The Role of Geopolitical Uncertainty on Shaping Carbon Neutrality Policy: Moderating Influence of Digital Transformation

Abstract

Climate change compels organisations to pursue carbon neutrality, yet recent global uncertainties—such as the COVID-19 pandemic, geopolitical tensions, and trade tariffs—have prompted many to reassess these strategies. Empirical evidence on how geopolitical uncertainty affects carbon neutrality policies and their financial implications is limited. Simultaneously, digital transformation is increasingly leveraged to support sustainability initiatives. Drawing on contingency theory, this study examines the impact of geopolitical uncertainty on carbon neutrality policies and their capacity to generate competitive advantage, while assessing the moderating role of digital transformation on the link between these policies and organisational performance. The study focuses on French wine producers, who are revisiting carbon neutrality strategies amid geopolitical tensions and U.S. tariffs on European wine imports. Survey data from 225 senior managers were analysed using *factor-based partial least squares structural equation modelling*. Results indicate that geopolitical uncertainty undermines carbon neutrality policies, whereas these policies enhance both market and financial performance. Moreover, digital transformation strengthens the link between carbon-neutrality initiatives and performance outcomes. Findings underscore the utility of *contingency theory* for understanding how situational factors influence organisational policy and performance, providing practical guidance for the European wine industry and policymakers in navigating carbon-neutrality objectives under geopolitical uncertainty. The study also offers a foundation for future research on the competitive impact of carbon neutrality across European sectors.

Keywords: Carbon Neutrality, Geopolitical Uncertainty, Digital Transformation, Contingency Theory, Wine-making industry

1. Introduction

Climate change is increasingly evident in its harmful effects on our planet, as evidenced by extreme weather events and environmental shifts (Ebi et al., 2021; Wanke et al., 2021; Bolan et al., 2024). We are witnessing an alarming rise in the frequency and intensity of floods that devastate communities, prolonged droughts that threaten food security, and severe heatwaves that put human health at risk (Calculli et al., 2021). Additionally, unpredictable cloudbursts cause sudden, dangerous flash flooding, while landslides in mountainous regions disrupt lives and infrastructure (Chandel et al., 2025). One of the most concerning aspects of climate change is the rise in sea levels, which poses a significant threat to coastal cities and ecosystems (Schoeman et al., 2023). To combat these pressing challenges and curb the trajectory of global warming, the Intergovernmental Panel

on Climate Change (IPCC) has outlined a crucial target: to restrain the increase in global average temperatures to no more than 1.5 °C above pre-industrial levels by 2050 (Schaeffer et al., 2025). Achieving this goal is essential for reducing the severity of climate-related impacts and ensuring a sustainable future for generations to come (Hansen et al., 2025).

To effectively combat climate change, achieving carbon neutrality has become a fundamental goal for an increasing number of nations (Zhang et al., 2022; Belhadi et al., 2024; Pan & Jiang, 2025). Carbon neutrality is defined as maintaining a precise balance between the carbon dioxide emitted and the amount absorbed from the atmosphere through natural and artificial carbon sinks, such as forests, oceans, and soil (Khan et al., 2022; Zhao et al., 2022; Skrzypczak et al., 2025). The process of carbon sequestration is crucial in this context; it involves actively removing carbon dioxide from the atmosphere and securely storing it to prevent its re-entry (Chen et al., 2024; Callegari et al., 2024; Bag et al., 2024; Yang et al., 2025). This can be accomplished through various methods, including afforestation (planting trees), reforestation (restoring forests), and technological innovations such as direct air capture and the development of carbon capture and storage (CCS) systems (Wang et al., 2022). To achieve net zero emissions, a state in which the total greenhouse gases emitted are equal to the total removed from the atmosphere, nations must ensure that every ton of greenhouse gas (GHG) emitted is effectively counterbalanced by an equivalent amount of carbon sequestered (Fankhauser et al., 2022; Mo et al., 2023; Nureen & Nuță, 2024). This ambitious goal necessitates global cooperation, significant investments in renewable energy, and widespread adoption of sustainable practices to mitigate the impacts of climate change for future generations.

Geopolitical uncertainties often arise from rising tensions between two or more nations (Dogan et al., 2021). These tensions can take multiple forms, including military confrontations, trade disputes, and the imposition of economic sanctions (Teece, 2022). Such conflicts typically trigger cascading effects that disrupt domestic economies and reverberate throughout the global economic system (Ivanov & Dolgui, 2025). For example, military conflicts can result in the loss of human capital, destruction of infrastructure, and the diversion of resources away from productive uses, severely constraining economic growth (Pereira et al., 2022). Trade wars, characterised by tariffs and restrictions on imports and exports, can disrupt supply chains and increase costs for businesses and consumers alike (Blessley & Mudambi, 2022; Auruškevičienė et al., 2025). Similarly, economic sanctions, designed to penalise nations for specific actions, can hamper economic development and inflict widespread hardship on civilian populations (Peksen, 2021). In an increasingly interconnected global economy, these effects extend beyond national borders, influencing global markets, investment patterns, and international relations (Luo, 2024; Benito et

al., 2022). Understanding the mechanisms through which geopolitical tensions impact economic and organisational behaviour is therefore essential for both policymakers and business leaders (Gur & Dilek, 2023). Recent research suggests that geopolitical uncertainty has significant implications for the implementation of environmental policy, particularly for carbon-neutrality initiatives (Liu & Lü, 2023). As nations navigate complex international tensions and economic disruptions, organisations and governments are often compelled to reprioritise their agendas (Zeng et al., 2022; Pata et al., 2023). This reprioritisation tends to emphasise short-term survival and economic stability over long-term sustainability goals (Acheampong et al., 2023). Consequently, stakeholders may adopt strategies that ensure immediate resilience but compromise their commitment to achieving carbon neutrality (Komninos & Panori, 2025).

The impact of geopolitical uncertainty on organisations' carbon-neutrality policies is largely unexplored. Most existing research has focused on economic or political outcomes, leaving a theoretical gap in understanding how global tensions affect corporate sustainability strategies (Feng et al., 2024; Bakhsh et al., 2024). Furthermore, the complex ways in which political changes, trade restrictions, and international conflicts influence organisational decision-making regarding carbon neutrality remain poorly understood (Wu & Hussain, 2025). This underscores the need for research on the relationship between geopolitical uncertainty and environmental strategy. As companies face increasing pressure to meet sustainability commitments amid volatile global conditions, understanding these interactions becomes crucial. Addressing this gap will yield insights on balancing short-term resilience with long-term carbon-neutrality goals. To explore this further, we propose the following research question:

RQ1: What are the effects of geopolitical uncertainties on the carbon neutrality policies of organisations?

The organisation's commitment to carbon neutrality significantly influences market dynamics and financial performance (Zhang et al., 2023; Chevrollier et al., 2024). By adopting policies such as reducing greenhouse gas emissions and investing in renewable energy, the organisation not only aids environmental preservation but also attracts eco-conscious consumers and investors (Qing et al., 2024). These strategies can enhance brand loyalty, provide a competitive edge, and boost profits, all while fostering sustainable market trends (Adediran & Swaray, 2023; Zhang et al., 2024). While research on carbon neutrality policies is well established (Hussain et al., 2023), a gap remains in understanding how these policies directly affect organisational performance (Zhang et al., 2025). Some studies indicate that such initiatives can improve reputation and stakeholder engagement (Xie et al., 2023; Zhang et al., 2023), but the direct link to measurable outcomes such as profitability and productivity remains unclear (Boiral et al., 2025; Raj et al., 2025).

This prompts further investigation into the specific strategies for achieving carbon neutrality and their effects across different industries. Thus, we propose the following research question:

RQ2: What are the effects of the carbon neutrality policies of the organisation on the market performance and financial performance of the organisation?

Digital transformation has significantly improved the effectiveness of carbon-neutrality policies (Zhou et al., 2025; Bag et al., 2025; Guo & Zhao, 2025). By integrating advanced technologies, the organisation has streamlined operations and enhanced data analytics (Zheng et al., 2024; Lin, 2025; Barros Telles do Carmo et al., 2025). This transformation enables more accurate tracking of carbon emissions and the implementation of targeted mitigation strategies (Singh & Modgil, 2024; Fatorachian & Kazemi, 2025). Consequently, the positive impacts of these initiatives are increasingly reflected in overall organisational performance and in the organisation's commitment to sustainability. However, the interaction between digital transformation and the relationship between carbon-neutrality policies and performance remains poorly understood (Wang et al., 2025). This highlights the need for further investigation into how digital technologies affect sustainability initiatives and overall business success. Therefore, we propose the following research question:

RQ3: How does the organisation's digital transformation capability moderate the paths linking the carbon neutrality policy to market performance/financial performance?

To investigate our research questions, we apply contingency theory (Lee & Miller, 1996; Sousa & Voss, 2008; Maletič et al., 2018) to understand the complex relationship between carbon neutrality policy adoption and the contextual factors that influence its implementation. Specifically, we examine how geopolitical uncertainties, such as international conflicts, natural disasters, trade wars, and global pandemics, affect the development of these initiatives. Our study focuses on French wine producers who have adopted carbon-neutrality policies in line with the Bourgogne Wine Board's (BIVB) ambitious goals for the industry (Becker et al., 2020). By analysing their experiences and strategies, we aim to reveal how external pressures and local responses impact sustainable practices in the wine sector. The manuscript is organised as follows (see Thatcher & Fisher, 2022): the second section develops the theory and research hypotheses; the third section describes our research design; the fourth section presents the statistical analysis and findings; and the fifth section discusses the theoretical implications, relevance for practitioners and policymakers, limitations, and future research suggestions. We conclude the study in the final section.

2. Theory Development and Research Hypotheses

To comprehend the ways in which geopolitical conflicts can influence an organisation's carbon neutrality policy, we turn to the lens of contingency theory. Contingency theory (CT) enables us to analyse how various policies and process outcomes are shaped by the unique circumstances of each situation (Levitt et al., 1999; Sousa & Voss, 2008; Taylor & Taylor, 2014; Csaszar & Ostler, 2020). For instance, when a geopolitical crisis occurs—such as trade disputes, military conflicts, or diplomatic tensions—companies may experience disruptions to their operations or have their supply chains affected (Li et al., 2022; Roscoe et al., 2022; Kano et al., 2022; Bai et al., 2025). This, in turn, can lead to a re-evaluation of sustainability initiatives, including those aimed at achieving carbon neutrality (Voumik et al., 2024; Wang et al., 2025). By applying contingency theory, we can better understand the nuanced responses organisations may adopt in the face of these challenges, ultimately illustrating how external factors dictate their strategic decisions regarding environmental policies. Drawing on Luthans & Stewart (1977), we have developed a theoretical framework (see Figure 1) to explain how geopolitical uncertainty (GPU) affects organisations' adoption of carbon neutrality policies (CNP). These policies are crucial for enhancing overall organisational performance by aligning sustainability objectives with business strategies. Our framework also explores the role of digital transformation capabilities (DT) within organisations, analysing how these capabilities can enhance or moderate the relationship between carbon neutrality initiatives and both market performance, reflected in competitive positioning and customer engagement, and financial performance, measured through profitability and cost efficiency. By integrating these elements, we aim to provide a clearer understanding of how external uncertainties impact strategic sustainability efforts in a rapidly changing economic environment.

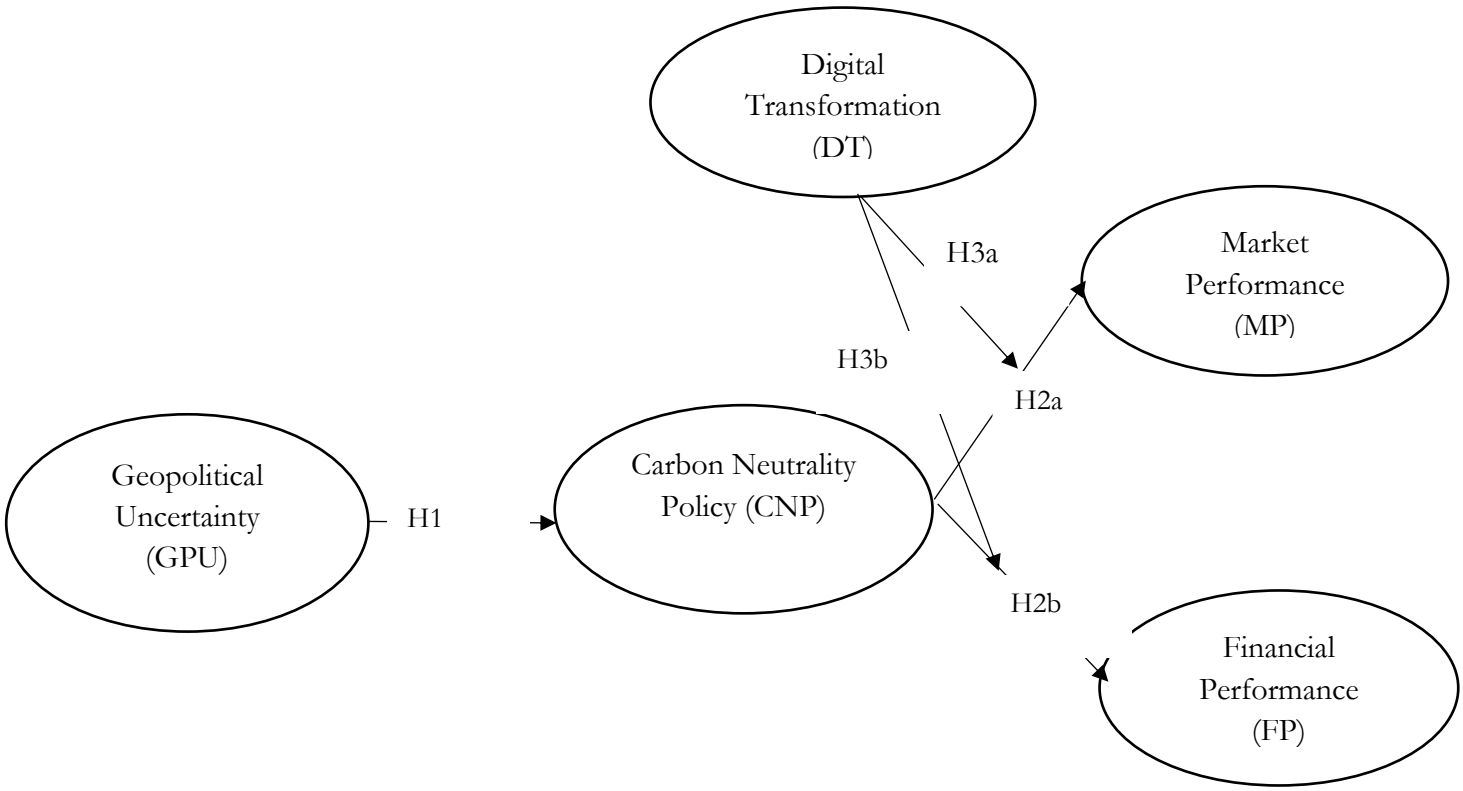

Figure 1: Theoretical Framework

2.1 Geopolitical Uncertainty and Carbon Neutrality Policy

The current landscape of geopolitical uncertainty has led to a substantial increase in unpredictability, significantly impacting organisations across various sectors (Zheng et al., 2025). As nations continually adjust their trade policies, particularly concerning tariffs, businesses are compelled to navigate these complex and shifting regulations (Zahoor et al., 2023). Moreover, the ongoing conflict between Russia and Ukraine has intensified these challenges, creating ripple effects felt in international markets and supply chains (Sun et al., 2024). Alongside this, escalating tensions involving countries such as Iran and Israel, as well as broader conflicts in the Middle East, contribute to a climate of instability (Jawadi et al., 2024). These geopolitical dynamics exert immense pressure on organisations to reassess their CNP, as they must not only meet regulatory requirements but also address public and stakeholder expectations around sustainability (Guo et al., 2024). The need for comprehensive strategies that reconcile economic goals with environmental responsibility has never been more urgent in this turbulent context (Ayadi et al., 2025). The growing

complexities and uncertainties in global geopolitics are prompting organisations to reassess their carbon neutrality policy (Javed et al., 2025). These shifting dynamics can lead to heightened awareness and an urgent re-evaluation of sustainability practices as businesses recognise the importance of demonstrating environmental responsibility amid fluctuating political landscapes (Alnafrah, 2024). By reassessing their approaches to carbon neutrality, organisations can not only enhance their reputation but also align themselves with the increasing demand for sustainable practices from consumers, investors, and regulatory bodies (Boiral et al., 2024). Hence, we can hypothesise based on preceding debates as:

H1: The rise in geopolitical uncertainty (GPU) has a positive impact on the organisation's carbon neutrality policy (CNP), enabling it to navigate instabilities caused by delays in investment decision-making for decarbonisation and clean technologies.

2.2 Carbon Neutrality Policy and Market Performance/Financial Performance

Organisations that adopt a carbon neutrality policy in response to geopolitical uncertainties can significantly enhance their market reputation (Liu & Lü, 2023; Zhang et al., 2024). By committing to sustainable practices, they not only showcase their dedication to environmental responsibility but also mitigate potential risks associated with global instability (Alnafrah, 2024). This strategic approach helps build trust and loyalty among consumers, ultimately improving brand image (Lee, 2023; Sgroi et al., 2023). Consequently, these organisations are likely to attract a broader customer base and increase their market share in an increasingly competitive landscape (Zhang et al., 2023; Barisan et al., 2024; Bag et al., 2025). Based on these arguments, we can hypothesise that:

H2a: The organisation's carbon neutrality policy, particularly during geopolitical uncertainty, has a positive impact on its market performance.

The carbon neutrality policy serves as a crucial framework for organisations, particularly amid geopolitical uncertainties (Javed et al., 2025). This policy encourages companies to thoroughly evaluate their investments in environmentally friendly cleaning technologies, exploring innovative solutions that not only align with their sustainability objectives but also enhance their overall financial health (Mutascu et al., 2024; Luqman et al., 2024). In response to fluctuating market conditions, organisations are encouraged to adopt alternative, cost-effective methods that can streamline operations and reduce expenses (Bhatia et al., 2024). For example, the integration of advanced cleaning systems that utilise eco-friendly materials may lead to significant savings in both time and resources (Rath et al., 2021). By implementing these technologies, companies can optimise their cleaning processes while maintaining or enhancing their profit margins (Chu et al., 2024). Moreover, this proactive approach ensures that the pursuit of financial gain does not come at the

expense of the organisation's commitment to carbon neutrality (Guntuka et al., 2024). By striking the right balance between cost reduction and environmental responsibility, businesses can enhance their financial performance while making meaningful contributions to achieving carbon neutrality goals (Zameer et al., 2021; Tang & Li, 2023). Hence, we can hypothesise it as:

H2b: A carbon neutrality policy of organisations has a positive impact on the financial performance of the organisation.

2.3 Moderating effect of digital transformation on the paths joining the carbon neutrality policy and market/financial performance

The implementation of digital transformation capabilities plays a crucial role in addressing information asymmetry within organisations (Wang et al., 2025; Singh, 2025). By leveraging advanced technologies and data analytics, businesses can gain clearer insights into their operations, market dynamics, and environmental impacts (Han et al., 2025). This enhanced understanding not only bridges information gaps but also amplifies the effectiveness of carbon neutrality policies (Koh et al., 2023). As a result, organisations are better equipped to meet carbon-neutrality goals, improve operational efficiency, and ultimately boost their overall performance in a competitive market (Zhang et al., 2024). The ability to embrace digital transformation can significantly amplify the positive effects of carbon neutrality policies on both market and financial performance (Chen & Guo, 2025). By integrating advanced technologies such as data analytics, artificial intelligence, and automation, organisations can streamline their operations, optimise resource usage, and improve decision-making processes (Warner & Wager, 2019; He et al., 2024; Barros Telles do Carmo et al., 2025). Hence, based on these arguments, we hypothesise it as:

H3a: The digital transformation has a positive effect on the path to carbon neutrality and market performance.

H3b: The digital transformation has a positive and significant effect on the path to carbon neutrality and financial performance.

3. Research Design

This research project utilises a survey-based methodology to test the proposed research hypotheses (Rungtusanatham et al., 2003; Scheaf et al., 2023). The survey is specifically designed to gather valuable insights from senior managers working in vineyards, focusing on their roles across critical areas such as marketing, product development, communication strategies, and administrative and financial management. To support this research, the Bourgogne Wine Board (BIVB), a distinguished professional organisation representing the interests of wine producers throughout the Burgundy region of France, graciously provided a comprehensive list of local wine producers

and their contact information (Estreicher, 2023). This collaboration was established after the BIVB representatives gained a clear understanding of the research objectives and their significance to the wine industry. By doing so, the study aims to capture a detailed, nuanced perspective on the challenges and practices faced by these senior managers in the competitive wine market.

3.1 Empirical Context

In our study, we focused on the French wine industry, which has historically been a cornerstone of both the French and broader European economies (Estreicher, 2023). The BIVB, a key organisation in this sector, has set an ambitious goal to achieve carbon neutrality by the year 2030, underscoring its commitment to sustainability and environmental responsibility (Becker et al., 2020). However, the industry faces significant challenges that threaten its progress. Recently imposed U.S. trade tariffs on imported wines have created financial barriers for many French producers, affecting their competitiveness in one of their largest export markets (Anderson & Wittwer, 2025). Compounding these issues, the ongoing conflict between Russia and Ukraine has disrupted global energy supplies, leading to soaring energy costs that directly impact production (Colgan et al., 2023). As a result of these geopolitical tensions, inflation has further increased winemakers' operational expenses (Le Monde, 2025). Considering these complex challenges, the French wine industry is now undertaking a critical reassessment of its objectives for carbon neutrality (Bouzdine-Chameeva et al., 2025). This strategic evaluation aims to ensure that, despite the tumultuous external environment, the industry remains competitive and continues to thrive in a rapidly changing global marketplace.

3.2 Measures

The empirical study consisted of two comprehensive stages (Hensley, 1999; Chan et al., 2016). The first stage involves conducting qualitative interviews, and the second stage entails data collection using a pre-tested instrument.

3.2.1 Qualitative Interviews and Construct Operationalisation

Initially, we conducted qualitative interviews to gain a deep understanding of the carbon-neutrality goals set by various wine producers. This exploration focused on how geopolitical uncertainties, such as the introduction of trade tariffs, the ongoing Russia-Ukraine war, and the broader implications of climate change, have shaped their commitment to these goals and informed their strategies for navigating the current uncertainties in the geopolitical landscape. The qualitative interviews comprised 19 semi-structured conversations, each lasting 30-75 minutes (Table 1). The interview process was thoughtfully divided into three distinct parts to facilitate an in-depth

exploration of the topics. In the first segment, we delved into participants' interpretations of carbon-neutrality objectives. We also examined how various geopolitical uncertainties have affected their operational frameworks and strategic decision-making. As part of this exploration, we identified specific measures that organisations have implemented to maintain their competitive edge during these challenging times while ensuring that their pursuit of carbon neutrality remains a priority. The second phase of our study concentrated on rigorously testing our research hypotheses. We sought to quantify the influence of geopolitical uncertainties on organisational carbon neutrality policies. Additionally, we assessed the ramifications of any adjustments made to these policies on market positioning and financial performance. Another key focus was the extent of reliance on diverse digital technologies, which play a critical role in enhancing digital transformation initiatives within these organisations. We aimed to understand how these technologies can enhance operational efficiency and drive progress toward carbon-neutrality goals. To ensure the reliability and validity of our findings, we meticulously pretested our measurement instrument. This process was essential for verifying that the survey items accurately encapsulate the core essence of our research objectives, thereby minimising potential ambiguity and enhancing the clarity of our study's outcomes.

We have *operationalised* our key constructs essential for our analysis: geopolitical uncertainty (GPU), carbon neutrality policy (CNP), digital transformation (DT), market performance (MP), and financial performance (FP). A critical review, insights from qualitative interviews, and feedback from pre-testing informed this process. Each of these constructs has been operationalised as a reflective construct, meaning they represent the underlying latent variables we are measuring. To evaluate these constructs, we used a 7-point Likert scale that allowed respondents to express their opinions and experiences on a scale from "*strongly disagree*" to "*strongly agree.*" This method ensures a nuanced understanding of how these factors interact and contribute to our overall findings.

Table 1: Scale for Measurement

Scale	Items	Literature
Geopolitical Uncertainty (GPU)	Our cost of production has increased due to the Russia-Ukraine war	Auruškevičienė et al. (2025)
	The trade tension between the USA and China has affected our business	
	Climate change often impacts the harvest time of grapes	
	The COVID-19 crisis has brought significant changes in consumer habits	
Carbon Neutrality Policy (CNP)	We calculate the carbon footprint by identifying all sources of emissions.	Zhao et al. (2022)
	We have developed a mechanism to reduce carbon emissions.	

	We have planted trees near our processing centres to offset the uncontrollable carbon emissions.	
	We communicate our efforts towards carbon neutrality with our stakeholders.	
Digital Transformation (DT)	We increasingly rely on digital technologies to assist us in our daily tasks.	Warner & Wager (2019); Festa et al. (2025); Barros Telles do Carmo et al. (2025)
	We believe that adopting digital technologies on farms will enable more effective monitoring of grape harvesting in the vineyard.	
	We rely on digital technologies to track the carbon footprint.	
	We continuously train our staff to develop skills for adopting digital technologies across all areas of our business.	
	We believe that digital technologies can help identify the dynamic changes in the external environment, enabling us to make informed decisions in response to these changes.	
Market Performance (MP)	Our carbon neutrality policy helps to increase the sales of our product.	Sgroi et al. (2023) ; Barisan et al. (2024)
	Our customers value our commitment to environmental protection and are willing to pay a premium for select products.	
	We strictly adhere to the guidelines set by the French Agency for Food, Environment, and Occupational Health & Safety (ANSES), which prohibit the use of glyphosate for pest treatment.	
	In the midst of geopolitical uncertainty, we have expanded our market base.	
Financial Performance (FP)	Our carbon neutrality policy has helped improve the return on investment (ROI).	Zhang et al. (2023)
	Our carbon neutrality policy help manage the working capital of the organisation.	
	Our carbon neutrality policy has helped improve the firm's operating profit (EBITDA).	
	Our carbon neutrality policy has helped improve our profit margin.	
	Our carbon neutrality policy has improved the average return on sales (ROS)	
	Our carbon neutrality policy help maintain the working capital of the firm (WC).	

3.2.2 Sampling Design and Data Collection

France is well-known for its wine industry, which includes over 38,000 wine producers. Among these, the Bordeaux region is the leading wine-producing area. In the first week of November 2024, we distributed a questionnaire via email, following Dillman's (2011) total design method. After three rounds of follow-ups with respondents, we collected 225 usable responses by July 2025. To minimise potential bias, we employed a key respondent approach for our study.

Following the recommendations of Kock & Hadaya (2018), we determined that a sample size of 160 responses could be achieved at a power level of 0.8 using the inverse square root method, and 146 responses could be achieved using the gamma-exponential method (see Figure 2). Therefore, our sample size of 225 is considered satisfactory for statistical analysis using the factor-based PLS-SEM tool, as suggested by Kock (2024). We analysed data from French wine producers, which vary significantly by organisational size, as determined by annual revenue and the number of employees in these enterprises. We categorised these businesses into four classes: micro, small, medium, and large (see Figure 3). Our sample consisted of 133 microenterprises (59.11%), 9 small enterprises (4%), 68 medium enterprises (30.22%), and 15 large enterprises (6.67%).

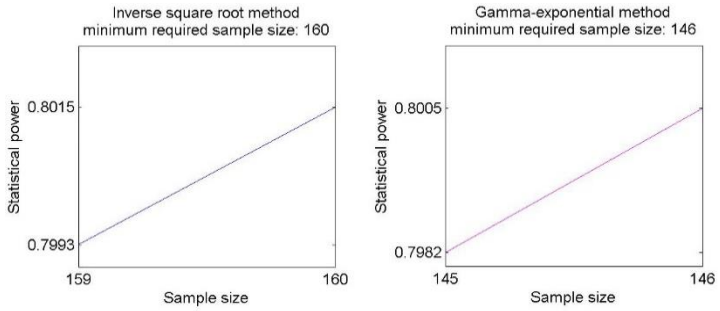

Figure 2: Minimum Sample Size (source: Kock & Hadaya, 2018)

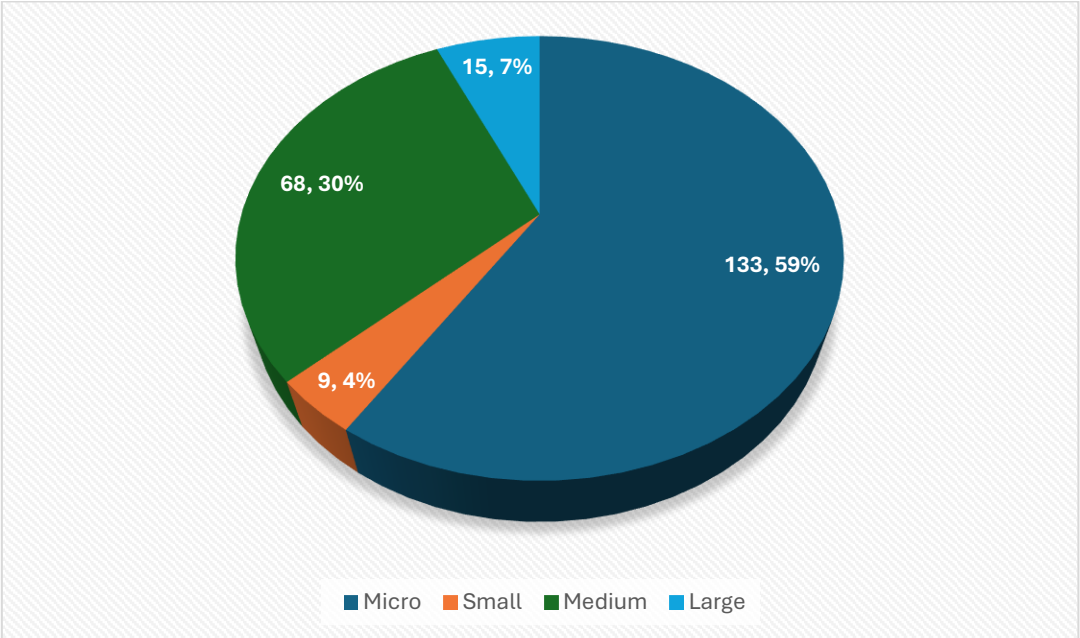

Figure 3: Demographic Profile

3.3 Non-Response Bias Test

In recent years, the response rate for survey-based research has shown a concerning decline, posing a substantial challenge to the validity and reliability of study findings (Scheaf et al., 2023). This decrease in participation can lead to a lack of diverse opinions and experiences represented in the data, ultimately skewing the results and undermining the conclusions drawn from the research (Miller, 2017; Stedman et al., 2019). The implications of this trend are far-reaching, as they can compromise the quality of insights gained and hinder researchers' ability to make informed decisions based on accurate information (Wagner & Kemmerling, 2010). In this study, we adopted the methodology outlined by Wagner & Kemmerling (2010) and decided to hire a local intern to assist with follow-up communications, ensuring we could effectively reach all participants. Given that the authors have limited proficiency in the French language, enlisting a French-speaking intern became essential. This intern's primary responsibility was to contact respondents who had not yet submitted their surveys and encourage their participation. Before proceeding with the hiring of the intern, we made it a priority to clearly outline all relevant guidelines and protocols. This included a comprehensive briefing on data privacy and ethical considerations to guarantee that respondents' anonymity would be rigorously protected. We emphasised that under no circumstances would the data be misappropriated, ensuring that the integrity of the survey process and the confidentiality of participant information remained a top priority throughout the study.

We conducted a comprehensive wave analysis on our dataset, adhering to the guidelines established by Armstrong & Overton (1977). For this analysis, we systematically organised our data into two distinct columns. The first column comprised data collected from December 2024 to March 2025, while the second column included data gathered from April 2025 to July 2025. To evaluate potential differences between these two time frames, we performed a t-test. The results of our analysis revealed that the p-value exceeded 0.1 across all measured items, indicating a lack of statistically significant differences. This finding suggests that non-response bias does not present a significant issue in the context of this study, thereby reinforcing the reliability of our results.

4. Data Analysis

We employed WarpPLS 8.0 for our data analysis, a sophisticated software tool designed for conducting Partial Least Squares Structural Equation Modelling (PLS-SEM). This version of WarpPLS integrates both factor-based PLS-SEM methodologies as proposed by Kock (2024) and provides consistent output that enhances the reliability of the results (Henseler & Schuberth, 2025). Traditional PLS-SEM, originally developed by Wold (1974), has gained widespread acceptance and application across numerous academic disciplines. Researchers in fields such as entrepreneurship

(e.g., Manley et al., 2021), strategic management (e.g., Sarstedt et al., 2014), operations management (e.g., Peng & Lai, 2012; Akter et al., 2017), marketing (e.g., Hair et al., 2011; Guenther et al., 2023), and human resource management (e.g., Ringle et al., 2020) frequently utilise this methodology due to its flexibility in modelling complex relationships between variables. Kock (2024) highlights that while traditional PLS-SEM offers significant advantages over covariance-based Structural Equation Modelling (CB-SEM)—notably in its adaptability to different research contexts and data conditions—it does have its drawbacks. One major limitation is that it often overlooks measurement errors, which can lead to biased and inconsistent results (Evermann & Rönkkö, 2023). In light of these criticisms, researchers such as Dijkstra & Henseler (2015) and Kock (2019, 2024) have introduced advanced PLS-SEM approaches. These extended methods aim to rectify the inaccuracies associated with traditional PLS-SEM, providing researchers with more robust tools to conduct reliable and precise analyses in their studies. In the following sections, we will present confirmatory factor analyses to validate the structure of our proposed model. We will also discuss our hypothesis testing. This thorough examination will help us evaluate the validity of our theoretical framework and the strength of our findings.

4.1 Measurement model

All item loadings in our analysis have been found to exceed the threshold of 0.5, indicating that each item is a significant contributor to its respective construct. Additionally, the scale composite reliability (SCR) values for the constructs are all above 0.7, suggesting a high level of internal consistency among the items within each construct. Furthermore, the average variance extracted (AVE) for each construct exceeds 0.5, indicating that the underlying construct accounts for a substantial proportion of the variance in the items. As detailed in Table 2, these findings align with the criteria established by Fornell & Larcker (1981), which assert that for constructs to possess convergent validity, the factor loadings should be greater than 0.5, the SCR should exceed 0.7, and the AVE should be greater than 0.5.

Table 3 provides an in-depth analysis, revealing that the square root of the Average Variance Extracted (AVE) for each construct, as represented by the values along the leading diagonal, exceeds the inter-construct correlation values found in the respective rows and columns. This critical statistical relationship underscores the capacity of each construct to maintain its distinctiveness from the other constructs within the model, thereby affirming adequate discriminant validity in accordance with the established criteria proposed by Fornell & Larcker (1981). Beyond the recommendations provided by Fornell & Larcker (1981), we have also included a comprehensive cross-loading matrix (refer to Table 4) in line with the suggestions put forth by

Gefen et al. (2000, c.f. Liang et al., 2007). An examination of Table 4 reveals that each measurement item exhibits a significantly higher loading on its designated construct compared to its loadings on alternative constructs. This observation strengthens the case for both convergent and discriminant validity, illustrating that each item appropriately aligns with its intended construct. Moreover, we have highlighted the Heterotrait-Monotrait Ratio (HTMT) values in Table 5. According to the guidelines established by Henseler et al. (2015), HTMT values should ideally be less than 0.85 and not exceed 0.9. The HTMT values presented in Table 5 are well beneath the threshold of 0.8, thereby reinforcing the assertion that the constructs possess sufficient discriminant validity. Overall, based on these evaluations, we can confidently assert that the constructs of the theoretical model depicted in Figure 1 meet all necessary criteria for both convergent and discriminant validity. Consequently, we conclude that the constructs exhibit robust construct validity, supporting the integrity and relevance of the measurement framework utilised in this research.

Table 2: Factor Loadings (λi), Scale Composite Reliability (SCR) and average variance extracted (AVE)

Construct	Items	Factor Loadings (λi)	Variance (λi^2)	Error ($1-\lambda i^2$)	SCR	AVE
Geopolitical uncertainty (GPU) (α=0.94)	GPU1	0.93	0.86	0.14	0.96	0.86
	GPU2	0.93	0.86	0.14		
	GPU3	0.93	0.86	0.14		
	GPU4	0.92	0.85	0.15		
Carbon neutrality policy (CNP) (α=0.78)	CNP1	0.76	0.58	0.42	0.86	0.60
	CNP2	0.76	0.57	0.43		
	CNP3	0.79	0.63	0.37		
	CNP4	0.79	0.63	0.37		
Digital transformation (DT) (α=0.81)	DT1	0.71	0.50	0.50	0.88	0.66
	DT2	0.85	0.73	0.27		
	DT3	0.83	0.69	0.31		
	DT4	0.84	0.71	0.29		
Market performance (MP) (α=0.79)	MP1	0.61	0.37	0.63	0.88	0.65
	MP2	0.88	0.77	0.23		
	MP3	0.90	0.82	0.18		
	MP4	0.81	0.65	0.35		
Financial performance (FP) (α=0.83)	FP1	0.84	0.70	0.30	0.88	0.61
	FP2	0.84	0.70	0.30		
	FP3	0.84	0.71	0.29		
	FP4	0.75	0.56	0.44		
	FP5	0.59	0.35	0.65		

Note: a (Cronbach's alpha), SCR (Scale Composite Reliability), AVE (Average Variance Extracted)

Table 3: Correlation among the constructs

	GPU	CNP	DT	MP	FP
GPU	**0.93**				
CNP	-0.11	**0.78**			
DT	-0.15	0.50	**0.76**		
MP	0.03	0.29	0.52	**0.75**	
FP	0.02	0.33	0.59	0.53	**0.78**

Note: GPU-Geopolitical Uncertainty; CNP-Carbon Neutrality Policy; DT-Digital Transformation; MP-Market Performance; FP-Financial Performance

Table 4: Item Loadings and Cross Loadings

	GPU	CNP	DT	MP	FP	Type (a	SE	P value
GPU1	**0.93**	0.03	-0.01	0.05	-0.03	Reflect	0.056	<0.001
GPU2	**0.93**	-0.02	-0.01	0.06	0.00	Reflect	0.056	<0.001
GPU3	**0.93**	0.01	0.02	-0.04	0.00	Reflect	0.056	<0.001
GPU4	**0.92**	-0.02	0.00	-0.07	0.03	Reflect	0.056	<0.001
CNP1	-0.01	**0.76**	-0.02	0.04	-0.04	Reflect	0.058	<0.001
CNP2	-0.12	**0.76**	-0.11	0.10	-0.15	Reflect	0.058	<0.001
CNP3	0.13	**0.79**	0.07	-0.10	0.09	Reflect	0.058	<0.001
CNP4	0.00	**0.79**	0.06	-0.04	0.09	Reflect	0.058	<0.001
DT1	-0.10	0.17	**0.71**	0.05	-0.15	Reflect	0.059	<0.001
DT2	0.00	-0.04	**0.85**	-0.22	-0.04	Reflect	0.057	<0.001
DT3	0.08	-0.07	**0.83**	-0.12	0.15	Reflect	0.057	<0.001
DT4	0.03	-0.09	**0.84**	-0.02	0.11	Reflect	0.057	<0.001
DT5	-0.03	0.07	**0.52**	**0.51**	-0.14	Reflect	0.061	<0.001
MP1	-0.07	0.09	0.22	**0.61**	-0.09	Reflect	0.06	<0.001
MP2	0.03	-0.10	-0.05	**0.88**	-0.09	Reflect	0.057	<0.001
MP3	0.09	-0.02	-0.03	**0.90**	-0.11	Reflect	0.056	<0.001
MP4	-0.03	0.00	-0.12	**0.81**	-0.08	Reflect	0.058	<0.001
FP1	-0.04	0.05	-0.06	-0.07	**0.84**	Reflect	0.057	<0.001
FP2	-0.10	-0.04	0.00	0.02	**0.84**	Reflect	0.057	<0.001
FP3	0.01	-0.09	0.08	-0.06	**0.84**	Reflect	0.057	<0.001
FP4	0.12	0.06	0.03	0.05	**0.75**	Reflect	0.058	<0.001
FP5	0.04	0.04	-0.06	0.09	**0.59**	Reflect	0.06	<0.001

Note: GPU-Geopolitical Uncertainty; CNP-Carbon Neutrality Policy; DT-Digital Transformation; MP-Market Performance; FP-Financial Performance

DT5 (dropped due to high cross-loading on two constructs)

Table 5: HTMT values

	GPU	CNP	DT	MP	FP
GPU					
CNP	0.468				
DT	0.407	0.755			
MP	0.272	0.471	0.748		
FP	0.224	0.483	0.719	0.716	

Note: GPU-Geopolitical Uncertainty; CNP-Carbon Neutrality Policy; DT-Digital Transformation; MP-Market Performance; FP-Financial Performance

4.2 Common Method Bias

The survey-based research design, which we have discussed in earlier sections, is an effective method for evaluating research hypotheses, particularly in situations where objective data pertaining to the constructs or variables in question is lacking (Flynn et al., 1994). This approach allows researchers to gather insights based on the perceptions and opinions of respondents, making it a practical solution for understanding complex issues (Van der Vaart & Van Donk, 2008). However, utilising this method comes with certain drawbacks (Ketokivi & Schroeder, 2004). One significant concern is known as "*common method bias (CMB)*" (Podsakoff et al., 2024). The CMB arises when the data collected from respondents reflects not only their perceptions but also the influence of the method itself, potentially leading to skewed or inaccurate findings (Podsakoff et al., 2003). For instance, factors such as the wording of survey questions or the order in which they are presented can inadvertently sway participants' responses (MacKenzie & Podsakoff, 2012). As a result, it is crucial for researchers to be aware of this potential bias, as it can compromise the validity and reliability of the study's conclusions (Podsakoff et al., 2024). Ensuring rigorous methodological practices and incorporating techniques to mitigate common method bias are essential for producing trustworthy outcomes in survey-based research (Craighead et al., 2011; Lai et al., 2013). In line with the recommendations presented by Podsakoff et al. (2024), we employed a comprehensive two-step approach to address potential biases in our research. In the first step, we introduced various procedural remedies aimed at reducing common method bias. This included ensuring that data collection methods were randomised and utilising multiple sources of data to enhance the validity of our findings. In the second step, we conducted a series of conservative statistical analyses after completing the data collection phase. These analyses enabled us to

rigorously evaluate the presence and impact of common method bias, ensuring that any potential issues were identified and addressed.

4.2.1 Procedural Remedies

MacKenzie and Podsakoff (2012, p. 546) outline several effective strategies for minimising biases in research, which can significantly enhance the validity of the outcomes. One of the primary recommendations is to carefully select respondents who possess in-depth knowledge of international business dynamics. These individuals should not only be well-versed in the current geopolitical landscape but also have firsthand experience with their organisation's strategies for navigating these complexities. Their familiarity with relevant digital technologies, which are increasingly integral to business operations, is also essential. This expertise enables them to provide insightful and informed responses. To further ensure the quality of the data collected, we have pretested the questionnaire with experts in the field. This pretesting process allows for valuable feedback on the clarity and relevance of the questions. Additionally, recognising the linguistic diversity of respondents, a French translation of the questionnaire was made available. This step is designed to empower French-speaking participants to fully engage with the survey. Great care was taken to craft the questionnaire, avoiding any ambiguous statements or double-barreled questions that might confuse respondents and compromise the integrity of the data. Overall, these meticulous efforts aim to collect robust and reliable data that can inform meaningful conclusions.

4.2.2 Statistical Analysis

We initiated our analysis with a widely recognised and cautious method for evaluating common method bias (CMB) in our dataset, specifically utilising Harman's single-factor test. This test involved conducting an exploratory factor analysis whereby all survey items were loaded onto a single underlying factor. The findings indicated that this singular factor explained approximately 37% of the total variance observed in the data. This value falls significantly short of the commonly accepted threshold of 50%, suggesting potential concerns regarding the presence of common method bias. Nonetheless, it is essential to acknowledge that this method has been subject to criticism from various scholars, who question its reliability and validity (Podsakoff et al., 2024).

To further investigate potential biases in the context of PLS-SEM, we focused on the full collinearity test, as recommended by Kock (2015). This test provides a robust framework for identifying and assessing collinearity issues within the data. Kock & Lynn (2012) advocate for the full collinearity test as a comprehensive method for simultaneously assessing both vertical and lateral collinearity among constructs. This procedure is fully automated using WarpPLS 8.0

software, which generates VIFs for all latent variables within the model framework. According to established guidelines, a VIF value exceeding 3.3 is indicative of pathological collinearity. Such high levels of collinearity may also suggest that the model is contaminated by common method bias. Therefore, if we find that all VIF values resulting from our full collinearity test are equal to or below the critical threshold of 3.3, we can confidently conclude that our model is free from common method bias, ensuring the integrity of our analysis. In our case (see Table 6), the VIF values are well below 3.0, indicating that the CMB is not a significant concern in our study.

Table 6: VIF

GPU	CNP	DT	MP	FP	OS	DT*CNP
1.072	1.376	2.062	1.555	1.783	1.054	1.045

4.3 Endogeneity Test

Following Kock's (2022) guidelines, we conducted three tests to assess endogeneity in our case (see Table 7). The first was the Nonlinear Bivariate Causality Direction Ratio (NLBCDR), which we found to be 0.714. This suggests a valid causal direction with minimal risk of reverse causation. Next, we calculated the Simpson's Paradox Ratio (SPR), which yielded a value of 1.00. This exceeds the acceptable threshold of 0.7, indicating that the model's results are robust and reflect a strong correlation between variables, thus avoiding misleading interpretations. Finally, we examined the Statistical Suppression Ratio (SSR), which yielded a value of 0.857, also exceeding the 0.7 threshold. This indicates that our dataset is free of statistical suppression, ensuring that our conclusions accurately represent the relationships among the variables.

Table 7: Model Fit and Quality Indices

Average path coefficient (APC)	0.219; p<0.001
Average R- squared (ARS)	0.132; p<0.001
Average adjusted R-squared (AARS)	0.123; p<0.001
Average block VIF (AVIF)	1.004
Average full-collinearity VIF (AFVIF)	1.421
Tenehaus GoF (GoF)	0.314
Simpson's paradox ratio (SPR)	1.000
Statistical suppression ratio (SSR)	0.857
Nonlinear bivariate causality direction ratio (NLBCDR)	0.714

The goodness-of-fit (GoF) statistic for the model is 0.314 (see Table 6), indicating a reasonable alignment with the observed data. This value reflects the model's ability to capture essential patterns, though there is room for improvement (Tenenhaus et al., 2005). Additionally, the average path coefficient (APC) is 0.219 (see Table 6), demonstrating a moderate relationship among the variables within the model. The average R-squared (ARS) value is 0.132 (see Table 6), suggesting that the model accounts for about 13.2% of the variance in the data, highlighting its explanatory power. Together, these metrics emphasise the model's effectiveness in revealing the relationships among the variables while identifying areas for potential enhancement.

4.4 Hypothesis Testing

We finalised our analysis by performing hypothesis testing, as illustrated in Figure 4. The results indicate that our model explains approximately 14% of the total variance observed in market performance, as represented by an R-squared value of 0.14. In terms of financial performance (FP), our model explains a more substantial portion, with 18% of the total variance accounted for, reflected in an R-squared value of 0.18. When considering the overall performance of the model, the average R-squared value stands at 0.132, indicating its adequacy in capturing significant variations in both market and financial outcomes.

H1 (GPU→CNP) ($\beta = -0.28, p < 0.01$) suggests that the increase in geopolitical uncertainty has a significant negative impact on the carbon neutrality goals set by the nation, industry, and organisation. Hence, to tackle the negative impacts of geopolitical uncertainty, organisations formulate policies that aim to balance competitiveness and carbon neutrality goals, focusing attention on carbon neutrality. This is because geopolitical uncertainty has not only impacted production costs but also affected sales volumes due to trade tariffs on imports. Hence, we can argue that the H1 is supported, as the rise in geopolitical uncertainty has a positive impact on the carbon neutrality policy, enabling it to tackle the crisis by balancing business and carbon neutrality goals. H2a (CNP→MP) ($\beta = 0.35, p < 0.01$) supports the notion that the implementation of carbon neutrality policies has a significant and positive influence on market performance. This finding underscores the importance of revisiting carbon neutrality goals, particularly in light of current geopolitical challenges that could disrupt economic stability. By aligning their strategies with carbon neutrality objectives, companies cannot only sustain their existing market share but also enhance their overall market performance. This proactive approach enables firms to adapt to evolving market conditions, demonstrating their commitment to sustainability and ultimately fostering stronger customer loyalty and a competitive advantage. H2b (CNP→FP) ($\beta = 0.35, p < 0.01$) provided support for the carbon neutrality policy during turbulent times, indicating that the policy

has a positive and significant impact on financial performance. H3a (β = -0.10, p = 0.06) indicates that the capability for digital transformation has a surprisingly negative moderating effect on the relationship between CNP (carbon neutrality policies) and MP (market performance) (Figure 5). This finding challenges widely held beliefs and previous research, which generally support the notion that digital transformation significantly enhances organisational performance. However, it is essential to interpret these results within the specific context of our study. The sample predominantly comprises micro-enterprises, which account for approximately 57% of the total respondents. These smaller firms often face unique constraints that larger organisations do not experience. Investment in digital transformation among these micro-enterprises has been both slow and selective. Many firms have hesitated to adopt new technologies or streamline their operations digitally, often due to limited resources and the complexities associated with the transformation process. Compounding these challenges, the ongoing turmoil since the COVID-19 pandemic has brought about significant disruptions across various industries. Moreover, the French wine industry is currently facing additional challenges, including the geopolitical repercussions of the Russia-Ukraine conflict and the tariffs imposed by the United States on imported wines, which have significantly impacted trade dynamics. As a result of these compounding challenges, the journey toward effective digital transformation in smaller firms requires careful alignment with their operational processes; this transformation is unlikely to yield positive results in the short term. It takes time for these organisations to fully realise the benefits of digital initiatives, suggesting that immediate improvements in performance should not be expected. H3b (β = -0.14, p = 0.02) challenges widely accepted perspectives and previous research findings that assert digital transformation has a positive and substantial impact on a firm's competitiveness. Specifically, this research reveals that digital transformation exerts a negative moderating influence on the relationship between a firm's carbon neutrality policies and its financial performance (Figure 6). This suggests that factors such as the size of the firm—whether small, medium, or large—and the specific contextual circumstances in which it operates are crucial in understanding and interpreting these unexpected results. These nuances highlight the complexity of integrating digital initiatives with sustainability goals and their combined effects on overall business outcomes. In our study, we discovered that one of the control variables, organisational size (OS), plays a crucial role in influencing various outcomes. Specifically, we found that organisational size has a positive impact on market performance (MP), as indicated by a coefficient of β = 0.12 with a p-value of 0.04. This suggests that large organisations tend to perform similarly in the market, particularly during times of geopolitical uncertainty, when market dynamics can be highly volatile. On the other hand, our findings revealed that organisational size negatively affects financial performance (FP), with a

coefficient of β = -0.20 and a p-value of less than 0.01. This significant inverse relationship indicates that as organisational size increases, financial performance may decline, possibly due to increased complexity, inefficiencies, or higher operational costs that larger organisations might face. These results underscore the importance of considering organisational size when assessing both market and financial performance in a fluctuating political landscape.

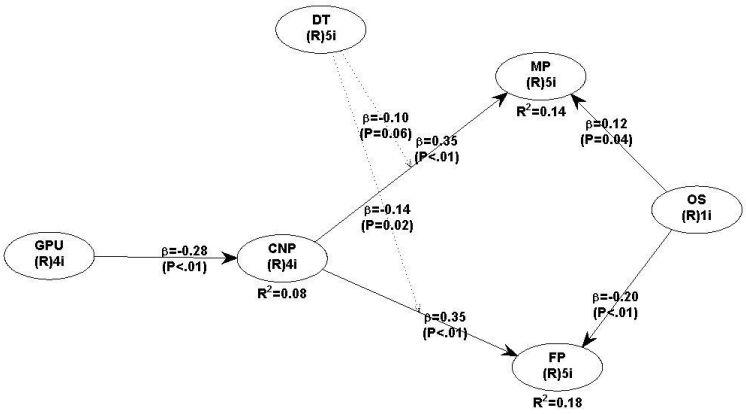

Figure 4: Final Model

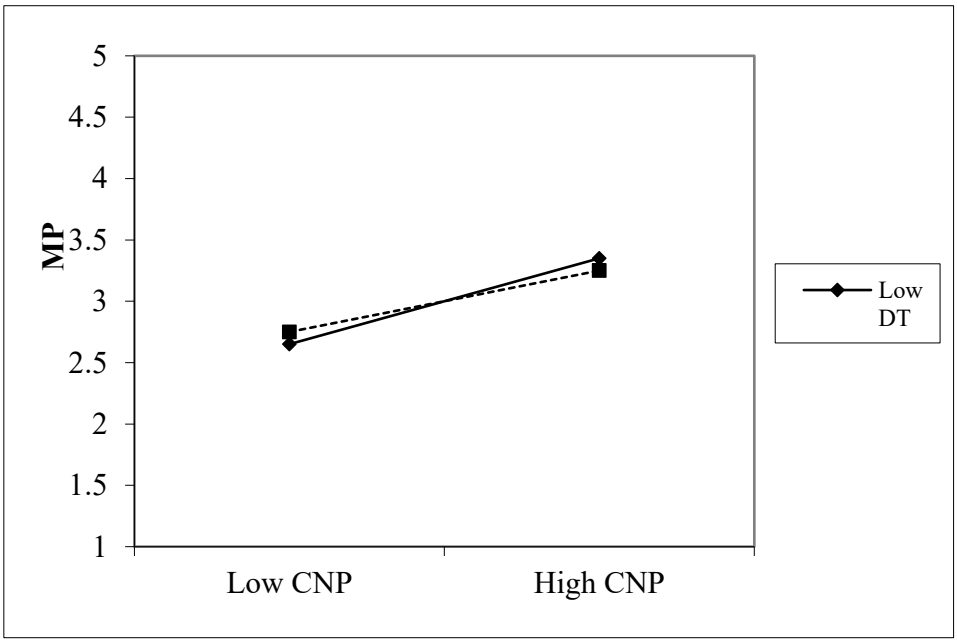

Figure 5: Moderating effect of DT on the path joining CNP and MP

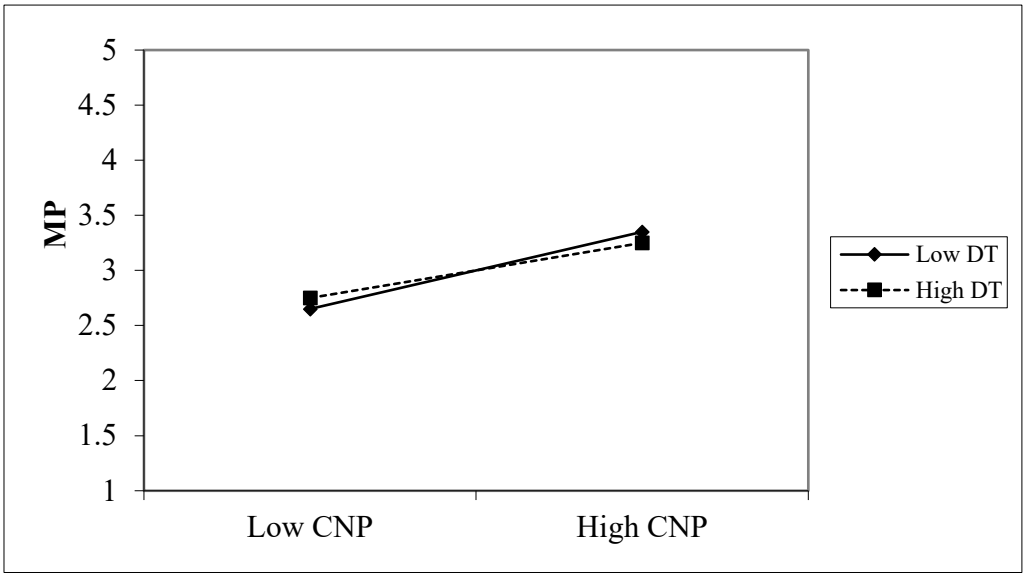

Figure 6: Moderating effect of DT on the path joining CNP and FP

5. Discussions

The findings of this study provide significant insights into the impact of geopolitical uncertainty on the development of carbon neutrality policies. Additionally, they emphasise the crucial role that digital transformation plays in effectively translating these policies into tangible organisational performance. In particular, the results shed light on the challenges that wine producers are currently facing, stemming from geopolitical instability, including trade tensions and regulatory changes. These circumstances directly influence their strategic approaches to achieving carbon neutrality goals. Overall, the study provides a comprehensive understanding of the complex interplay between external geopolitical factors and the internal strategies employed by wine producers to navigate these challenges while striving for sustainability in their operations. The results not only help advance our theoretical understanding but also offer numerous solutions to the wine producers and policymakers.

5.1 Implications for Theory

In addressing the first and second research questions, this study advances theoretical understanding of how ***geopolitical uncertainty shapes the formulation and implementation of carbon neutrality policies and, in turn, influences organisational performance***. Drawing on the foundational contingency arguments of Luthans & Stewart (1977), our findings reaffirm that organisational strategies are not universally optimal but instead emerge from the interaction between **external situational factors**—such as geopolitical instability—and **internal**

organisational factors, including carbon neutrality commitments and digital transformation capabilities. This reinforces the core premise of contingency theory that organisational effectiveness depends on the degree of alignment between environmental conditions and internal strategic responses. Our empirical results extend prior contingency-based research by explicitly situating **geopolitical uncertainty** as a salient and evolving contextual variable in sustainability-related decision-making. While earlier studies applying contingency theory have focused primarily on market turbulence, technological uncertainty, or competitive intensity (e.g., Lee & Miller, 1996; Sousa & Voss, 2008), our study demonstrates that geopolitical dynamics—such as trade conflicts, shifting regulatory alliances, and international political instability—constitute a distinct form of uncertainty that significantly influences carbon neutrality strategies. In doing so, we extend the contingency framework into the emerging domain of **geopolitics–sustainability linkages**, an area that has received comparatively limited theoretical attention.

Consistent with Sousa & Voss (2008), our findings support the argument that contingency theory provides a valuable long-term perspective that complements the resource-based view and dynamic capability theory. Whereas the resource-based view emphasises the possession of valuable internal resources and dynamic capability theory highlights the ability to reconfigure these resources in response to change (Aragón-Correa & Sharma, 2003), our results suggest that **the effectiveness of such resources and capabilities remains contingent upon the broader geopolitical context**. Thus, this study refines existing theory by showing that internal sustainability-oriented capabilities—such as carbon-neutrality policies—do not operate in isolation but derive their performance implications from how well they fit prevailing external conditions.

Furthermore, our findings align closely with those of **Javed et al. (2025)** by confirming that geopolitical uncertainty significantly influences organisational sustainability ambitions, particularly with respect to carbon neutrality. However, we extend their work by demonstrating that ***firm size acts as a critical boundary condition***. Specifically, small firms appear disproportionately vulnerable to geopolitical disruptions due to their limited access to financial, technological, and institutional resources. This insight enriches contingency theory by underscoring the importance of ***organisational heterogeneity***, suggesting that identical external pressures may generate markedly different strategic responses and outcomes depending on organisational characteristics. In this respect, our study contributes to a more differentiated understanding of how contingency effects unfold across firms of varying sizes.

Regarding the performance implications of carbon-neutrality policies, our findings further deepen contingency theory by showing that sustainability strategies can enhance market

competitiveness and financial outcomes when aligned with situational demands. This supports earlier research indicating that external pressures—such as regulatory requirements and stakeholder expectations—shape firms' strategic responses and performance consequences (Lee & Miller, 1996; Taylor & Taylor, 2014). However, our study advances this literature by positioning carbon neutrality not merely as a compliance-driven response but as a ***strategic lever whose performance effects depend on contextual fit***, thereby reinforcing the explanatory power of contingency theory in sustainability research.

Addressing the third research question, this study makes a particularly novel theoretical contribution by identifying a ***negative moderating effect of digital transformation***, which contradicts much of the existing literature that portrays digitalisation as uniformly beneficial (e.g., Bag et al., 2024; Zheng et al., 2024; Singh, 2025; Lin, 2025). While prior studies—largely grounded in dynamic capability theory—emphasise the efficiency, agility, and innovation benefits of digital transformation, our findings suggest that these benefits are ***highly contingent on organisational context***. This divergence challenges the implicit assumption of universality in the digital transformation literature.

By adopting a contingency perspective, our study offers an alternative theoretical explanation for these mixed outcomes. Larger firms may experience diminished returns from digital initiatives due to bureaucratic inertia and complex coordination structures, while smaller firms often lack the resources and technological readiness required to fully capitalise on digital investments. This nuanced insight extends contingency theory by demonstrating that digital transformation itself functions as a ***context-dependent strategic variable***, rather than an unconditional performance enhancer.

Taken together, our findings make a substantive contribution to contingency theory by integrating ***geopolitical uncertainty, carbon neutrality policies, and digital transformation*** within a unified framework. By doing so, this study not only confirms key theoretical assumptions but also extends the theory into underexplored empirical contexts, offering a more refined and context-sensitive understanding of how organisations can navigate sustainability challenges while pursuing long-term performance and resilience.

5.2 Implications for the Managers and Policymakers

The study provides valuable insights for managers and policymakers in the winemaking industry. It is particularly relevant for micro, small, and medium-sized enterprises (SMEs) that face challenges due to geopolitical uncertainties and are working towards achieving carbon neutrality.

The findings underscore the importance for wine-producing firm owners to adopt a comprehensive strategy that balances pursuing carbon neutrality with reducing costs. By focusing on maintaining product quality while minimising expenses, these smaller businesses can improve their competitive edge in a rapidly changing market. Ultimately, this balanced approach not only supports their sustainability goals but also positions them to succeed in a challenging landscape filled with both obstacles and opportunities. This study aligns with the perspective of Becker et al. (2020) in the context of the French spirits sector. It advances theoretical insights by introducing geopolitical uncertainties that pose significant challenges for owners of micro and small vineyards, especially as conditions have become more difficult in recent years.

The study offers essential insights, particularly given that discussions of digital transformation often overlook a comprehensive assessment of the current landscape. As a result, the outcomes tend to be less favourable than what is often claimed by advocates of these initiatives. At the core of this debate is the dynamic capability view, which asserts that an organisation's ability to adapt, innovate, and thrive in rapidly changing environments is a significant game-changer. This perspective holds especially true for organisations that consistently outperform their peers. However, the contingency approach emphasises that there is no universal solution applicable to all types of organisations. Smaller firms, in particular, encounter unique challenges and constraints that prompt them to reconsider their investment strategies. In more difficult market conditions, these companies must carefully weigh the risks and potential returns of investing in digital transformation. As a result, in the short term, the capabilities derived from digital transformation may not align with the expectations set by competitive firms in more favourable circumstances. Therefore, it becomes imperative for organisations to thoroughly assess their specific context and the limitations they face before committing significant resources to enhance their digital capabilities. Tailoring approaches to fit individual organisational needs and situational realities is essential for achieving meaningful outcomes in digital transformation efforts.

5.3 Limitations of the Study and Future Research Directions

This study aims to empirically examine the impact of geopolitical uncertainties on carbon-neutrality policies, with a specific focus on the French wine industry. Our approach to testing the hypotheses is firmly rooted in a positivist research framework, which emphasises objective measurement and empirical data. Unfortunately, we encountered significant challenges due to the lack of available secondary data specifically tailored to the nuances and complexities of the French wine sector. Our attempts to acquire more detailed insights were also unsuccessful, as the longitudinal data necessary for a comprehensive analysis were withheld for undisclosed reasons. Given these constraints, we

opted for a survey-based methodology. However, we recognised our first significant hurdle: the lack of established measurement scales to assess variables such as geopolitical uncertainty and carbon-neutrality policy. In response, we endeavoured to develop our own measurement scale, following the systematic guidelines outlined by Flynn et al. (1994) and Carpenter (2018). Despite our efforts, we acknowledge that this limitation may constrain the robustness of our findings. Therefore, we strongly advocate for future research to develop a more comprehensive measurement scale that effectively captures the perceptions and attitudes of key industry stakeholders. This development would significantly enhance researchers' ability to test their hypotheses in contexts where longitudinal data may be scarce. Additionally, we propose that employing an in-depth qualitative research design, particularly through a multiple-case study approach, could yield valuable insights into the distinct strategies used by micro, small, medium, and large enterprises to navigate geopolitical uncertainties and carbon-neutrality policies. By conducting such qualitative research, we could explore the underlying organisational structures and designs of these businesses, offering a clearer understanding of how they adapt to and manage complex challenges. Lastly, it is essential to highlight that our study is confined to a specific industry within a single country. This limitation raises questions about the generalisability of our findings to other contexts. To address this challenge, we advocate for more comprehensive research that spans multiple countries and various industries, thereby enhancing the applicability and relevance of the insights gained from our study.

6. Conclusion

In conclusion, our study offers an optimistic perspective, along with important cautions for our readers. This research focuses on three critical questions about the interplay between digital capabilities and business strategies among French wine producers. Utilising contingency theory as our theoretical framework, we systematically analysed survey data collected from a diverse group of wine producers across France. Our findings make a significant contribution to the understanding and application of contingency theory, particularly in addressing the paradox of investing in digital capabilities amid fluctuating market conditions. The results underscore how specific situational factors—ranging from geopolitical tension to trade tariffs—influence the strategic decisions firms make. Overall, this study provides invaluable insights for academics seeking to advance theoretical frameworks, managers aiming to enhance operational strategies, and policymakers seeking to align regulations with geopolitical uncertainties and carbon-neutrality goals. By highlighting the interconnectedness of these elements, we provide a comprehensive understanding of how firms can navigate the complexities of today's business landscape.

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