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Review

GEOPOLITICAL FORCES AND STRATEGIC DECISION-MAKING IN MULTINATIONAL FIRMS: A SCORECARD AND HEATMAP COMPARATIVE ANALYSIS

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Abstract. In an increasingly interconnected world, the knowledge economy-encompassing technology, education and research-faces complex challenges posed by the evolving geopolitical dynamics. This paper examines how multinational companies strategically respond to these shifts. Through a comprehensive analysis of regulatory changes, political instability, trade policies and decarbonization concerns, this paper highlights the composite nature of geopolitical risks and their influence on corporate strategy. Methodologically, the research employs a scorecard and a heatmap to provide a systematic, organization-level framework for comparing firms' strategic responses. The scorecard evaluates regulatory compliance, supply chain resilience, risk management, strategic partnerships, innovation and carbon reduction targets across Apple, SAP and Tesla, with scores ranging from 2.00 to 4.00. Apple achieves the highest overall score (3.33/4), followed by Tesla (3.00/4) and SAP (2.83/4), indicating differences in innovation, policy alignment and supply chain resilience. The heatmap compares TotalEnergies, Danfoss and General Electric across eight decarbonization indicators, showing Danfoss as the sustainability leader. General Electric exhibits strong renewable-energy capabilities, but remains constrained by legacy infrastructure. By applying this comparative framework, the study identifies improvement areas and offers strategic recommendations to help multinational companies strengthen geopolitical risk management and maintain competitive advantage in a rapidly changing global environment.

Keywords: geopolitics, knowledge economy, decarbonization, scorecard, heatmap.

JEL Classification: C43, C61, D81, Q54.

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List of abbreviations

E.U. – European Union;
ESG – Environmental, Social and Governance;
GE – General Electric;
IB – International Business;
IOCs – International Oil Companies;
LNG – Liquefied Natural Gas;
M&As – Mergers and Acquisitions;
MNCs – Multinational Companies;
NOCs – National Oil Companies;
O&G – Oil and Gas;
R&D – Research and Development;
U.S. – United States.

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1. Introduction

The rising geopolitical evolution of the past decade has transformed the strategic landscape for multinational companies, especially for those embedded in the knowledge economy (Buckley, 2024; Verbeke & Yuan, 2024; Meyer, 2023). Digital sovereignty, fragmented supply chains, divergent climate policies and the exploitation of data have created novel, advanced exposures that standard risk assessment frameworks are struggling to acquire (Contractor, 2023; Chatzinikolaou & Vlados, 2026). Recent international studies highlight how the geopolitical pressures, sustainability transitions and organizational adaptability have become essential throughout different economic contexts. Evidence from the European energy sector illustrates that amplifying the share of renewable energy can reduce geopolitical threats linked to energy import dependence (Streimikiene & Kyriakopoulos, 2025). International research further indicates that companies are prone to reconfigure their internal structures and strategic practices when facing geopolitical pressures. Evidence from the Greek business environment demonstrates how remuneration and reward systems evolve during crisis conditions, impacting workforce stability and organizational performance (Ntanos et al., 2020). Complementary findings show that environmental innovation and open-innovation dynamics augment organizations' competitive advantage, especially in situations of intense sustainability pressures (Skordoulis et al., 2020). It is also revealed through studies from South Asian pharmaceutical enterprises that operational and financial enhancements are brought from proactive environmental plans, eco-innovation and technological advancement (Ahmed et al., 2021). The broader sustainability literature emphasizes how circular economy integration and ecosystem-service interactions contribute to organizational resilience (Kapsalis et al., 2019). Furthermore, as affirmed by Kyriakopoulos (2022), energy communities stress that decentralization improves energy autonomy and reduces exposure to geopolitical disruptions.

As companies progressively depend on worldwide innovation networks, transboundary data streams and complex energy transitions, their strategic decisions are turning out indispensable from the geopolitical dynamics (Andrews et al., 2026; Dincă et al., 2023).

Even if the field of international business (IB) research has paid growing attention to geopolitical risk, existing studies mainly investigate inter-state interactions or geopolitical trends at the macroeconomic level (Ciravegna et al., 2023; Luo & Tung, 2025). There is scarce evidence about the ways businesses incorporate geopolitical risk management within their organizational structures, sustainability practices and strategic planning (Hou & Qiu, 2025; Reyad et al., 2023). More specific, empirical and theoretical insights on the area intersecting geopolitical stress and corporate decarbonization plans are insufficiently explored (Alam et al., 2024; Zhang et al., 2025; Sun & Li, 2024).

The current study addresses the just-mentioned gaps by constructing a structured framework that assesses how multinational companies respond to geopolitical threats across multiple strategic dimensions. The paper introduces a comparative scorecard and a heatmap that examine companies' attitudes towards regulatory compliance, supply chain resilience, innovation, risk management and carbon reduction (Abdullah et al., 2024). By employing this framework to companies from the technology, manufacturing and energy spheres, the paper confers innovative insights regarding how geostrategic forces drive corporate strategy in a society of increasing digitalization and sustainability shifts (Cumming, 2024; Li & Zhang, 2024).

The paper is divided as follows: the first section reviews the literature on the knowledge economy, geopolitics and decarbonization. Then, the second section presents the methodological framework and scoring model. Further on, section 3 shows the empirical results, while the fourth section discusses their implications for corporate strategy. The paper concludes with recommendations for multinational firms navigating geopolitical uncertainty.

2. Scoping literature review

This paper undertakes a scoping review to synthesize existing research on the knowledge economy, geopolitical risk and corporate decarbonization (Ahmed & Khan, 2024; Benito et al., 2023; Moura et al., 2025). The scoping review research method is suitable for this study since it allows the structured integration of various conceptual perspectives, together with empirical findings, drawn from IB, sustainability transitions, and digital and political economy (Mishcheniuk, 2024). Insights derived from the scoping review provide the conceptual foundation of the comparative scorecard and heatmap framework developed in this paper, guiding the selection of dimensions, evaluation criteria and interpretation of cross-industry patterns (Bozonelos & Tsagdis, 2023; Czech, 2026).

2.1. Overview of the knowledge economy and geopolitical challenges

In the knowledge economy, knowledge plays the role of the main driver in terms of economic expansion (Hope, 2023). A knowledge economy primarily depends on intellectual capabilities rather than physical inputs or natural resources (Meyer, 2023; Li, 2025). Thus, investments together with innovation in various sectors, such as education, energy, manufacturing, technology are utterly important (Sony & Naik, 2023; Narula, 2023; Glaser-Segura et al., 2018).

Knowledge is represented in its relation to people as "human capital" and reflects the need for workforce to continuously acquire and adapt skills (Marin, 2023; Watahiki et al., 2020; Dima et al., 2023).

This growing demand for highly-skilled workers embodies the "learning economy". According to the Organization for Economic Co-operation and Development [OECD], the "knowledge-based economies" are the economies "directly based on the production, distribution and use of knowledge and information" (OECD, 1996, p. 7). OECD's policies on science and technology in different industries are designed to enhance the performance and well-being of the knowledge-based economies, together with driving increased investments in high-tech sectors, the expansion of advanced industries, a more skilled workforce and productivity gains.

The knowledge-based economy is built around knowledge production, strategic planning and mapping efforts and is brought to life through meetings, conferences and broader action networks (Powell & Snellman, 2004; Pelau et al., 2010). As Moisio affirms, the uncertain context of knowledge-based global capitalism is continually organized through studies and concepts that link this form of capitalism to specific political regions or communities (Moisio, 2018). In addition, it is enhanced that the growth of knowledge economies is not just an economic phenomenon, but is highly connected to geopolitical and spatial dimensions (Li et al., 2023; Strange, 2023).

It is well-known that knowledge has always been considered a main factor for productivity increase and economic development, with the emphasis on how information, technology and continuous learning drive economic success. Unger highlights that nowadays traditional manufacturing has been replaced by the knowledge economy as the most advanced form of production. Traditional mass production is no longer the catalyst for economic gain. Yet, a developed knowledge economy is still unattainable even in the wealthiest nations, being continuously explored (Unger, 2019).

Since we live in a data-driven world, digitalization plays a crucial role in the development of cutting-edge technologies, introduced in all the economic sectors (Biclesanu & Dima, 2021; Sony & Naik, 2023). Thus, the concepts of digitalization and the digital economy are interlinked. The digital economy marks the evolution from Industry 3.0 (the "digital revolution"), involving the shift from analog to digital technologies, to Industry 4.0, which integrates advanced technologies and interconnected systems that enhance innovation and efficiency (Buckley, 2024). This transition reflects the growing integration of technology in every aspect of business and society (Javaid et al., 2024). In this sense, knowledge-based economy is related to the digital economy, considering the fact that knowledge is essential for the digital economies and the digital tools enhance knowledge distribution.

Once with the expansion of the digital economy and increasing competition for control, cooperation between states and firms is of utmost importance (Y. Zhao et al., 2025). In order to attain geopolitical stability, powerful nations should act responsibly towards the less powerful ones. It has been recognized that power cannot be exerted solely by firms or governments, thus a continuous need for flourishing political capabilities is required (Vousinas, 2025). Governments must acknowledge the need to share structural power with firms and build channels to cooperate not only with other nation-states, but also with global corporations (Lawton et al., 2023). It is widely acknowledged that IB has been reshaped by digital technology and big data, dominated by various big tech companies, such as Apple, Amazon, Meta, with data becoming a vital asset for their dynamic learning capabilities. Changes in the balance of power in terms of data ownership have been reflected especially by the recent high-profile disputes between Big Tech firms and government. As the regulatory disputes involving Meta illustrate, the control of data and digital infrastructure have allowed Big Tech companies to challenge governmental authority, being more difficult for governments to enforce data regulation (Khanal et al., 2024).

Lawton presents four structures of power (or pillars) in his article: production, knowledge, security and finance. He focuses on the idea that knowledge holds the capacity of shaping all these additional three power structures by creating information asymmetry. Furthermore, he emphasizes the fact that power lies in the ability to produce, control and convert data into knowledge (Lawton et al., 2023). This knowledge can then challenge a state's views on national security and market competitiveness. It can be very well reflected through Google's example, which faced repetitive E.U. sanctions for practices related to data analytics in terms of anti-competitive purposes and not for data protection (Chee, 2019).

Below, in Table 1 there are highlighted the four structural power pillars, in relation to the computer-based economy. In addition, there are presented the original concepts, digital variants and implications for IB.

Table 1. Structural power pillars and the digital economy (source: Lawton et al., 2023)

Pillar	Original Concept	Digital Variant	Implications for IB
Production	The power to create wealth and shift the distribution of social and political influence.	Who possesses or controls data, creates wealth. Data are regarded as invaluable inputs for production.	Policymakers are challenged to welcome new forms of work, while practitioners are pushed towards more aligned or integrated strategies with governments and other firms.
Security	The power to secure the existence and limit the choices of others.	Security now includes the virtual realm. Privacy and data security are two of the main risks today.	Policymakers are challenged to produce integrative and robust regulations, while practitioners forge new ways to cope with heterogeneous institutional environments.
Knowledge	The power to disseminate (or restrict) information and communication.	Who possesses data, possesses knowledge, and controls the diffusion of information.	Policymakers are challenged to manage globally diffused knowledge, that often resides with nonstate actors (firms). Practitioners must rethink knowledge management structures.
Finance	The authority to create credit that influences purchasing power.	Digital technologies, cryptocurrencies, and digital tokens imply that credit creation is no longer the sole preserve of the state and the banking system.	Policymakers face the challenge of regulating and rethinking their role in credit creation, while practitioners seek new sources of cheap and less regulated credit (like cryptocurrencies).

Drawing on structural power theory and the knowledge-based view of companies, this study supports that geopolitical risk does not impact organizations uniformly. Instead, it materializes differently across areas such as regulatory exposure, supply chain composition, innovation initiatives and decarbonization strategies.

2.2. Conceptual definitions

For conceptual clarity, this study adopts the following definitions:

- *Geopolitical risk* refers to the degree to which companies recalibrate their regulatory, operational and innovation decisions in response to geo-economic uncertainty (Caldara & Iacoviello, 2022);
- *Strategic resilience* denotes organizations' ability of maintaining operational continuity and competitive advantage under conditions of geopolitical stress, while also reflecting their competence to anticipate and adapt to external shocks through strategic, operational and technological capabilities (García-Sánchez & Aibar-Guzmán, 2023);
- *Decarbonization strategy* expresses the manner in which carbon-reduction targets, renewable energy adoption and climate policy management exist in the corporate strategy, aligning with companies' wider decarbonization strategy of reducing emissions and transitioning towards low-carbon operations (Krueger et al., 2020).

These definitions guide the analytical framework and support the development of the research questions.

In this study, *geopolitical risk* is operationalized through organizational dimensions including regulatory compliance, supply-chain resilience, risk-management structures and strategic partnerships. *Strategic resilience* is operationalized through companies' ability to maintain adaptive capabilities under geopolitical tensions, reflected by innovation intensity, diversification practices and governance mechanisms. *Decarbonization strategy* is operationalized through indicators related to renewable energy investments, carbon-reduction targets, emissions intensity and low-carbon technological adoption.

International business and research focusing on sustainability transition emphasizes multiple organizational dimensions that create responses of firms to geopolitical pressures. Innovation capability, policy alignment, risk-management structures, supply-chain diversification and sustainability commitments are repeatedly identified as main determinants of strategic resilience (Alam et al., 2024). These dimensions present how companies manage their exposure to political, technological and institutional risks. They also offer the conceptual basis for observing differences in strategic responses between firms. This grounding directly contributes to the development of RQ1 and RQ3.

Prior research on sustainability and climate governance continuously identifies key dimensions used to assess enterprises' environmental and strategic performance. These include greenhouse-gas emissions disclosure, carbon-intensity reduction, renewable-energy integration, energy-efficiency enhancements and the adoption of science-based climate targets. These dimensions are widely applied in comparative assessments of corporate performance and evaluate firms' resilience under regulatory, market and geopolitical stress (Narula, 2023; Czech, 2026).

Their relevance for the literature provides a conceptual foundation for observing how companies include decarbonization in their wider strategies for handling geopolitical risk, which directly supports the development of RQ2.

The organizational and strategic dimensions identified above are operationalized in this study through a comparative scorecard. Already existing international business research frequently uses tools for comparing options across several criteria. The scope is to assess how companies respond to regulatory pressure, supply-chain risks, innovation efforts and sustainability purposes (Meyer, 2023; Luo & Tung, 2025). Using these dimensions in a structured evaluation framework allows for a systematic comparison of how multinational companies handle geopolitical pressures. This methodological approach ensures that the scorecard follows established analytical practices and effectively supports the investigation of RQ1 and RQ3.

Building on these analytical foundations, the following subsection focuses on how geopolitical dynamics influence corporate decarbonization strategies across industries.

As global environmental concerns intensify, businesses are increasingly aligning their operations with sustainability goals, driven not only by regulatory pressures and shifting consumer expectations, but also by the complex political and economic dynamics at the international level (Alam et al., 2024; Cumming, 2024). Thus, geopolitical factors play a critical role in shaping the decarbonization strategies of companies across various industries.

Forces such as trade policies, government regulations and cross-border agreements significantly influence the pace and direction of decarbonization efforts, presenting both challenges and opportunities for companies (Narula, 2023; Zhang et al., 2025). These geopolitical

influences, coupled with the urgent need to address climate change, have pushed companies to adopt strategies which reduce their environmental impact while maintaining long-term growth and competitiveness (Ciravegna et al., 2023). Recent studies demonstrate that ESG (Environmental, Social and Governance) readiness improves companies' resilience to geopolitical shocks (Ahmed & Khan, 2024; Hossain et al., 2024; Reyad et al., 2023). Furthermore, corporate governance structures additionally shape how organizations drive their carbon performance under conditions of uncertainty (García-Sánchez & Aibar-Guzmán, 2023). Empirical evidence suggests that geopolitical instability disproportionately affects enterprises with not so powerful ESG integration, undermining their valuation and limiting their access to capital. (Czech, 2026; S. Zhao et al., 2025). It is also important to be noticed that institutional investors are playing an influential role in shaping decarbonization strategies and climate governance (Zhou & Wei, 2025). Visualizing at macro level, sustainable development and climate governance are progressively guided by digital intelligence and geopolitical fragmentation (Y. Zhao et al., 2025).

The strong players of the global energy sector, oil and gas (O&G) companies, are adapting to two major global shifts: **economic globalization** (fuelling the energy demand) and **climate change** (acting as a catalyst for energy system transformation and decarbonization). In this sense, a conceptual framework is presented for examining O&G strategic responses during two periods: the 1990s to early 2010s and the post-Paris Agreement era. This framework connects O&G strategies of globalization and decarbonization, focusing on production, finance and knowledge as key internal structures.

From Figure 1 it can be noticed that the companies are placed between the state and the market, with national energy security tightly linked to geopolitics and also economic globalization and climate change positioned next to each other. The period from the 1990s to the early 2010s was marked by economic globalization and a sharp rise in global demand

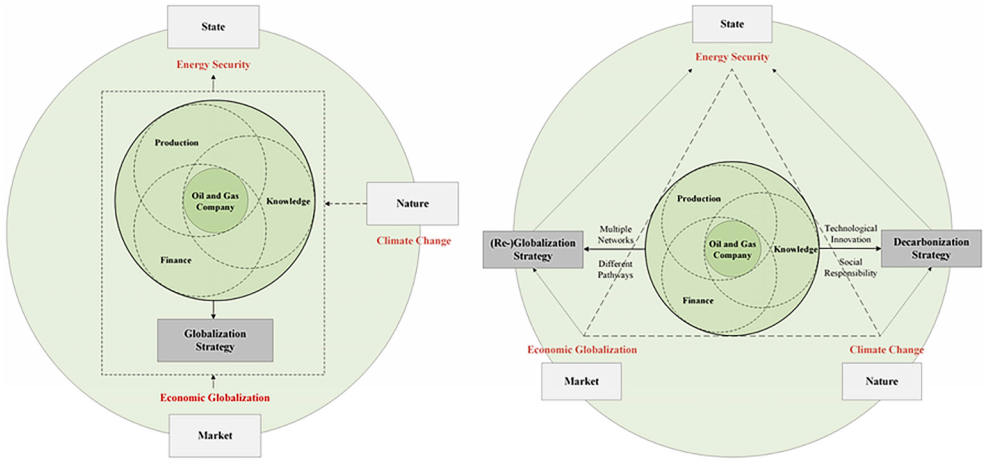


Figure 1. Integrated conceptual framework for: a – globalization strategy for the 1990s – early 2010s; b – (re-)globalization and decarbonization strategies for the post-Paris Agreement era (source: Guo et al., 2023)

for fossil fuels. In response, O&G companies optimized global resource allocation, focusing on recoverable reserves, reserve replacement and output expansion as key indicators for success. They implemented integrated upstream and downstream business models to grow international competitiveness, diversify investment risks and ensure stable capital returns. This era also saw a wave of large-scale mergers and acquisitions (M&As) among publicly traded international oil companies (IOCs) in Europe and the U.S. due to low oil prices and intense competition. Moreover, state-owned national oil companies (NOCs) from emerging economies like China and India expanded their global presence by purchasing international O&G assets.

The second period, following the 2015 Paris Agreement, marked a more structured global approach to climate change mitigation and adaptation, with many nations establishing clear climate objectives. By May 2022, 146 countries had committed to net-zero targets, from which 79 embedded these goals in legislation or official policy documents (Guo et al., 2023).

It is clear that in this evolving geopolitical environment multinational companies encounter significant uncertainty and volatility as they navigate these changes. With higher stakes compared to the 1990s and early 2000s, businesses should develop strategies to respond effectively to geopolitical shifts. Additionally, they should address the challenges associated with their country of origin in host nations, manage the multilateral and bilateral stakeholder tensions and either align with or oppose to national priorities.

In 2023 Accenture conducted a study involving over 2,600 CEOs and chairpersons from 128 countries and 18 industries regarding leaders' opportunities and challenges of reaching SDG goals. In Figure 2 it is highlighted that around the world, 87% of CEOs believe that the actual levels of geopolitical instability hinder the global effort to achieve the Sustainable Development Goals (United Nations Global Compact & Accenture, 2023).

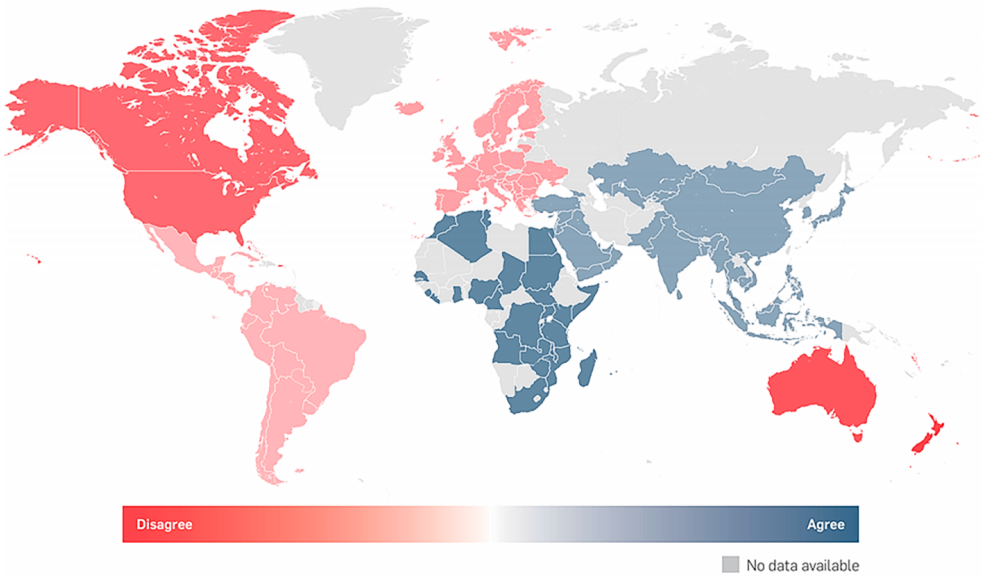


Figure 2. Geopolitical instability sets back sustainability in over half (51%) of developing countries, United Nations Global Compact & Accenture (2023)

According to Accenture's study, the world is not on track to meet the Sustainable Development Goals (SDGs) by 2030, despite progress in some areas. The Paris Agreement's goal to limit global temperature rise to 1.5 °C is not being met, as the latest UNFCCC report shows current climate pledges would result in a 2.5 °C increase by 2100, which could have disastrous global consequences. The past three years, marked by the COVID-19 pandemic, climate change impacts and geopolitical conflicts, have contributed more to the set back progress. The attainment of sustainability commitments is constrained by insufficient long-term commitments from major stakeholders and policymakers, limited availability of effective technology and inadequate access to resources and affordable financing. However, the study highlights that globalization is crucial, with 80% of CEOs stating it is highly necessary for achieving the SDGs. Francesca Fondse, CEO of De Angelus Estates and Angelus Africa SD Projects, affirmed the following: "The subject of globalization is a double-edged sword. It can be very good, but it has clearly not delivered the promise of progress for everyone." (United Nations Global Compact & Accenture, 2023). Furthermore, 91% of the interviewed CEOs affirm that they lack technological solutions that would help their business attain resilience.

While these contributions advance the understanding of the structural and geopolitical forces shaping the knowledge economy, they offer relatively limited direction on how such forces are internalized and operationalized within business systems.

2.3. Research gap and study positioning

Despite the literature advancement regarding geopolitics in IB and corporate decarbonization strategies, a limited number of contributions integrate these perspectives into a unified framework for cross company comparison. The existing work is limited to single-firm case studies or conceptual discussions, marking a gap for comparative, visualization-based tools, capable of translating geopolitical complexity into actionable, managerial insights. Addressing this gap, the current study conceives an exploratory, comparative approach, with the goal of creating and employing a scorecard and heatmap framework to assess companies' strategic responses to geopolitical threats. With this motivation being stated, the paper is driven by a set of research questions that shape the methodological outline, as presented in the following section.

Despite raised academic interest in terms of the strategic consequences of geopolitical risk, existing manuscripts differ substantially in their conceptual scope, methodological design and empirical context. The latest papers have offered a clearer understanding into how enterprises drive geopolitical risk in their strategic plans. According to Vousinas (2025), it is highly recommended that geopolitical risk is included into business planning cycles, emphasizing stress-testing as a key managerial tool for assessing the strategic robustness over geopolitical scenarios. Balancing this planning-led approach, Mishcheniuk (2024) presents in his paper that supplier diversity, host-country political ties and operational adaptability amplify geopolitical resilience, through evidence from Czech multinationals such as Škoda Auto, ČEZ, Pilsner Urquell and Avast. The takeaways are also confirmed by employing a larger survey model. It has been enhanced that capital markets regularly penalize organizations with increased geopolitical sensitivity, leading to noticeable reductions in firm value once that geopolitical threats rise (Pringpong et al., 2023). Although this body of work advances the link between

enterprises' perceptions and their management of geopolitical stress, it remains limited in providing a comparative framework supported by visual analytics across multiple dimensions.

Given the exploratory nature of this study and the methodological orientation towards comparative visualization tools (a Power BI-based scorecard and a Jupyter-based heatmap analysis), research questions are more appropriate than formal hypotheses. The intersection between geopolitical risk, strategic resilience and corporate decarbonization remains theoretically fragmented, with limited prior models that would support the formulation of precise, testable hypotheses. In these contexts, international business and sustainability research frequently use research questions to guide evaluations based on multiple criteria and to compare companies. This approach is especially useful when the goal is to map patterns and identify configurations rather than to estimate causal effects (Meyer, 2023; Bozonelos & Tsagdis, 2023). The heatmap analysis further supports the use of RQs, providing an integrated, descriptive overview of decarbonization practices across firms and sectors. Furthermore, it offers a broad, overall picture rather than testing specific, detailed relationships. Therefore, RQs have a more suitable structure for capturing variation and highlighting strategic differences. They also generate insights that can support future research based on hypothesis and statistical testing.

In addition to the scoping review insights, the paper uses an exploratory, comparative approach, addressing the following research questions.

RQ1: *What distinguishes multinational companies' strategic responses to geopolitical risk throughout core organizational dimensions, such as regulation, innovation, resource-based view of geopolitical strategy and supply chains?*

RQ2: *In what manner is decarbonization incorporated into the geopolitical risk management strategies across different industries?*

RQ3: *How do the sector-specific characteristics determine firms' strategic positioning amidst geopolitical landscape?*

3. Research methodology

The main objective of this paper is the creation of a **scorecard assessment framework and a heatmap**. The scorecard evaluates the strategic responses of selected MNCs to geopolitical challenges. The heatmap compares companies from a similar industry, focusing on decarbonization efforts.

In order to design the scorecard, a systematic framework with data sources, defined criteria and scoring mechanisms is created. The model combines both quantitative and qualitative metrics, providing a comprehensive perspective on the analyzed company reports. Quantitative data derives from numerical indicators, while textual analysis and expert opinions lead to qualitative insights. With a well-defined set of criteria and a scoring system, the scorecard model serves as a tool for benchmarking the reports. This enables the ranking or categorization of reports based on their performance across various dimensions. The comparative analysis offered by the scorecard can present the gaps in the current geopolitical context, highlighting areas that may require further development or attention.

The scorecard was initially created in **Excel**. Then, **Power BI** software was used for further data analysis and visualization. The components of the scorecard were divided into the following: key **dimensions** (relevant to geopolitical challenges), **criteria** (measurable indicators of each dimension), **scoring** (the scoring system was using scales from 1 to 4, where each company was scored based on the extent to which it met the specific criteria) and the assessed **companies**, placed on different columns.

The six selected scorecard dimensions are grounded in the knowledge-based view and structural power theory, showing how companies influence policy, industrial processes and innovation-driven capabilities (Lawton et al., 2023; Meyer, 2023). Each dimension was implemented through observable indicators drawn from corporate disclosures (R&D intensity, compliance records, risk-management systems, supply-chain diversification, partnership span and ESG orientation). There were assigned equal weights to all dimensions for ensuring transparency and for avoiding subjective ranking of sectors. Equal weighting was selected because the exploratory nature of the framework does not support the assumption that one geopolitical dimension systematically dominates the others across industries.

For the scales the following mechanism in terms of information disclosure was respected.

1 – Minimum disclosure: information is provided in a very limited way, accessible only to a small group of people or with minimal details;

2 – Moderate disclosure: information is partially available, with some missing details or accessible to a wider audience, but not to everybody;

3 – Substantial disclosure: the information is quite detailed and available to a wider audience, but may contain certain restrictions or does not include extremely specific details;

4 – Total disclosure: the information is completely detailed, available to everybody, being no restrictions in accessing it, with extremely specific details.

A four-point scale was intentionally selected in order to bypass the central tendency bias and to strengthen clearer distinction between firms.

Regarding **data gathering of the scorecard**, for each company there were used mainly the annual reports, complemented by sustainability reports, reports from consultancies etc. Although the scoring process implies qualitative judgment, this limitation is reduced by applying standardized criteria, relying on publicly available corporate disclosures and maintaining a consistent scoring logic across all companies.

The analyzed companies from various industries were the following: **Apple (manufacturing), SAP (technology) and Tesla (automotive and energy).** The selected organizations are the representatives of multiple industries, with different levels of geopolitical exposure, regulatory pressure and decarbonization challenges, building a meaningful basis for cross-sector comparison.

Finally, the scores from all dimensions were combined, which confer the overall score. For each column on which companies were placed, the **arithmetic mean (average)** was calculated.

In order to ensure methodological transparency and reproducibility, Table 2 summarizes all input variables which were used for the scorecard and heatmap analyses, comprising dimensions, indicators, descriptions, value ranges, units and data sources. This input summary of the conducted analyses allows other researchers to replicate the assessment framework for different multinational firms and geopolitical contexts.

Table 2. Input variables used in the scorecard and heatmap analysis (source: authors' own creation)

Framework	Dimension	Indicator (Criteria)	Description	Value range (Scale)	Unit	Data Source
Scorecard	Regulatory compliance	Regulatory breaches; compliance audits passed	Degree of company adherence to legal requirements	1–4	Ordinal	Annual reports, compliance disclosures
Scorecard	Supply chain resilience	Recovery time; supplier diversification	Ability to respond to supply chain disruptions	1–4	Ordinal	Sustainability reports
Scorecard	Risk management	Geopolitical risk officer; scenario planning	Existence of structured geopolitical risk practices	1–4	Ordinal	Corporate governance reports
Scorecard	Strategic partnerships	Number/ scope of partnerships; revenue share	Extent of collaboration and external integration	1–4	Ordinal	Annual reports
Scorecard	Innovation	R&D spending; patents filed	Organization's innovation capacity and technological advancement (e.g., R&D expenditure intensity, number of patents, innovation-related disclosures)	1–4	Ordinal	Financial statements
Scorecard	Carbon reduction targets	Emission reduction; renewable usage	Commitment to decarbonization goals	1–4	Ordinal	ESG / sustainability reports
Heatmap	Sustainability focus	Renewables vs. fossil fuel reliance	Balance between renewable energy and fossil-fuel-based energy	1–4	Ordinal	Sustainability reports
Heatmap	Energy efficiency solutions	Technology-driven vs. traditional systems	Adoption of energy-efficient technologies	1–4	Ordinal	Corporate disclosures
Heatmap	Global reach	Regional vs. global operations	Geographic scope of operations	1–4	Ordinal	Annual reports
Heatmap	Green innovation	Leadership in green technologies	Development of low-carbon technologies	1–4	Ordinal	ESG reports
Heatmap	Emission targets	Net-zero commitments	Strength of carbon reduction targets	1–4	Ordinal	Sustainability reports

End of Table 2

Framework	Dimension	Indicator (Criteria)	Description	Value range (Scale)	Unit	Data Source
Heatmap	Renewable investment	Capacity and funding in renewables	Scale of renewable energy investments (e.g., GW capacity reported by companies)	1–4	Ordinal	Company disclosures
Heatmap	Decarbonization technologies	Carbon capture, smart grids, etc.	Use of technologies for decarbonization	1–4	Ordinal	ESG reports
Heatmap	Carbon intensity impact	Reduction in emissions intensity	Measured impact on emissions (e.g., reported decreases in carbon intensity, emissions per unit of output, progress towards decarbonization targets)	1–4	Ordinal	Sustainability reports

4. Results and discussion

This section introduces and outlines the results in connection with the stated research questions. Firstly, the scorecard analysis essentially addresses RQ1 and RQ3 through the comparison of company-level strategic stance along business dimensions. Secondly, the heatmap analysis addresses RQ2 by determining patterns from different industries while harmonizing decarbonization and geopolitical risk. Accordingly, the following subsections consolidate the findings for each research question individually, providing a clear, structured and evidence-driven response to RQ1, RQ2 and RQ3.

Overall, the results confirm RQ1 and RQ2, partially confirming RQ3, as the analyses reveal clear differences across companies and sectors. These variations refer to the way in which businesses manage geopolitical pressures and decarbonization commitments.

The findings imply that companies with increased geopolitical readiness scores, especially Apple, also prove stronger innovation and more stable supply-chain performance, considered drivers for long-term productivity expansion. Thus, there is noticed a positive association between geopolitical readiness and company performance proxies, such as revenue scale and market positioning. On the contrary, SAP's lower score displays its more conservative strategic positioning. Differences at sector level show that geopolitical uncertainty interrelates with national energy regulations and global trade setups, influencing macroeconomic competitiveness and capital flows.

These patterns emphasize distinct strategic differences across firms, with varying levels of geopolitical sensitivity, innovation capability and regulatory alignment. The results also present that firms with complex ESG integration and clearer decarbonization assurances show more resilient profiles under geopolitical vulnerability. Moreover, sector-specific features

(especially in technology, manufacturing and energy) shape how enterprises combine geopolitical risk with strategic adaptation. This highlights that the industry context significantly influences how companies respond.

4.1. Scorecard results and comparative discussion

The results for scorecard construction, together with outcomes are displayed in this section.

As an initial step, the scorecard was created in Excel, where scores were offered to each company across the predefined dimensions and criteria, as observed below, in Table 3.

Table 3. Scorecard in Excel (source: authors' own contribution)

Dimension	Criteria	Apple	SAP	Tesla
Regulatory compliance	Number of regulatory breaches, percentage of compliance audits passed	3	4	2
Supply chain resilience	Time to recover from disruptions, number of alternative suppliers identified	3	2	4
Risk management	Presence of a geopolitical risk officer, regularity of scenario planning exercises	3	3	2
Strategic partnerships	Number and scope of collaborations, percentage of revenue derived from partnerships	3	3	4
Innovation	R&D spending as percentage of revenue, patents filed	4	2	3
Carbon reduction targets	Carbon footprint reduction percentage, renewable energy usage	4	3	3
Overall score	Average	3.33	2.83	3

Subsequently, the dataset was imported into Power BI software, which allowed data transformation, analysis and the building of interactive dashboards, being observed in Figure 3.

To ensure analytical consistency and comparability, the dataset was standardized through numerical variable transformation procedures in Power BI. This was performed by converting all score-related variables into a consistent numerical format, enabling aggregation and cross-company comparability of the selected geopolitical and strategic dimensions. Also, this standardization ensured that the dataset could be systematically analyzed without inconsistencies in data type interpretation.

Subsequently, the dataset was restructured into a structured format suitable for comparative evaluation, as highlighted in Figure 4. The transformation process generated standardized "Company" and "Score" variables (from "Attribute" and "Value"), allowing Apple, SAP and Tesla to be treated as comparable categorical entities in a unified dataset. In this way, systematic cross-company comparison across all dimensions became possible.

Following the data standardization and restructuring procedures, comparative visuals were created in the "Report view" section of the software, enhanced in Figure 5. The scorecard (Table 4) was created through a matrix-based visualization framework, where the alignment of dimensions and companies was performed to enable clear cross-company comparisons and interpretations of geopolitical and strategic factors.

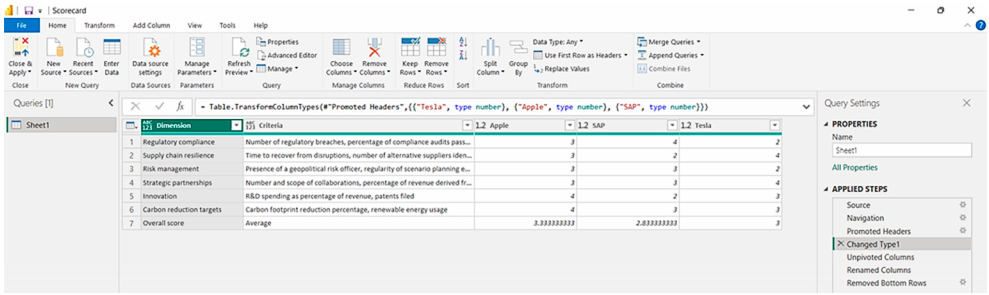


Figure 3. Data standardization process for comparative geopolitical analysis, in Power BI, authors' own elaboration

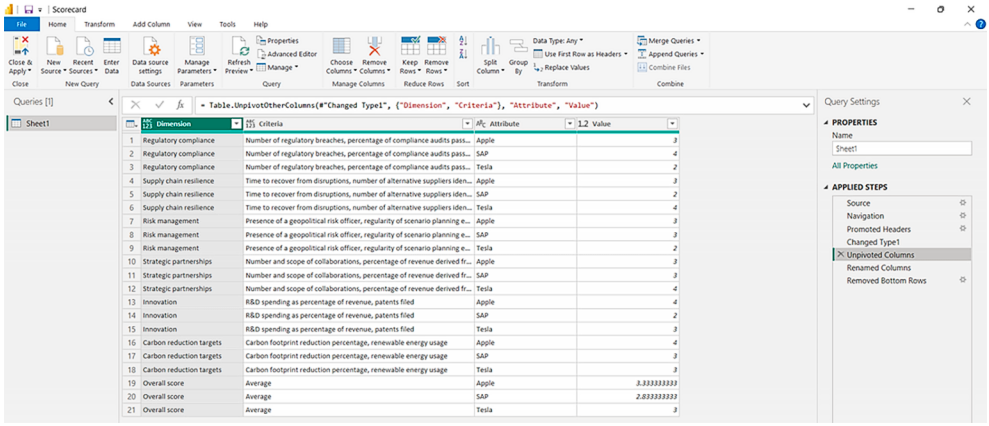


Figure 4. Data restructuring for comparative company-level analysis, in Power BI, authors' personal input

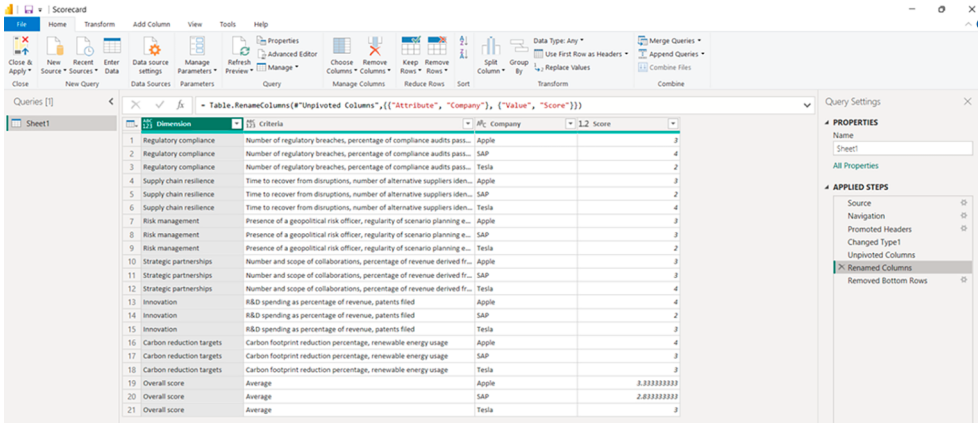


Figure 5. Comparative visualization framework for scorecard analysis, in Power BI, authors' own elaboration

Table 4. Scorecard (Matrix visual) in Power BI (source: authors' own insight)

Dimension	Apple	SAP	Tesla
Carbon reduction targets	4.00	3.00	3.00
Innovation	4.00	2.00	3.00
Regulatory compliance	3.00	4.00	2.00
Risk management	3.00	3.00	2.00
Strategic partnerships	3.00	3.00	4.00
Supply chain resilience	3.00	2.00	4.00
Total	3.33	2.83	3.00

An extended form of the matrix visual, with the criteria included, can be observed below, in Table 5.

Table 5. Scorecard – extended form (source: authors' unique contribution)

Dimension	Apple	SAP	Tesla
Carbon reduction targets	4.00	3.00	3.00
Carbon footprint reduction percentage, renewable energy usage	4.00	3.00	3.00
Innovation	4.00	2.00	3.00
R&D spending as percentage of revenue, patents filed	4.00	2.00	3.00
Regulatory compliance	3.00	4.00	2.00
Number of regulatory breaches, percentage of compliance audits passed	3.00	4.00	2.00
Risk management	3.00	3.00	2.00
Presence of a geopolitical risk officer, regularity of scenario planning exercises	3.00	3.00	2.00
Strategic partnerships	3.00	3.00	4.00
Number and scope of collaborations, percentage of revenue derived from partnerships	3.00	3.00	4.00
Supply chain resilience	3.00	2.00	4.00
Time to recover from disruptions, number of alternative suppliers identified	3.00	2.00	4.00
Total	3.33	2.83	3.00

Based on the aggregated scores, it results that Apple leads in terms of positioning against geopolitical landscape, with a score of 3.33, followed by Tesla (3) and SAP (2.83).

In addition, a **clustered bar chart** was used to compare the performance of the companies across dimensions, emphasized in Figure 6.

In Figure 7, a consolidated dashboard view (from the "Report view" menu) could be surprised, offering a coherent overview of company performance.

The **interpretation of scorecard results** is based on the following discussion.

Apple shows as the strongest performer, the company remarking itself through innovation (especially through R&D spending) and regulatory compliance, with a strong focus on carbon reduction, by decreasing its carbon footprint in product manufacturing, through its commitment to become carbon neutral by 2030. This outcome aligns with structural power theory, as Apple demonstrates strong control over knowledge and production structures, enabling it

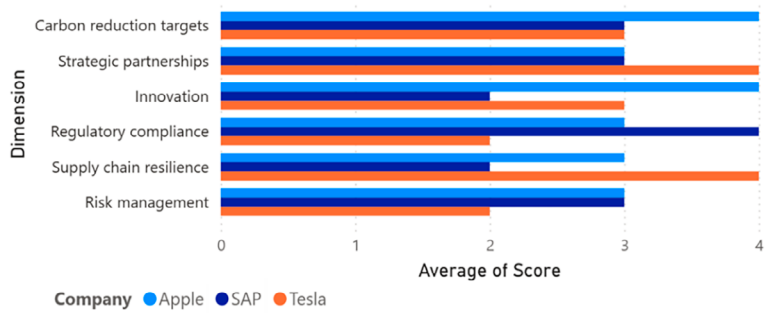


Figure 6. Scorecard average, authors' own contribution



Figure 7. Power BI dashboard preview, authors' specific contribution

to handle regulatory environments more effectively, while bringing tremendous innovation. However, its antitrust problems in the EU and U.S., as well as supply chain dependencies in geopolitically sensitive zones, mainly East Asia, represent geopolitical vulnerabilities.

Tesla ranks second, excelling in electric vehicle technology and clean energy solutions, with a strong focus on innovation in battery technology and autonomous driving. Yet, its challenges in terms of supply chain resilience and risk management derive from labor disputes and geopolitical dependence on China, especially related to critical sourcing of raw materials for battery production (lithium and cobalt augmenting exposure to supply chain vulnerabilities).

SAP holds a slightly lower score, derived mainly from weaker capabilities in terms of innovation and decarbonization. With respect to its innovation efforts, these are comparatively less impactful, holding a more conservative approach to carbon reduction, when contrasted with Apple and Tesla. The company offers stability in regulatory compliance, risk management and strategic partnerships. Boosted by its vast partnerships with major tech companies like Microsoft and Google, SAP's service offerings are truly enhanced.

In terms of profitability for the most recently reported fiscal year, Apple reported $391.04 billion, being the largest by revenue, followed by Tesla with $97.69 billion and SAP with $34.18 billion (Apple Inc., 2024; Tesla, Inc., 2024; SAP SE, 2024).

Thus, it can be concluded that the strengths and weaknesses of each company are shaped by its sector, strategic priorities and market position. Apple dominates in consumer

technology innovation and regulatory compliance, but is challenged by geopolitical tensions. Tesla is the leader of green technology innovation, but must mitigate its internal and geopolitical risks. SAP is a reliable player in enterprise solutions with a strong regulatory track record, but still, it should continue to consolidate its innovation and decarbonization efforts to maintain resource-based advantage.

Overall, these trends align with international findings and demonstrate that companies exposed to geopolitical and economic pressures tend to rethink their internal setups, innovation activities and sustainability priorities. These similarities suggest that the different profiles of Apple, Tesla and SAP are shaped not only by their sector and strategic choices. They also reflect wider patterns identified in recent research on crisis management, environmental innovation and the energy transition. This consistency shows that the comparative framework used in this study is beneficial for understanding how multinational firms deal with complex geopolitical uncertainty.

Consolidation of findings in relation to RQ1 and RQ3 (scorecard)

- **RQ1**

RQ1 focuses on examining how multinational companies vary in their strategic responses to geopolitical risk across key organizational domains, including regulatory engagement, innovation actions, supply chain configuration and risk-management practices.

The findings reveal substantial heterogeneity in how multinational enterprises internalize geopolitical risk at firm level. The scorecard assessment shows that firms diverge notably in emphasizing legal compliance, innovation capabilities, supply chain resilience and risk mitigation. Apple's robust performance demonstrates its capability of harnessing knowledge and production power structures, while Tesla's innovation-led strategy feels constrained by supply chain reliance. SAP's more conservative strategic posture emphasizes the stabilizing influence of compliance alignment and partnership networks. Overall, the evidence confirms that geopolitical risk is not managed evenly, but addressed selectively across strategic dimensions, also depending on company-level capabilities and governance configurations. This evidence directly addresses RQ1, by bringing clear distinctness into how enterprises prioritize regulatory conformity, innovative development and risk control, pressured by geopolitical forces and in the same time, demonstrating how multinational firms show different strategic responses across, governance and supply chain resilience, marked by geopolitical stress (Andrews et al., 2026; Buckley, 2024; Li et al., 2023). In this sense, RQ1 is answered by validating that geopolitical risk management is unevenly distributed across enterprises, emphasizing distinct organizational capabilities rather than a homogeneous approach to adaptation.

- **RQ3**

RQ3 explores whether sector-specific traits influence the way in which companies strategically position themselves and their exposure to the broader geopolitical environment.

It is confirmed through the comparative analysis that sectoral characteristics possess a strong influence on how companies formulate their geopolitical answers. Technology-oriented enterprises benefit from knowledge benefits and increased regulatory adaptability, whereas manufacturing and energy companies experience greater exposure to supply chain disruptions and climate-related policies. Variation in asset structures across sectors, political exposure and innovation magnitude highlight differences in strategic resilience, supporting

the view that geopolitical strategy is fundamentally contoured by industry structure. The distinct character of the industries is noticed, as a response to RQ3, by indicating that sectoral features are of tremendous importance in highlighting corporate-level geopolitical placement, conditioning companies' strategic orientation and susceptibility to geopolitical disruptions (Verbeke & Yuan, 2024; Chatzinikolaou & Vlados, 2026). Consequently, RQ3 is addressed by demonstrating that industry structure, resource specificity and regulatory exposure radically shape how organizations position themselves and formulate strategic responses to geopolitical disruptions.

4.2. Heatmap results and cross-industry decarbonization models

The second analytical dimension of the study highlights the creation of a heatmap, which compares three companies from an interconnected sphere. The selection of companies has been performed based on the similarities of the three of them in terms of energy efficiency, sustainability, renewable energy investments and global operations.

A heatmap represents an analytically robust approach to compare complex sustainability practices within organizations, suitable for IB research characterized by multiple layers of uncertainty.

The main advantage of a heatmap is to visually represent the correlations, patterns and clusters of performance between companies. By using colour gradients, areas of low and high performance are highlighted, which can draw attention to specific areas. In addition, cross-dimensional insights can easily be extracted, by showing correlations between metrics, for example how innovation correlates with decarbonization targets across companies.

The selected companies for the heatmap creation were **Total Energies, Danfoss and General Electric**. The process of data collection was performed by extracting the information from most recent reports and insights on the three companies' energy efficiency and sustainability initiatives.

In order to create the heatmap, firstly the dimensions were chosen, followed by assigning the performance levels, using a 1 to 4 scale, with 1 representing traditional or low impact and 4 representing leader or high impact in each dimension. The scoring system is presented as follows.

1: Traditional approach or low impact in a specific dimension;

2: Moderate focus or impact in a specific dimension, not a leader;

3: Strong focus or significant impact in a specific dimension, approaching leadership;

4: Leader, innovative or highly impactful in a specific dimension.

Similar to the scorecard, the heatmap performance levels imply informed qualitative judgment. Transparency is guaranteed through openly defined scale descriptors, precise scoring rationales and the use of corporate information released to the public.

Next in the process of building, a colour gradient was chosen, using from red (low performance) to green (high performance), but also a sequential colour palette (light to dark shades of one color, in this case yellow as an intermediary colour).

Then, the heatmap was created using **Python** code, in a **Jupyter** environment, for which **Anaconda Navigator** was also needed. The following code was run, as shown in Figure 8.

As stressed in Figure 9, the heatmap was created, displaying clear color-gradient visualization according to performance levels, from low to high.

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Code JupyterLab Python 3 (ipykernel)

[3]:
```
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt

# Data for the heatmap (scores from 1 to 4)
data = np.array([
    [3, 4, 3],
    [2, 4, 3],
    [4, 3, 4],
    [3, 4, 4],
    [3, 4, 4],
    [3, 3, 4],
    [3, 4, 4],
    [3, 4, 4],
])

# Labels for dimensions and companies
dimensions = [
    "Sustainability Focus", "Energy Efficiency Solutions",
    "Global Reach", "Innovation in Green Technologies",
    "Carbon Emission Reduction Targets", "Renewable Energy Investment",
    "Technologies for Decarbonization", "Impact on Carbon Intensity"
]
companies = ["TotalEnergies", "Danfoss", "General Electric"]

# Setting up matplotlib figure
plt.figure(figsize=(10, 8))

# Creating heatmap
ax = sns.heatmap(data, annot=True, cmap="RdYlGn", cbar=True, fmt="d",
                 xticklabels=companies, yticklabels=dimensions, linewidths=0.5)

# Customizing plot appearance
plt.title("Heatmap of Decarbonization Efforts (Scores: 1-4)", fontsize=16, pad=20)
plt.xticks(rotation=43, ha="right", fontsize=11)
plt.yticks(rotation=0, fontsize=11)
plt.tight_layout()

# Displaying heatmap
plt.show()
```

Figure 8. Python code to be run in Jupyter, author's personal input

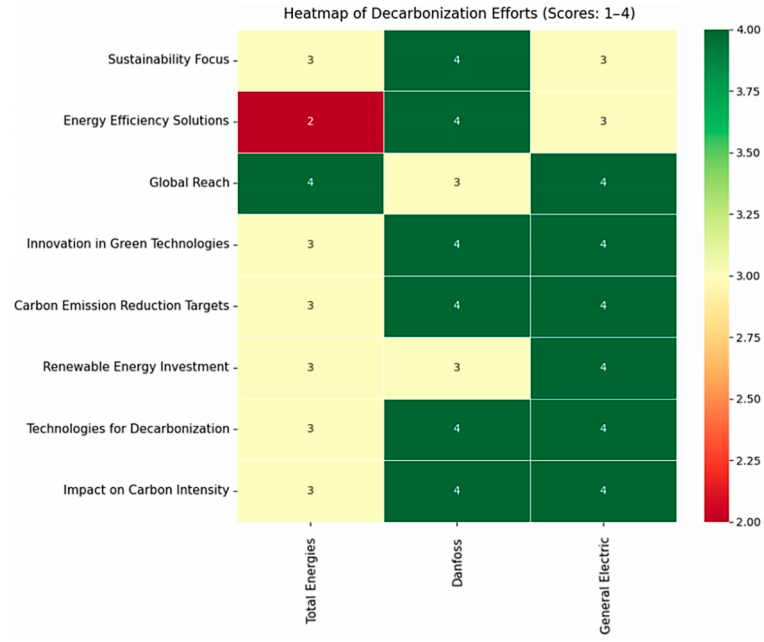


Figure 9. Generated heatmap in Jupyter, author's original contribution

To support interpretive transparency, Table 6 surprises the underlying rationale of the scores for each firm and dimension.

Table 6. Score interpretation and rationale (source: authors' own creation)

Dimension	TotalEnergies	Danfoss	General Electric
Sustainability Focus (Renewables vs. Fossil Fuels)	**3** (strong mix of renewables and fossil fuels)	**4** (focus on energy efficiency, less fossil fuel reliance)	**3** (strong renewable investment but still linked to traditional power)
Energy Efficiency Solutions (Tech-driven vs. Traditional Systems)	**2** (focus on improving traditional systems, e.g., oil & gas)	**4** (leader in energy efficiency tech, e.g., heat pumps, motors)	**3** (focus on efficient power generation and grids)
Global Reach (Regional vs. Global Impact)	**4** (global operations, strong LNG presence)	**3** (global, but more focused on Europe)	**4** (global presence in energy and infrastructure sectors)
Innovation in Green Technologies (Leader vs. Follower)	**3** (leader in offshore wind, carbon capture, LNG)	**4** (cutting-edge in smart grids, heating solutions, energy efficiency)	**4** (leader in wind turbines, energy-efficient tech)
Carbon Emission Reduction Targets	**3** (clear targets for net-zero by 2050, but high reliance on LNG)	**4** (carbon neutral by 2030, strong decarbonization strategies)	**4** (50% emission reduction by 2030, net-zero by 2050)
Renewable Energy Investment	**3** (35 GW of renewable capacity by 2025)	**3** (focus on energy-efficient tech, renewable sector investments)	**4** (substantial investments in wind, hydro, and digital energy solutions)
Technologies for Decarbonization	**3** (carbon capture, LNG, low-carbon technologies)	**4** (energy-efficient technologies, district energy, smart grids)	**4** (wind turbines, carbon capture, digital solutions)
Impact on Carbon Intensity	**3** (12% reduction in carbon intensity of energy products)	**4** (strong impact on decarbonizing industries and buildings)	**4** (leading in wind energy and grid optimization)

The **heatmap patterns** are interpreted in the below **discussion.**

It is clear that he heatmap visuals disclose different decarbonization strategies, framed by companies' inherited assets, technological alignment and geopolitical orientation.

- Total Energies is transitioning from a fossil fuel-based company to a more balanced, multi-energy portfolio. While it has made significant progress in renewable energy and carbon intensity reduction, its reliance on Liquefied Natural Gas (LNG) and oil still affects its decarbonization impact. The firm has ambitious targets for net-zero by 2050 and is heavily investing in low-carbon technologies like carbon capture and LNG as part of its energy transition strategy.
- Danfoss is a clear leader in energy efficiency solutions and decarbonization technologies. Its solutions, such as energy-efficient motors, heat pumps and district heating systems, are essential for reducing emissions in industries and buildings. The company is committed to carbon neutrality by 2030 and focuses on creating innovative technologies that promote sustainability, rather than extracting energy, which underlines its leadership position.

- General Electric (GE) is deeply focused on renewable energy and green technologies like wind turbines, carbon capture and energy-efficient grids. Its commitment to a 50% reduction in carbon emissions by 2030 and net-zero by 2050 reflects its leadership in both traditional power and renewable energy sectors. GE's global impact is vast, with a strong presence in energy infrastructure, power generation and digital solutions. Still, the company's dependence on traditional energy systems restrains its progress from decarbonization leadership, enhancing how habits and inertia may slow down the sustainability efforts.

As a final insight derived from the heatmap, Danfoss is the overall leader in terms of decarbonization, driven by its focused sustainability mission, innovative solutions and early carbon neutrality targets. Then, General Electric shows strength in specific areas like renewables and global reach, but its legacy in traditional systems limits its overall leadership. Nevertheless, Total Energies is making progress, but its heavy reliance on fossil fuels prevents it from leading in decarbonization efforts.

Consolidation of findings in relation to RQ2 (Heatmap)

- **RQ2**

RQ2 scrutinizes how decarbonization is embedded into industry-differentiated strategies for mitigating geopolitical vulnerabilities.

The heatmap analysis supports RQ2 argumentation by mapping sector-specific trends in the way decarbonization is embedded within the geopolitical risk actions of corporations, consistent with recent ESG–geopolitics literature (Abdullah et al., 2024; Hossain et al., 2024; Hou & Qiu, 2025; Sun & Li, 2024; Zhou & Wei, 2025). The results of heatmap analysis illustrate that decarbonization is not uniformly incorporated within geopolitical strategies and it is highly conditioned by sectoral dynamics. Companies which operate closer to energy production and efficiency, such as Danfoss and General Electric, embed decarbonization more centrally into strategic decision-making, while energy incumbents like Total Energies encounter structural constraints arising from legacy assets. The evidence shows that decarbonization operates both as a risk-mitigation instrument and as a strategic positioning lever, reinforcing organizations' competitiveness under geopolitical stress. In effect, this means that RQ2 is answered by underscoring that decarbonization operates as a constraint and as a strategic lever in the same time, with its role differing substantially across sectors in line with legacy assets, technological focus and geopolitical exposure.

5. Conclusions

This paper formulates and deploys a comparative analytical framework, integrating a scorecard and a heatmap to evaluate the strategic responses of multinational corporations with respect to geopolitical stress, with fundamental attention to decarbonization. The qualitative assessment at enterprise level, combined with comparative visualization tools confers a structured exploratory approach, measuring the geopolitical positioning of economic sectors. The manuscript enriches IB theory by converting geopolitical threat and decarbonization into measurable, directional dimensions, while extending structural power theory towards a comparative organizational-level analytical framework.

Broadly, the findings present explicit insights for each research question. Each research question is analyzed independently, supported by different analytical instruments, whereby the scorecard exposes firm-level strategic variation (RQ1 and RQ3) and the heatmap captures cross-industry decarbonization patterns outlined by geopolitical risk (RQ2).

The investigation shows outstanding heterogeneity in organizations' geopolitical strategy (RQ1), reflects disparities in decarbonization integration across sectors (RQ2) and attests the relevance of sectoral traits in framing strategic orientation (RQ3).

Relative to prior literature, frequently grounded in conceptual debates or isolated case studies, this paper provides a visualization-based framework supporting cross-industry and cross-corporate analysis in the light of geopolitical and sustainability practices.

The practical implications of the findings are multiple. From a **theoretical point of view**, the manuscript links structural power theory and the knowledge-driven perspective of the businesses by shaping abstract ideas into quantifiable dimensions. **From a managerial perspective**, the scorecard and heatmap highlight geopolitical blind spots by providing decision-support tools that allow executives to identify geopolitical vulnerabilities, prioritize strategic investments in innovation and decarbonization and compare their firms' performance against peers exposed to similar geopolitical dynamics. Viewed though the **public policy** lens, the findings emphasize the criticality of transparent regulation and international cooperation regarding the guidance of business reactions to geopolitics and climatic barriers.

Overall, this study enriches IB research by developing one of the first comparative, visualization-based frameworks that integrate geopolitical risk and decarbonization at organizational level. Furthermore, the paper contributes to the international business literature by operationalizing geopolitical risk and decarbonization into a structured comparative framework, applicable across industries and geopolitical contexts.

6. Limitations and future research

The actual study is subject to certain limitations. The scorecard and heatmap rely on informed qualitative judgment, despite the utilization of standardized criteria and transparent scoring rationales. Future research could further improve the robustness of the framework through inter-rater validation, by involving multiple independent researchers in the scoring process to evaluate the consistency of their assessments.

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