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Enhancing Supply Chain Resilience through Supplier
Diversification

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Patras, Greece, June 2026

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This research paper is dedicated to my family for their support.

Abstract

The purpose of the present study is to investigate the relationship between supplier diversification and supply chain resilience. The importance of this research lies in the general geopolitical volatility that prevails, as well as in the broader conditions of globalization and international trade, which have led firms to the development of more complex processes and structures. For these reasons, which often bring firms face-to-face with unpredictable events and risks, the increase of supply chain resilience, as a main business operation, as well as the factors that may strengthen it, constitute a matter of utmost importance.

For the needs of the research, primary data were collected through a structured questionnaire. The questionnaire was distributed to professionals working in fields related to supply chain management. From the 43 responses received, 42 responses were valid and based on them the respective statistical analysis was conducted, during which the SPSS software was used as a tool to export the statistical results. Initially, descriptive analysis of the characteristics of the participants and the firms that they work for was conducted. Next, reliability analysis was carried out with the use of Cronbach's alpha index, correlation analysis, and regression analysis.

The results showed that there is a positive and statistically significant relationship between the two variables. More specifically, the results showed that the firms that collaborate with multiple suppliers from different geographic locations seem to be more resilient and manage risks and disruptions more effectively. Additionally, challenges, such as increased complexity, high costs, and the difficulty in finding reliable suppliers, which are related to the implementation of such strategies were identified.

Furthermore, through open-ended questions it was also reported that the main disruptions faced by firms in recent years are related to geopolitical crises, delays in transportation, and shortages of raw materials and components. These difficult situations were handled through supplier diversification practices and the search for alternative supply solutions in order to reduce dependence on single suppliers.

Overall, the study concludes that supplier diversification constitutes an important strategic tool in order for firms to develop a resilient supply chain and acquire mechanisms to handle crises in dynamic and unpredictable environments.

Keywords

supplier diversification, supply chain resilience, supply chain risk management, sourcing strategies, supply chain disruptions

Περίληψη

Στόχος της παρούσας έρευνας είναι η μελέτη της σχέσης μεταξύ της διαφοροποίησης των προμηθευτών και της ανθεκτικότητας της εφοδιαστικής αλυσίδας. Η σημασία της έρευνας έγκειται στο γεγονός της γενικότερης γεωπολιτικής αστάθειας που επικρατεί και δημιουργεί συνθήκες αβεβαιότητας, καθώς και στο γενικότερο πλαίσιο της παγκοσμιοποίησης και του διεθνούς εμπορίου, το οποίο έχει οδηγήσει τις επιχειρήσεις στην ανάπτυξη πιο περίπλοκων διαδικασιών. Για αυτούς τους λόγους, οι οποίοι φέρνουν τις επιχειρήσεις συχνά αντιμέτωπες με απρόσμενα γεγονότα και κινδύνους, η αύξηση της ανθεκτικότητας της εφοδιαστικής αλυσίδας ως βασικής λειτουργίας των εταιρειών, καθώς και των παραγόντων που μπορούν να την ενισχύσουν, αποτελεί πολύ σημαντικό ζήτημα.

Για την διεξαγωγή της έρευνας συλλέχθηκαν πρωτογενή δεδομένα μέσω δομημένου ερωτηματολογίου. Το ερωτηματολόγιο διαμοιράστηκε σε επαγγελματίες των οποίων η εργασία σχετίζεται με την εφοδιαστική αλυσίδα. Από τις 43 απαντήσεις που συλλέχθηκαν, οι 42 απαντήσεις ήταν έγκυρες και με βάση αυτές έγινε η σχετική στατιστική ανάλυση, κατά την οποία χρησιμοποιήθηκε το λογισμικό SPSS ως εργαλείο εξαγωγής στατιστικών αποτελεσμάτων. Αρχικά, έγινε περιγραφική ανάλυση των απαντήσεων που αφορούσαν τα χαρακτηριστικά των συμμετεχόντων αλλά και των εταιρειών στις οποίες εργάζονται και στη συνέχεια, πραγματοποιήθηκε ανάλυση αξιοπιστίας με τη χρήση του δείκτη Cronbach's alpha, ανάλυση συσχέτισης και ανάλυση παλινδρόμησης.

Τα αποτελέσματα της ανάλυσης έδειξαν ότι υπάρχει θετική και στατιστικά σημαντική σχέση μεταξύ των δύο μεταβλητών. Πιο συγκεκριμένα, οι εταιρείες που συνεργάζονται με πολλούς προμηθευτές και από διάφορες γεωγραφικές περιοχές φαίνεται να είναι πιο ανθεκτικές και να αντιμετωπίζουν πιο αποτελεσματικά τους κινδύνους και τις διαταραχές. Παράλληλα, αναγνωρίστηκαν και κάποιες προκλήσεις που σχετίζονται με την εφαρμογή αυτών των πρακτικών, όπως η αυξημένη πολυπλοκότητα, το μεγαλύτερο κόστος καθώς και η δυσκολία στην εύρεση αξιόπιστων προμηθευτών.

Επιπλέον, μέσα από ανοικτού τύπου ερωτήσεις αναγνωρίστηκε ότι οι βασικές διαταραχές που έχουν αντιμετωπίσει οι εταιρείες τα τελευταία χρόνια σχετίζονται με τις γεωπολιτικές κρίσεις, τις καθυστερήσεις στις μεταφορές και την έλλειψη πρώτων υλών και εξοπλισμού. Αυτές οι δυσκολίες αντιμετωπίστηκαν μέσα από πρακτικές διαφοροποίησης προμηθευτών

και αναζήτησης εναλλακτικών λύσεων προμήθειας, με στόχο να μειωθεί η εξάρτηση από μεμονωμένους προμηθευτές.

Η μελέτη καταλήγει στο συμπέρασμα ότι η διαφοροποίηση προμηθευτών αποτελεί σημαντικό στρατηγικό εργαλείο των επιχειρήσεων, ώστε να διαμορφώσουν μία ανθεκτική εφοδιαστική αλυσίδα καθώς και να αποκτήσουν μηχανισμούς για την αντιμετώπιση των κινδύνων και των κρίσεων σε δυναμικά και απρόβλεπτα περιβάλλοντα.

Λέξεις – Κλειδιά

διαφοροποίηση προμηθευτών, ανθεκτικότητα εφοδιαστικής αλυσίδας, διαχείριση κινδύνων εφοδιαστικής αλυσίδας, στρατηγικές προμηθειών, διαταραχές εφοδιαστικής αλυσίδας

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List of Acronyms

COVID-19 Coronavirus Disease 2019
EOQ Economic Order Quantity
MBA Master of Business Administration
MGD Manufacturing Geographic Diversification
OFDI Outward Foreign Direct Investment
RMB Renminbi (Chinese Currency)
RMI Risk Management Infrastructure
SCDO Supply Chain Disruption Orientation
SPSS Statistical Package for the Social Sciences

1. Introduction

Nowadays, supply chains are considered a significant mechanism for firms' operations globally, as the supply of materials, the production, and the distribution of goods and services are carried out through them. Globalization and the increase in international trade have played a crucial role in the evolution of supply chains into core business partners, since they have led firms to develop more complex processes (Christopher & Peck, 2004; Tang, 2006). Even though the positive effects of this development are numerous and generally accepted (lower costs, wider supplier networks, flexibility), there are also risks and disruptions that have arisen and should be addressed.

More specifically, some recent disruptions that supply chain professionals have been called to handle include the COVID-19 pandemic, shortages of raw materials, geopolitical conflicts, transportation delays, and the energy crisis (Ivanov & Dolgui, 2020; Queiroz et al., 2020). These difficult situations highlighted the weaknesses of supply chains and made the need to transform them into more flexible and adaptive mechanisms, capable of remaining strong and supporting firms' functions even during difficult periods, more apparent.

Therefore, firms have recognized the need to reinforce their supply chain resilience and strengthen their ability to handle disruptions and unexpected events (Ponomarov & Holcomb, 2009). This is considered mandatory if companies want to stay competitive in global markets and maintain business continuity. In this context, one of the most important strategies suggested for strengthening supply chains is supplier diversification (Adobor & McMullen, 2007). In other words, companies should maintain a broad supplier network and decrease their dependence on single or local sourcing in order to have reliable alternatives in case of disruption.

Supplier diversification is considered particularly important practice, especially during periods of increased uncertainty (Tang, 2006), as it can contribute to the elimination of disruptions in the supply of materials and products, the improvement of flexibility, and the assurance of business continuity. Additionally, the development of a broad supplier network with alternative sources of supply may allow firms to respond rapidly to crises and adapt efficiently to changes in the market and demand (Christopher & Peck, 2004). Apart from the advantages related to supplier diversification, the implementation of such

strategies is not always an easy or cost-free process. Collaboration with multiple partners may increase the complexity of supplier network management, create stricter coordination and communication requirements, and increase firms' operational costs (Chen et al., 2023). Moreover, finding reliable suppliers that meet the required quality and operational standards is often a very demanding process. For these reasons, many companies try to maintain a balance between supplier diversification and preserving existing reliable partnerships.

The present study focuses on the relationship between supplier diversification and supply chain resilience. More specifically, it investigates how supplier diversification can affect the ability of firms to efficiently manage supply chain disruptions and risks. The subject of this study is considered particularly important, since the issue of supply chain resilience has recently become a major focus for both the academic community and firms due to geopolitical conflicts (Ivanov, 2021). Although the existing literature has extensively examined risk management in supply chains, there is still room for further research regarding the implementation of supplier diversification practices and their actual effect on firms' resilience. Additionally, the continuous changes in the global business environment make it necessary to investigate new approaches and practices that strengthen the resilience and adaptability of supply chains.

For the execution of the research, a quantitative methodological approach was adopted through the use of a structured questionnaire. The questionnaire was distributed to professionals from the fields of procurement, logistics, and supply chain management. After the collection of primary data, the study attempted to record the perceptions and experiences of the participants regarding supplier diversification strategies and the way these practices affect supply chain resilience against crises and disruptions. The data were analyzed using statistical methods and data analysis tools, aiming to investigate the relationship between the two main variables. Through this process, the study aims to draw conclusions regarding the role of supplier diversification in risk management and in the creation of flexible and resilient supply chains.

The present study has been structured into five chapters. Chapter 1 presents the introduction to the research, the general framework of the topic, the importance of the problem, and the main steps of the study. Chapter 2 includes a review of the relevant literature regarding supplier diversification, risk management, and supply chain resilience

and also presents the theoretical approaches and findings from previous studies. Next, Chapter 3 analyzes the research methodology, the data collection process, the sample, and the statistical analysis methods used in the study. In Chapter 4, the results of the empirical research are presented, and the data analysis is carried out. Finally, Chapter 5 presents the discussion of the findings, the main conclusions, the limitations of the research, and suggestions for future studies on this subject.

2. Literature Review

A large portion of the literature has addressed supplier and geographic diversification as an efficient tool for enhancing resilience of supply chain under conditions of uncertainty and local disruptions. Multiple recent studies support that having many suppliers and production plants across many locations may reduce the dependence of supply chain efficiency from single sourcing and regional disturbances.

The research of McCarthy Byrne, Niranjana and Gravier (2025) examines how geographic diversification of production contributes to risk management in modern supply chains. After the introduction of resource-advantage theory, the authors support that geographically distributed production systems are complicated and difficult to duplicate, fact that boosts firms' resilience and their competitive advantage in the market. The study inducts the model of MGD (Manufacturing Geographic Diversification), according to which geographic diversification of production locations acts as hedging strategy, reducing the risk of an unpredictable event to affect simultaneously all production locations. Additionally, the research highlights two main internal factors, the Supply Chain Disruption Orientation (SCDO) and the Risk Management Infrastructure (RMI), as important prerequisites for the development of geographically diversified production networks. The results of the study show that higher levels of SCDO and RMI reinforce the businesses' tendency to distribute their production to multiple locations, a fact that it is connected to improved customer-oriented performance and increased corporate performance. This present study contributes to the understanding of the role of diversification as mechanism to boost supply chain's resilience, offering significant theoretical and practical implications for risk management strategies.

Similarly, the study of Li, Liu, Wang and Chen (2025) explores how sourcing from global markets may boost resilience in Agri-food supply chain in China. The findings of the research show that import diversification eliminates the risk of disruption and increases stability and resilience of supply chain. However, it is highlighted that when global markets move in a similar way during periods of crisis, the benefits of diversification are weakened and the risk may spread in supply chain, increasing the possibility of disconnections and breakdowns in the chain. Consequently, the positive impact of diversification is not linear but depends on the level of mutual risk in the market. Overall,

import diversification may reinforce the stability and resilience, but it is not sufficient on its own. It is of utmost importance that the global risk in markets is taken into account so the firms can efficiently manage the risks and avoid the disruptions.

Aligned with these findings, Chen Y., Chen G., Xu and Duan (2023) examine how supplier diversification strategies such as single sourcing, dual sourcing and partial outsourcing, can affect the decisions and the firms' profit in supply chain of batteries for electrical vehicles. By using a theoretical model, the authors analyze when it is beneficial for manufacturers to source from one, two or even from internal suppliers. Additionally, it is studied how orders allocation among suppliers and power of the brand may impact the results and how primary suppliers may react to these decisions. The study also highlights that factors such as shares allocation and power of the brand significantly affect the efficiency of diversification strategy, showing that the optimal choice depends on the market characteristics and how power is allocated among different suppliers in supply chain.

Despite the widely recognized benefits of supplier diversification, there is a significant portion of studies and articles that support that the positive effects of multi-sourcing depend on specific assumptions regarding demand, cost structures and nature of risk. Several authors have developed models to demonstrate that single sourcing under particular circumstances may be more effective than sourcing from multiple suppliers.

Tajbakhsh, Lee and Zolfaghari (2010) reexamine supplier diversification in an uncertain environment, focusing on the special case of EOQ model with random returns (binomial yield). The authors prove that in this specific model single-sourcing is always the best strategy, even if there are many reliable but low-productive suppliers. Their main finding relies on the cost structure and the stochastic nature of returns, since the distribution of yield leads to a mathematical result in which the total expected cost remains the same regardless of the number of suppliers, making the diversification non-efficient from financial perspective. In addition, the authors support that the sole sourcing remains the best practice in general forms with fixed order cost, while the multiple sourcing may be equivalent only in special occasions where the cost is exactly the same for all suppliers. The work constitutes an important contribution as it highlights that the efficiency of suppliers' diversification mainly depends on the assumptions of the specific model,

emphasizing the need for careful assessment of uncertainty sources and the cost structures in designing strategies for the resilience of supply chains.

Likewise, Swaminathan and Shanthikumar (1999) analyze supplier diversification in the context of inventory management, aiming to evaluate how multiple suppliers may reduce total supply costs under conditions of uncertainty. The authors base their analysis on an analytical EOQ model, in which product quality follows a binomial distribution, and they use mathematical analysis to optimize the total cost of supply and inventory. The results of the study show that, under specific conditions, sourcing from a single supplier is the optimal strategy, since diversification of the supplier network does not lead to a lower total cost. Additionally, the study supports that the total optimal order quantity remains the same as the EOQ, regardless of the number of suppliers. Overall, the article contributes to the literature by questioning the general view that supplier diversification always constitutes an effective tool for addressing uncertainty in the supply chain.

Yan, Ji and Wang (2012) further contribute to this discussion by analyzing how supplier diversification in an uncertain environment, even though it is often suggested as a strategy to reduce risk, is not always optimal. Through an analytical quantitative approach and theoretical inventory management models, the authors prove that having an expanded supplier network may increase the complexity of decision-making and does not lead to lower costs or higher performance, especially when risks among suppliers are independent. The article demonstrates that supplier diversification may be strategically critical when there is a possibility of simultaneous failures, while it also highlights that the existence of negatively correlated performances may increase both buyer and consumer welfare. The findings of this research support that, under specific conditions, collaboration with a limited number of suppliers, or even with only one supplier, may prove to be more efficient than diversification.

Beyond the operational and cost matters, previous research has shown that supplier diversification is highly affected by several organizational, technological and institutional factors. These internal and external factors define how easily a firm can expand their supplier network and efficiently apply supplier diversifications strategies.

The concept of supplier diversity is associated with expanding the supplier base by including minority-owned, small, or non-traditional businesses, and it has become a

strategic element of the supply chain in the United States. According to Adobor & McMullen (2007), the diversification of supplier network can serve as source of competitive advantage, provided that it is integrated into broader corporate objectives and is being supported by a higher-level management commitment. Despite the challenges - including the difficulty in identifying reliable small suppliers and the tendency of firms to concentrate their supply base – the development of partnerships, the establishment of trust-based relationships and the cultivation of a collaborative organizational culture reinforce the stability of the supply chain. Furthermore, the authors highlight that supplier diversification enhances supply chain's resilience by reducing the dependence from a few major suppliers and by increasing the flexibility, fact that it is related directly to modern approaches to risk management in supply chains.

The recent research of Shen, Shen & Wu (2025) examines the way with which the «internetization» – in other words, the integration of digital technologies into supplier search and evaluation – affects the diversification of global supply chains and, consequently, the resilience of businesses. The authors demonstrate that firms encounter significant information difficulties when seeking new foreign suppliers, since the process entails high search costs and uncertainty for the quality and the reliability of potential partners. The adoption of digital technologies reduces these costs by 0,3-0,5 million RMB and increases the possibility of finding new suppliers by up to 3,3%, leading to a gradual increase in the number of supplier sources and in greater diversification of supply base. The most important finding of this research is that the digital empowerment of businesses primarily boosts diversification through the reduction of information frictions, while the expansion of supplier's network reduces the variations in the profits and enhances the resilience against external factors, as is evidenced by the reduction in profitability volatility over time. The article contributes to the related literature by pointing out that digital transformation constitutes a critical factor which facilitates suppliers' diversification and shields supply chain against global disruptions.

In addition, Li & Zhao (2025) investigate the way in which common ownership among firms affects the structure and diversification of supply chains. The results of their study indicate that higher degrees of common ownership among firms result in lower dependence on top suppliers and boost the presence of new suppliers, thereby limiting market concentration. This is mainly caused by two factors: the reduction of transaction

costs and the increase in information transparency among firms with a common investment structure. Based on the above, the study points out that, apart from operational strategies, supplier diversification and supply chain resilience are also affected by the financial structure of firms.

Complementing the above, the study by Shan, Xiong and Zhang (2023) examines how firms can choose their suppliers more efficiently, taking into account not only cost or quality but also collaboration, timely delivery, and supply chain resilience. The authors highlight that resilience is one of the most important criteria, as it helps firms face disruptions and recover swiftly. Moreover, it is stressed that working with multiple suppliers increases firms' stability, particularly in the automotive industry, where supply chain disruptions are costly. Overall, the article shows that such models may help firms make safer and more resilient supplier choices.

Extending the discussion on the above, Wang et al. (2025) examines how international productive activity and specifically the outward foreign direct investment (OFDI), contributes to searching supplying sources of intermediary products, reinforcing in this way the diversification and the resilience of supply chain. Based on the Eclectic Theory and Internalization Theory, the writers prove that OFDI to develop multinational supplier networks and decrease the dependence from specific markets. Furthermore, business innovation acts as a leverage that enhances the impact of OFDI in supplier's diversification, improving the quality and the range of alternatives sources. The findings of this research verify that diversification through globalization constitutes a critical tool for the amplification of resilience and creation of flexible and safer supplier networks.

Finally, the literature shows that the effectiveness of supplier diversification strategies depends on related aspects, such as firms' willingness to take risks and behavior. Wu, Zhang, and Chen (2025) analyze two of the most important risk management strategies in the supply chain, namely suppliers' diversification and disruption prevention. The authors focus on how buyers' risk aversion, especially in the post-covid era, influences the choice between the two strategies. In more detail, the findings show that although the two approaches are equivalent for a risk-neutral buyer, the risk-averse buyers have the tendency to choose either dual sourcing or an investment in prevention, avoiding extreme "go big or go home" strategies. Furthermore, suppliers' diversification is proven to be

more effective when the risk of disruption is higher, while the prevention outperforms when the risk is low or moderate. The study emphasizes that suppliers' diversification is not always the dominant solution as its efficiency depends on the buyer's risk profile and the nature of disruptions, pointing out the need for adaptive strategies to enhance supply chain resilience.

In a similar vein, Xue, Choi and Ma (2016) proves that supplier diversification constitutes a basic mechanism for risk management in supply chains with high uncertainty of performance. The authors examine the risk of a manufacturer that procures from multiple but not completely reliable suppliers and analyze how the level of risk affects the optimal supply strategies. Based on the mean–variance concept, they prove that the more the risk aversion increases, the more the manufacturer distributes their orders to largest number of suppliers, achieving a more balanced and resilient supply structure. The diversification decreases the profit variance and limits the impact of random supply failures or reduced delivery volumes (random yield). Additionally, the article proves that diversification is considered a critical tool for the reinforcement of supply chain against disruptions as the selection of each supplier is determined by a combination of factors such as cost, expected performance and volatility.

Overall, the existing literature provides important evidence that supplier and geographic diversification may be an effective mechanism for boosting supply chain resilience under circumstances of uncertainty and disruptions. Previous studies have highlighted that diversification reduces the dependence on single supplier or location, limits the possibility of exposure to local disruptions and reinforce the flexibility on decision making in supply chain. At the same time, an increasing amount of research shows that the benefits from diversifications are not linear, since they depend on factors such as demand characteristics, cost structures, the risk correlation among suppliers, the organizational capabilities and behavioral traits, such as risk aversion.

Despite the valuable knowledge, the greatest portion of previous research is based on standardized models with restricted hypothesis, focusing on specific industries or types of disruptions or examining the diversifications from an operational or cost minimizing perspective. Even lower attention has been paid to supplier diversification as a risk management strategy in supply chain, tightly connected to supply chain's resilience, while

at the same time the organizations, behavioral and structural dimensions are taken into consideration.

To address these gaps, the present study aims to add to the literature by examining supplier diversification as a multidimensional strategy to reinforce resilience and stability. Based on the previous findings, this study focuses on integrating the risk management knowledge in supply chain and resilience literature, in order to define under which circumstances and through which mechanisms supplier diversification boosts supply chain resilience. In this way, the study promotes the understanding of diversifications and places it as a strategic method to manage uncertainty and disruptions in modern supply chains.

3. Methodology

In this chapter, it is presented the methodological approach that was followed in order to examine the relationship between supplier diversification and supply chain resilience. Methodology consists a critical part of a research since it defines how the data are being collected, processed and analyzed, ensuring the reliability and the validity of the results (Saunders et al., 2019).

In the present research, the method that was followed for the data collection is the survey questionnaire (Creswell, 2014). The core constructs were measured using validated scales from prior literature (DeVellis, 2017), while additional questions were included to capture contextual and qualitative insights. More specifically, Sections 1–4 of the questionnaire include control and structural variables, while Section 5 measures Supply Chain Resilience based on the validated scale developed by Brandon-Jones et al. (2014). Sections 6–9 include additional question types (Likert-scale, ranking, dichotomous, and open-ended questions) designed to capture perceptions, contextual factors, and qualitative insights related to supplier diversification. The questionnaire design is presented in detail in Section 3.2.

Overall, the choice of the survey questionnaire allows the systematic recording of businesses' perceptions and practices in regards of supply chain management and the examination of the relationships and interactions among basic and important variables.

3.1 Research Design

The present study follows an explanatory research design aiming at explaining how supplier diversification affects supply chain resilience. The choice of quantitative methodology is based on the need for measurement and comparison of variables as well as drawing of conclusions.

The research is cross-sectional as the data was collected in a specific time period and its variation over time is not examined (Rindfleisch et al., 2008). Cross-sectional designs are commonly used in supply chain and management research when data are collected at a single point in time (Bryman & Bell, 2018). Despite the fact that a time-based analysis could yield additional information, the cross-sectional approach is considered sufficient to analyze the relationships between the variables in the current study.

The use of the questionnaire in the present study allows the collection of data from many participants while ensuring the standardization of the answers and facilitating the statistical analysis (Saunders et al., 2019; Creswell, 2014). Additionally, the standardized form of the questionnaire contributes to the elimination of subjectivity and enhances the comparability of the results.

3.2 Data Collection and Questionnaire Design

The data used in the present study is primary and was collected through a structured questionnaire. The structure of the questionnaire was based on extensive literature review in order to ensure that all variables examined reflect the concepts of supplier diversification and supply chain resilience (Sekaran & Bougie, 2016).

The questionnaire consists of open-ended and closed-ended questions, assisting in collecting both qualitative and quantitative data. The first questions focus on collecting participants' demographic information and companies' characteristics while the rest are examining the structure of supply chain and suppliers' management practices.

The questionnaire was designed based on the literature around supplier diversification and supply chain resilience and combines both validated scales and complementary questions which aim to depict the general context of this research. More specifically, the main variables were measured through validated scales from previous studies, while additional questions were included in order to capture perceptions, contextual factors and qualitative data which are related to supplier diversification.

The sections 1-4 of the questionnaire contain control variables and organizational characteristics of the firms such as demographic information, the roles of participants and basic characteristics of supply chain. Section 5 focuses on measuring supply chain resilience, based on a validated scale from the literature, such as that developed by Brandon-Jones et al. (Brandon-Jones et al., 2014).

The sections 6-9 contain additional question types such as Likert Scale questions, ranking questions, open-ended and dichotomous questions which have been designed to reflect perceptions, environment factors and qualitative dimensions that are related to supplier diversification.

The questionnaire was distributed electronically via Google Docs through professional networks and social media platforms, allowing the collection of data from professionals across different business sectors. The choice of electronic distribution contributed to faster data collection process and geographical expansion cover of the sample.

The data collection period extends from the beginning of April 2026 to the end of May 2026, during which a sufficient number of responses were collected to proceed with the statistical analysis.

The complete questionnaire used in the present study is provided in **Appendix A**.

3.3 Sample and Sampling Methodology

The participants of the survey are professionals in the sector of supply chain management who are actively involved in decision making processes such as supply, logistics, productions and operations.

In order to ensure the suitability of the sample, the questionnaire includes a filter question through which participants who are not actively involved in relevant activities are excluded from the survey.

The sample was selected using both purposive and convenience sampling (Saunders et al., 2019). Purposive sampling was used in order to select participants with relevant experience and knowledge of the subject, while convenience sampling was employed due to the practical accessibility of specific professional networks.

The final sample consisted of 43 participants, who are derived from different business sectors, such as manufacturing, retail, logistics, and the agri-food sector. The diversity of the sample enhances external validity of the survey and allows the drawing of conclusions (Bryman & Bell, 2018).

3.4 Measurement of Variables

3.4.1 Supplier Diversification

Supplier Diversification constitutes a key independent variable of the survey and is captured through structural metrics that are related to the structure of the supply chain base.

Specifically, the metrics that are examined are:

- The number of main suppliers,
- the percentage dependence on the main supplier,
- the geographic distribution of suppliers,
- the use of multiple sourcing strategies.

These indicators enable the measurement of both the intensity and the extent of diversification, providing a complete picture of the procurement strategies that firms follow (McCarthy Byrne et al., 2025; Li et al., 2025).

3.4.2 Supply Chain Resilience

The resilience of the supply chain was measured through a seven-point Likert scale, where the participants were asked to evaluate how much they agree or disagree with certain statements.

These statements are related to:

- The speed of operational recovery,
- the ability to return to normal operations,
- the effective management of disruptions.

The use of a multidimensional scale allows the capture of the different aspects of resilience, enhancing the validity of the measurement (Brandon-Jones et al., 2014).

3.4.3 Perceptions on supplier diversification

Additionally, the participants' perceptions regarding supplier diversification are examined through Likert-scale questions.

The variables examined are:

- The reduction of dependence on suppliers,
- the contribution to resilience,
- the increase in complexity,
- the role of geographic diversification,
- the importance of digital tools.

The incorporation of perception variables allows a deeper understanding of firms' decisions (Bryman & Bell, 2018).

3.4.4 Control Variables

The control variables include the characteristics of both the participants and the firms.

More specifically, these variables are:

- The Industry sector,
- The size of the firm,
- Years of operation,
- The level of experience,
- The geographic range of suppliers.

The inclusion of these variables in the research allows the isolation of the effect of the main independent variable (Hair et al., 2019).

3.5 Data Analysis Methods

The data analysis was conducted using statistical software SPSS.

At the initial stage of the study, descriptive statistical analysis was used in order to present the main characteristics of the sample, such as means, standard deviations and frequency (Field, 2018).

Next, the reliability of the scale was evaluated with the use of Cronbach's alpha index (Cronbach, 1951). Using Cronbach's alpha index allows the evaluation of the internal consistency among the variables that measures each construct.

To further examine the relationships among variables, the correlation analysis was used as it allows the assessment of the direction and the strength of the relationships between two variables (Pallant, 2020).

Lastly, the linear regression (Hair et al., 2019) was used in order to examine the effect of supplier diversification on supply chain resilience. The use of linear regression allows for the control of multiple variables and the evaluation of the contribution of each factor. For the regression analysis, composite mean scores of the main Likert-scale constructs were utilized.

The choice of specific statistical techniques is aligned with existing studies in supply chain literature and facilitates the comparison of the results (Hair et al., 2019; Field, 2018).

3.6 Methodology Justification

Quantitative statistics were chosen in order to empirically investigate the relationship between supplier diversification and supply chain resilience.

The use of a questionnaire allows the collection of data from real professionals of the field (Saunders et al., 2019), a fact that reinforces the value of the research. Additionally, the standardization of the questions contributes to the reduction of subjectivity and increase of reliability.

The use of a validated scale allows the comparison of the results with the existing international literature and strengthens the scientific validity of the research (DeVellis, 2017) as it reduces the risk of errors and strengthens the reproducibility of the research by other scholars in the future.

Lastly, statistical techniques such as regression were used, which allowed the study of causal relationships among variables and the drawing of conclusions.

3.7 Methodology Limitations

Although the methodology that was used has numerous advantages, there are some limitations that should be taken into account as well.

First, the participants were chosen based on ease of access. More specifically, the questionnaire was distributed through channels such as author's broader social circle, supply chain professionals in LinkedIn and co-students in the MBA which may not reflect the majority of professional in the field.

Moreover, the data analyzed are based on what the participants replied to the questions and that means that they are biased by their personal beliefs and opinions (Podsakoff et al., 2003) or their replies may not be as honest as they should be as they may have presented their ideas as they think they should be rather than as they actually are.

Last but not least, as the research was conducted in a specific time period, only the relationships among specific factors can be examined and not the causal relationships over time.

3.8 Ethical issues

The participation in the research is anonymous and voluntary. The participants were informed about both the scope of the research and the use of the data prior to answering the questionnaire.

The questionnaire was shared with all participants through Google Docs where the anonymity of the responses was clearly indicated. Thus, the data were collected and stored in a way that ensures confidentiality and does not violate personal data protection principles.

4. Results

4.1 Introduction to the Results

In this chapter, the results of the empirical study, conducted to investigate the relationship between supplier diversification and supply chain resilience, are presented. The analysis and the presentation of the results are based on the data which were collected through a structured questionnaire from professionals operating in the fields of supply chain management, procurement, logistics, and business operations across various industries. For the process and analysis of the results, the statistical software SPSS was used as the primary tool.

Initially, the descriptive characteristics of the sample and the main variables are presented as a first picture of the profile of the participants and the firms that they work for, as they are considered important factors for the analysis and interpretation of the findings.

Subsequently, the reliability of the measurement scales is examined with Cronbach's alpha index, followed by the analysis of the correlation of relationships among the main variables of the research. Lastly, linear regression is used in order to evaluate the effect of supplier diversification on the resilience of the supply chain.

It is important to note that the initial number of the respondents of the questionnaire were initially 43, however one response was excluded from the analysis because the participant did not meet the screening criteria. Therefore, the final responses analyzed below are 42.

4.2 Sample Characteristics

In this section, the characteristics of the respondents and the respective firms are presented, as well as the characteristics related to supplier diversification strategies. For the analysis, frequencies and percentages were used.

4.2.1 Respondent Characteristics

The following table presents the demographic and professional characteristics of the respondents participated in the present study.

Table 4-1 Respondents Characteristics

Variable	Category	Frequency	Percentage (%)
Department	Engineering	1	2.4
	Logistics	1	2.4
	Maintenance	2	4.8
	Operations	10	23.8
	Procurement	20	47.6
	Production	3	7.1
	Project Management	1	2.4
	Sales	2	4.8
	Supply Chain	2	4.8
	Total	42	100
Position Level	Non-managerial roles	14	33.3
	Supervisor/ Team Leader	8	19.0
	Middle management	10	23.8
	Senior management/ Executive	10	23.8
	Total	42	100
Experience	Less than 3 years	6	14.3
	3-5 years	8	19.0
	6-10 years	11	26.2
	More than 10 years	17	40.5
	Total	42	100

Source: Author

The majority of the participants are actively working in the Procurement department, which accounts for approximately half of the total sample. Additionally, a significant percentage of participants work in Operations as well, while the participation of professionals from Production, Supply chain, Maintenance and Logistics is considerably lower. The fact that the majority of the participants in the present study are professionals from the procurement department and are closely involved in supplier management

processes reinforces the relevance and reliability of the sample in the context of this research.

Furthermore, a considerable percentage of the respondents hold middle and senior level management positions, while a lot of the respondents come from supervisory and non-managerial roles. These results show that the participants of this study occupy different position levels with different levels of responsibility and involvement in decision-making processes, related to supply chain management, supplier selection and evaluation.

Regarding their experience, the majority of the participants have been working in the respective fields for more than six years, while the percentage of respondents with more than ten years of experience is relatively high. This finding reinforces the reliability of the responses collected, since it can be assumed that the respondents have a substantial professional experience and knowledge in the supplier and disruption management processes.

4.2.2 Firm Characteristics

The following table presents the main characteristics of the firms included in the sample.

Table 4-2 Firm Characteristics

Variable	Category	Frequency	Percentage (%)
Industry sector	Automotive	2	4.8
	Agri-Food	1	2.4
	Logistics/ Transportation	3	7.1
	Manufacturing/ Industrial	27	64.3
	Operations	1	2.4
	Retail	5	11.9
	Shipping	3	7.1
	Total	42	100.0
Number of employees	Fewer than 50	7	16.7
	50–249	8	19.0
	250–999	7	16.7
	1000 or more	20	47.6
	Total	42	100.0
Years of operation	Less than 5 years	1	2.4
	5-10 years	3	7.1
	11-20 years	3	7.1
	More than 20 years	35	83.3
	Total	42	100.0
Geographic scope of sourcing	Domestic suppliers only	1	2.4
	Mainly domestic with some international suppliers	7	16.7
	Balanced domestic and international sourcing	21	50.0
	Mainly international suppliers	13	31.0
	Total	42	100.0

Source: Author

ⁱ For analysis purposes, similar industry categories were consolidated into broader sector classifications.

As shown in the table above, the results regarding the firms' characteristics indicate that the majority of the firms operate in the Manufacturing sector, while fewer firms operate in Retail, Logistics/Transportation and Shipping. Regarding the size of the firms, most of them have more than 1000 employees, a fact that indicates that a big part of the sample is composed of large firms with complex operational processes and supply chain structures.

Regarding the years of operation, the majority of the firms have been operating for more than twenty years, which suggests that most of them have proven experience and established presence in their respective sectors. Moreover, most of the firms stated that they maintain a balance between domestic and international sourcing, while a considerable part of the firms relies mainly on international sourcing. This finding shows that the firms including in the sample operate in complex and challenging supply chain environments with high exposure to supply chain risks and disruptions which are related to supplier management and international markets.

4.2.3 Supplier Diversification Characteristics

The following table presents the main characteristics related to supplier diversification practices adopted by the participating firms.

Table 4-3 Supplier Diversification Characteristics

Variable	Category	Frequency	Percentage (%)
Number of Primary Suppliers for Critical Materials	1	0	0.0
	2	0	0.0
	3–5	7	16.7
	More than 5	35	83.3
	Total	42	100
Dependence on Largest Supplier	Less than 25%	22	52.4
	25-49%	12	28.6
	50-75%	7	16.7
	More than 75%	1	2.4
	Total	42	100
Geographic Diversification of Suppliers	1	1	2.4
	2-3	8	19.0
	4-6	11	26.2
	More than 6	22	52.4
	Total	42	100
Use of Multiple Sourcing Strategies	Yes	37	88.1
	No	5	11.9
	Total	42	100.0
Major Supply Disruption in last 3 years	Yes	18	42.9
	No	24	57.1
	Total	42	100.0

Source: Author

The findings regarding supplier diversification show that the majority of the firms collaborate with more than five main suppliers for critical materials, while more than half of the sample stated that less than 25% of their purchasing volume is allocated to their largest supplier. This may indicate a high level of supplier diversification and limited dependence on a single supplier.

Additionally, the majority of the firms stated that they collaborate with suppliers from more than six countries and at the same time, most of them apply multiple sourcing strategies for critical materials. These findings highlight the presence of geographic diversification and generally supplier diversification practices, aiming to reduce dependence on single and local suppliers.

Furthermore, a significant part of the firms has experienced at least one major supply disruption in the last three years. This finding shows that the organizations of the sample operate in environments with high uncertainty and risk exposure, and this emphasizes the importance of developing strategies that reinforce supply chain resilience.

Lastly, a slight majority of the sample has not experienced a supply disruption, a fact that may be connected to the greater emphasis placed on supplier diversification (as indicated by the previous findings); however, this relationship will be examined in detail in the next paragraphs of the study.

4.3 Descriptive Statistics of Main Variables

In this section, the descriptive statistics of the main variables of the study related to supply chain resilience and perceptions regarding supplier diversification are presented. For the analysis, mean values and standard deviations were used.

4.3.1 Supply Chain Resilience

The following table presents the descriptive statistics for the variables related to Supply Chain Resilience.

Table 4-4 Supply Chain Resilience Descriptive Statistic

Variable	Mean	Standard Deviation
Material flow restoration	4.52	1.311
Recovery of operating performance	4.55	1.418
Recovery to its original state	4.14	1.441
Ability to deal with disruptions quickly	4.69	1.316

Source: Author

As shown in the above table, the results from the descriptive statistics for the variables that are related to Supply Chain Resilience show relatively high mean values, which means that most of the participants agreed with the statements for all aspects of supply chain resilience. Slightly higher means are observed in the firms' ability to deal with disruptions quickly and recovery of normal conditions in the supply chain, a fact that indicates participants' positive attitude on these variables.

Regarding the standard deviation, the values are at moderate levels, and this indicates a satisfactory degree of homogeneity among respondents' responses. All in all, the results reflect the perceptions of the firms included in the sample that they are resilient to supply chain disruptions.

4.3.2 Perceptions on Supplier Diversification

The following table presents the descriptive statistics for the variables related to perceptions on supplier diversification.

Table 4-5 Descriptive Statistics for Supplier Diversification Perception Variables

Variable	Mean	Standard Deviation
Supplier diversification reduces dependency on single suppliers	5.88	1.131
Supplier diversification improves resilience to disruptions	5.83	1.188
Managing multiple suppliers increases operational complexity	4.95	1.481
Geographic diversification enhances risk management	5.02	1.569
Digital tools facilitate supplier diversification	5.40	1.326

Source: Author

The higher mean values in the first two variables show a high level of agreement among participants for the positive effects of supplier diversification. More specifically, higher mean values are observed in variables related to the reduction of dependence on single suppliers and improvement of resilience to supply chain disruptions. This finding reflects the perception of the respondents that supplier diversification is important for enhancing supply chain resilience.

On the other hand, high mean values are also observed in the variables related to increased operational complexity due to collaboration with multiple suppliers. This result suggests that the organizations recognize not only the positive effects but also the challenges associated with diversification strategies. In addition, the participants have positively evaluated the contribution of geographic diversification to risk management as well as the contribution of digital tools in applying the supplier diversification practices.

Regarding the standard deviations of the variables, it can be assumed that the values are at a moderate level so again there is homogeneity in the participants' responses.

4.4 Reliability Analysis

Reliability analysis was conducted in order to examine the internal consistency of the measurement scales used in the present study.

Table 4-6 Reliability Analysis Results

Construct	Number of Items	Cronbach's Alpha
Supply Chain Resilience	4	0.799
Supplier Diversification Perceptions	5	0.722

Source: Author

The Cronbach's Alpha values for Supply Chain resilience and Supplier Diversification Perceptions variables are above 0.70 therefore, the measurement scales can be considered satisfactorily consistent and reliable. Consequently, the variables included in each construct are considered appropriate and can be used in the following correlation and regression analyses.

4.5 Correlation Analysis

Correlation analysis was conducted in order to examine the relationship between supplier diversification and supply chain resilience.

Table 4-7 Correlation Analysis Results

Variable	Supply Chain Resilience	Supplier Diversification
Supply Chain Resilience	1	0.560**
Supplier Diversification	0.560**	1

Source: Author

**** Note:** Correlation is significant at the 0.01 level (2-tailed).

As it can be seen from the above table and since we take into consideration that r is greater than 0.5 and p -value is lower than 0.01 ($r=0.560$, $p\text{-value}<0.01$), it can be assumed that there is a positive and statistically significant relationship between supply chain resilience and supplier diversification. At the same time, the value of Pearson Correlation Coefficient suggests that there is a moderate positive correlation between the two variables.

This finding leads to the indication that higher levels of supplier diversification are connected to the increased ability of companies to manage risks and recover after disruptions. Although this finding reflects a mutual tendency of the variables, it cannot imply a causal relationship between the variables.

4.6 Regression Analysis

In this section, regression analysis is conducted in order to examine the effect of supplier diversification perceptions on supply chain resilience. To structure the regression model, Supply Chain Resilience was defined as the dependent variable, while Supplier Diversification Perceptions was used as the independent variable. The regression analysis was conducted using the composite mean scores of the two constructs in order to examine the effect of supplier diversification perceptions on supply chain resilience.

The following table presents the results of the regression model.

Table 4-8 Regression Model Summary

Model	R	R Square	Adjusted R Square	F	Sig.
1	0.560	0.314	0.296	18.272	<0.001

Source: Author

As shown in the above table, the regression model is statistically significant as the p-value is lower than 0.001 ($F = 18.272$, $p\text{-value} < 0.001$). Additionally, the coefficient of determination is equal to 0.314, a fact that indicates that approximately 31.4% of the variation in Supply Chain Resilience can be explained by the variable Supplier Diversification Perceptions. This value can be considered satisfactory for research in the field of Business Administration, where the behavior of the firms is influenced by numerous factors. Overall, the results show that the Supplier Diversification Perceptions are highly related to the level of Supply Chain Resilience.

Table 4-9 Regression Coefficients

Variable	B	Beta	t	Sig.
Supplier Diversification Perceptions	0.654	0.560	4.275	<0.001

Source: Author

The results in **Table 4-9** show that Supplier Diversification Perceptions variable has a positive and statistically significant effect on Supply Chain Resilience since $\beta = 0.560$ and the p-value is lower than 0.001. More specifically, the positive value of the standardized coefficient ($\text{Beta} = 0.560$) indicates that when the level of positive perceptions regarding supplier diversification increases, the level of supply chain resilience increases as well. Furthermore, the high value of t-statistic ($t = 4.275$) reinforces the significance of the relationship between the two variables. This finding is in line with the results from the correlation analysis and supports the perspective that supplier diversification strategies may contribute to firms' resilience against the supply chain disruptions and risks.

4.7 Additional Findings

In this paragraph, the additional findings from ranking and barriers-related questions and open-ended responses included in the questionnaire are presented. These findings provide a deeper understanding of participants' and firms' priorities in supplier selection, the challenges that firms may face when they apply supplier diversification practices as well as the disruptions that they have already dealt with and how they handled them.

4.7.1 Supplier Selection Priorities

The following table presents the mean values and the standard deviations of the criteria as they were ranked by the respondents. The ranking used was one indicating the most important criterion and five the least important from participants' perspective.

Table 4-10 Supplier Selection Priorities

Criterion	Mean	Standard Deviation
Cost	2.93	1.257
Quality	2.29	1.330
Reliability	2.60	1.106
Flexibility	3.45	1.017
Geographic Diversification	3.74	1.781

Source: Author

From the above table, it can be assumed that for the respondents, quality and reliability are the most important factors when selecting suppliers as they have the lowest mean values compared to the rest of the criteria. This finding shows that firms give more emphasis to collaborating with suppliers with high standards that they can rely on, especially in environments with increased uncertainty and risks of disruption.

On the other hand, flexibility and geographic diversification are considered less important criteria compared to the previously mentioned criteria. Additionally, the cost, which has a medium mean value, seems to have an important role in supplier selection, but it is not the dominant criterion for the firms included in the sample.

4.7.2 Barriers to Supplier Diversification

The following table presents the barriers that firms face when applying supplier diversification practices.

Table 4-11 Main Barriers to Supplier Diversification

Barrier	Frequency	Percentage (%)
Lack of reliable suppliers	17	40.5
Increased complexity	14	33.3
High cost	5	11.9
Internal resistance	5	11.9
Difficulty in bringing all of them up to our standards	1	2.4

Source: Author

As presented in the above table, the lack of reliable suppliers is the most important barrier for firms when implementing supplier diversification strategies, as it was chosen by 40.5% of the participants. These results show that although supplier diversification is considered important, most of the firms face difficulties in finding suppliers who meet the required standards in terms of quality and reliability.

Additionally, high complexity appears also to be an important barrier, since 33.3% of the respondents stated that managing multiple suppliers causes additional difficulties in supply chain management, as the processes are becoming more complicated and time-consuming. On the contrary, high cost and internal resistance affect a smaller part of the firms included in the sample. Lastly, there was a response indicating as a barrier the difficulty in bringing all of them up to our standards, which can also be associated with the lack of reliable supplier barrier and reinforce further its importance.

All in all, the results of this table indicate that even if there are positive effects from adopting supplier diversification strategies, there are also considerable obstacles that firms are required to overcome along the way.

4.7.3 Qualitative Insights from Open-ended Responses

In this paragraph, a summary of the responses to the open-ended questions is presented. The responses to these questions provide additional and valuable information regarding the disruptions that firms faced the recent years, as well as the practices followed in order to handle these situations. These findings could not be used in the statistical analysis that was conducted in the previous paragraphs, however; they contribute to the drawing of conclusions.

From the responses it can be concluded that the most common disruptions are related to geopolitical crises and wars, such as the war in the Middle East and Ukraine, which affected transportation and caused shortages of raw materials and electronic components. More specifically, a lot of participants reported as disruptions the increased transportation time, the increased transportation and material costs and the limited availability of the products.

Regarding the way firms handled the disruptions mentioned above, most of them seem to have adopted strategies based on supplier diversification, meaning that they searched for alternative local or international suppliers. In quite a few responses, the solution involved finding suppliers from Asia, which may indicate a tendency toward alternative low-cost suppliers. Also, some firms tried to reinforce smooth coordination among procurement, logistics, and production departments within the company for better risk management. Furthermore, many responses mentioned the application of back-up plans, such as the reallocation of orders to local suppliers that were not affected by transportation delays and the adaptation of production priorities in order to reduce the negative effects.

At the same time, the participants through their responses revealed challenges that are associated with the implementation of supplier diversification strategies. The most common challenges mentioned are: finding of reliable suppliers, maintaining high quality, increased complexity and high cost and amount of time which are required for the evaluation and the smooth integration of new suppliers in their network. In addition, some of the participants mentioned also issues of internal resistance and difficulties in adaptation of the current employees in the new collaborations and procedures.

All in all, the findings from the open-ended questions reinforce the findings from the quantitative analysis conducted in the previous paragraphs, as they show that apart from the important contribution of supplier diversification practices on supply chain resilience, the implementation is accompanied by important organizational and operational challenges.

4.8 Summary of Findings

To summarize, the findings of the analysis show that the firms included in the sample give emphasis to supplier diversification as a tool to enhance supply chain resilience. The correlation results showed that there is a positive and statistically significant relationship between supplier diversification perceptions and the level of supply chain resilience, a fact that was reinforced by the results of regression analysis.

Additionally, the participants recognized through their responses that the implementation of supplier diversification practices is accompanied by some considerable challenges such as increased complexity, difficulty in finding new reliable suppliers with high standards and high operational costs that this change entails.

Lastly, responses to the open-ended questions confirmed that the recent disruptions that firms faced are mainly related to geopolitical crises, delays in transportation and shortages of materials, while the supplier diversification practices and finding new suppliers appear as mitigation strategies. Overall, the findings of *Chapter 4* is the base for discussion and interpretation of the results that are analyzed in the next chapter.

5. Discussion and Conclusions

5.1 Discussion of Findings

The purpose of the present study is the investigation of the relationship between supplier diversification and supply chain resilience. After the collection of primary data through a questionnaire distributed to professionals operating in the sectors of procurement, supply chain, logistics, and operations, and after their analysis, the way supplier diversification strategies affect risk management and disruption handling was investigated.

The results of the research showed that there is a positive and statistically significant relationship between supplier diversification and supply chain resilience. More specifically, the results of the correlation analysis showed a moderate positive correlation between the two variables, while the results of regression analysis verified that perceptions of supplier diversification positively affect the level of supply chain resilience.

The findings of the research are in accordance with the existing literature, which supports that collaboration with multiple suppliers and geographic diversification reinforce the ability of the firms to efficiently handle unpredictable disruptions and manage risks (Christopher & Peck, 2004; Tang, 2006; Brandon-Jones et al., 2014). Additionally, the participants in the research agreed to a great extent that supplier diversification contributes to decreasing dependence on a single supplier and improving resilience against supply chain disruptions (Adobor & McMullen, 2007).

Additionally, the results showed that the firms included in the research already implement supplier diversification practices at a satisfactory level. The majority of the companies collaborate with more than five suppliers for critical materials and components, while many firms have key suppliers in more than six countries. These data indicate that the firms in the sample operate in international and complex supply chain environments, where risk management is considered a critical strategic matter.

On the other hand, the findings of the study also showed that the implementation of supplier diversification strategies, except for the positive effects on resilience, comes with some challenges and difficulties as well. As the main barriers in the application of supplier diversification, the increased complexity of managing multiple suppliers, the difficulty in

finding reliable new suppliers, and the high operational cost required were mentioned. This finding is in accordance with the previous literature, in which it is supported that the positive effects of supplier diversification are not always linear and depend on some factors, such as the cost structure, the organizational ability of the firms, and the nature of the risks that arise (Chen et al., 2023; McCarthy Byrne et al., 2025).

Except for the quantitative findings of this study, the answers that were provided to the open-ended questions are also considered particularly important, as they provide a deeper understanding regarding the challenges and disruptions that firms have faced in recent years. More specifically, the participants through their responses reported that the most significant disruptions are mainly associated with geopolitical crises and wars, transportation delays, as well as shortages of raw materials and components, which created several difficulties in the smooth operation of supply chains (Ivanov, 2021; Queiroz et al., 2020).

As a way to handle these challenges, most of the respondents stated that they searched for alternative local and international suppliers in order to reduce delays and secure the availability of materials and components. This finding further strengthens the importance of supplier diversification as an effective strategy to manage risks and to reinforce the ability of firms to respond to unexpected disruptions (Tang, 2006; Ponomarov & Holcomb, 2009).

Furthermore, during the evaluation of the importance of factors when selecting suppliers, the participants gave emphasis to the quality of the materials and the suppliers' reliability, while geographic diversification and flexibility were considered less important. This fact indicates that, despite the importance of diversification, companies continue to consider reliability and stability in their collaborations as essential prerequisites for the proper functioning of the supply chain.

5.2 Theoretical and Managerial Implications

The present study contributes to the existing literature, as it studies supplier diversification not only as an operational supply practice but also as a strategic tool that can be used to enhance supply chain resilience. The results of the study confirmed the main idea of the research, that supplier diversification may constitute an efficient mechanism for risk management in environments with high uncertainty and frequent disruptions (Tang, 2006; Christopher & Peck, 2004).

On a more practical level, this research provides useful information for professionals in the supply chain sector. Nowadays, as circumstances continuously change, firms are required to develop more flexible and diversified networks of suppliers in order to reduce their dependence on specific markets or partners and strengthen their ability to respond to crises and disruptions (Ponomarov & Holcomb, 2009).

Moreover, the study highlights the importance of using digital tools and new technologies for the management and evaluation of suppliers (Ivanov & Dolgui, 2020), as well as for the elimination of the complexity that comes with diversification strategies. In addition, the results show that the efficient implementation of supplier diversification strategies requires an appropriate business structure that supports more complex processes, sufficient resources, and effective cooperation between the different departments within the firm that are affected by such decisions and changes.

5.3 Limitations

The present study contributes to the existing literature, as it studies supplier diversification not only as an operational supply practice but also as a strategic tool that can be used to enhance supply chain resilience. The results of the study confirmed the main idea of the research, that supplier diversification may constitute a strategic tool for enhancing supply chain resilience. Apart from the contribution of supplier diversification, this research also presents some limitations that should be taken into account when interpreting the results in order to be more accurate and realistic.

First of all, the sample used for this research is limited, since the participants on which the analysis was based are 42. A sample that is considered sufficient for statistical analysis; however, an even larger sample may have given more accurate results.

Further, the selection of the sample was conducted through purposive and convenience sampling, since the participants are mainly people from the author's social circle, a fact that limits the ability to consider the findings as generally valid for all supply chain professionals.

Another limitation is that the study was based on self-reported data, which may involve a degree of subjectivity. More specifically, the reliability of the responses may be influenced by the participants' personal perceptions or generally accepted beliefs, which they may subconsciously tend to reflect, even if these do not fully correspond to their actual experience (Podsakoff et al., 2003).

Moreover, as previously mentioned, the research is cross-sectional, as the data were collected in a specific time period and reflect the conditions of this specific period. As a result, from the data of the study, no conclusions can be drawn regarding the development of the relationship between the variables in the long term.

Last but not least, the research was focused mainly on the perceptions of the participants related to supplier diversification and not on objective factors related to firms' performance, which could be used as a basis for future studies.

5.4 Future Research

In future research, it would be very interesting to study again the relationship between supplier diversification and supply chain resilience, but with a larger and more representative sample, that is to say a sample with participants from firms all around the world and from different industry sectors. In this way, the positive relationship between the variables may be proven more objectively and the results could be considered more generally applicable.

Additionally, it may be useful for future studies to adopt a longitudinal approach in order to examine how supplier diversification strategies affect firms' resilience in the long term and during different types of crises. Through this approach, the relationship between the variables could be studied in a more multidimensional way and more practical insights for professionals in the supply chain sector could be provided.

Furthermore, another important way for future approaches regarding this relationship is to focus on the role of digital tools, artificial intelligence systems and risk prediction systems in the management of diversified supplier networks, aiming to reduce the barriers identified in this study. In this way, it could be easier for firms to manage diversified supplier networks more effectively and improve the implementation of supplier diversification strategies.

Lastly, it would also be interesting for future studies to examine whether there is a relationship between the size of a firm and the implementation of supplier diversification strategies. More specifically, firms of different sizes may face different challenges and limitations regarding the management of supplier networks and disruptions. Therefore, future findings could provide a clearer picture of how supplier diversification strategies should be applied in different types of firms in order to be effective or even whether the implementation of such practices is beneficial for small firms.

5.5 Conclusions

Based on the findings of the study, supplier diversification appears to be closely related to supply chain resilience. Firms that cooperate with multiple suppliers and use geographically diversified supplier networks seem to be in a better position when disruptions occur, especially in periods with uncertainty and instability in global supply chains (Christopher & Peck, 2004; Tang, 2006).

The responses of the participants showed that many firms have already understood the importance of reducing dependence on single suppliers. Especially nowadays, where there are delays in transportation and orders' deliveries, shortages of materials, and major disruptions in international relations that affect global markets, this has become even more critical. As a result, many firms have focused more on creating flexible supply networks and searching for alternative suppliers to prevent these risks or to be able to tackle them if they arise.

However, diversification strategies are not a panacea for all operational problems. On the contrary, the findings of the study showed that many firms still face difficulties during the implementation of these practices. Increased complexity, higher costs and the difficulty in

finding suppliers that meet the required standards were some of the most common challenges mentioned by the participants.

Overall, supplier diversification should be considered an important strategic tool with a positive effect on supply chain resilience and risk management (Ponomarov & Holcomb, 2009; Brandon-Jones et al., 2014). Even though there are some challenges that should be tackled along the way, the ability of firms to adapt to new conditions and develop flexible supplier networks, which are prerequisites for supplier diversification, may become important requirements for sustainability in the future, where the business environment is expected to be increasingly uncertain and dynamic.

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Appendix A: Research Questionnaire

Title: Supplier Diversification and Supply Chain Resilience

Dear Participant,

This survey is conducted for academic purposes as part of a Master's thesis examining how supplier diversification influences supply chain resilience.

All responses are anonymous and confidential. The survey refers to your firm's primary supply chain.

SECTION 1: Screening Question

1. Are you directly involved in supply chain, procurement, logistics, or operations decisions in your firm?
 - Yes
 - No (If No, please do not continue)

SECTION 2: Respondent Information (Control Variables)

2. In which department do you primarily work?
 - Supply Chain
 - Procurement
 - Logistics
 - Operations
 - Production
 - Other: _____
3. What is your current position level?
 - Non-managerial role
 - Supervisor / Team leader
 - Middle management
 - Senior management / Executive
4. How many years of experience do you have in supply chain or procurement?
 - Less than 3 years
 - 3–5 years
 - 6–10 years
 - More than 10 years

SECTION 3: Firm Characteristics (Control Variables)

5. Industry sector:
 - Manufacturing
 - Retail
 - Logistics / Transportation
 - Agri-food
 - Automotive
 - Other: _____
6. Number of employees:

- Fewer than 50
 - 50–249
 - 250–999
 - 1000 or more
7. Years of operation:
- Less than 5 years
 - 5–10 years
 - 11–20 years
 - More than 20 years
8. Geographic scope of sourcing:
- Domestic suppliers only
 - Mainly domestic with some international suppliers
 - Balanced domestic and international sourcing
 - Mainly international suppliers

SECTION 4: Supplier Diversification (Structural Variables)

9. How many primary suppliers does your firm use for critical materials/components?
- 1
 - 2
 - 3–5
 - More than 5
10. What percentage of total purchasing volume is allocated to your largest supplier?
- More than 75%
 - 50–75%
 - 25–49%
 - Less than 25%
11. In how many different countries are your key suppliers located?
- 1
 - 2–3
 - 4–6
 - More than 6
12. Does your firm use multiple sourcing strategies for critical inputs?
- Yes
 - No
13. Has your firm experienced a major supply disruption in the last 3 years?
- Yes
 - No

SECTION 5: Supply Chain Resilience (Based on Brandon-Jones et al., 2014)

Please consider your firm's primary supply chain and its response to disruptions (e.g., supply shortages, transportation delays, demand shocks, unexpected events).

Please indicate your level of agreement with the following statements:

Scale:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Somewhat Disagree
- 4 = Neither Agree nor Disagree
- 5 = Somewhat Agree
- 6 = Agree
- 7 = Strongly Agree

- 14. Material flow would be quickly restored.
- 15. It would not take long to recover normal operating performance.
- 16. The supply chain would easily recover to its original state.
- 17. Disruptions would be dealt with quickly.

SECTION 6: Managerial Perceptions on Supplier Diversification

Scale: 1–7

- 18. Supplier diversification reduces dependency on single suppliers
- 19. Supplier diversification improves resilience to disruptions
- 20. Managing multiple suppliers increases operational complexity
- 21. Geographic diversification enhances risk management
- 22. Digital tools facilitate supplier diversification

SECTION 7: Ranking Question

Rank the following factors based on importance when selecting suppliers

(1 = Most important, 5 = Least important, Each rank should be used only once)

- Cost
- Quality
- Reliability
- Flexibility
- Geographic diversification

SECTION 8: Barriers

What is the main barrier to supplier diversification?

- High cost
- Increased complexity
- Lack of reliable suppliers
- Internal resistance
- Other: _____

SECTION 9: Open-ended Questions

Describe a recent supply disruption your firm faced and how it was handled:

What are the biggest challenges your firm faces when diversifying suppliers?

Author's Statement:

I hereby declare that, in accordance with article 8 of Law 1599/1986 and article 2.4.6 par. 3 of Law 1256/1982, this thesis/dissertation is solely a product of personal work and does not infringe any intellectual property rights of third parties and is not the product of a partial or total plagiarism, and the sources used are strictly limited to the bibliographic references.