: a neoclassical realist perspective of India and China in the oil industry in West Africa (LSE Theses Online). http://etheses.lse.ac.uk/794/1/Verma_Tiger_and_the_Dragon.pdf
- Wu, K. (2014). China's energy security: Oil and gas. *Energy Policy*, 73, 4–11. <https://doi.org/10.1016/j.enpol.2014.05.040>
- Zhang, Q., Li, Z., Wang, G., & Li, H. (2016). Study on the impacts of natural gas supply cost on gas flow and infrastructure deployment in China. *Applied Energy*, 162, 1385–1398. <https://doi.org/10.1016/j.apenergy.2015.06.058>
- Zou, C., Zhao, Q., Chen, J., Li, J., Yang, Z., Sun, Q., Lu, J., & Zhang, G. (2018). Natural gas in China: Development trend and strategic forecast. *Natural Gas Industry B*, 5(4), 380–390. <https://doi.org/10.1016/j.ngib.2018.04.010>