



ENSURING SUSTAINABLE SUPPLY CHAIN: RETAILERS RESPONSE TO FOOD SUPPLY CHAIN DISRUPTIONS

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Article History

Volume 6, Issue 12, 2024

Received: 02 Jun 2024

Accepted: 25 Jun 2024

doi:

10.48047/AFJBS.6.12.2024.3991-4001

Abstract

The COVID-19 pandemic revealed major weaknesses in food supply chains worldwide, especially affecting retailers. This thesis examines the disruptions faced by Malaysian retailers in the Lembah Klang area from 2017 to 2022. It identifies key disruptions, evaluates their impact on food availability, and offers recommendations to improve resilience. By conducting interviews with experts and retailers, the study explores challenges like labour shortages, transportation issues, and changing consumer behaviours. It also looks at effective strategies such as managing inventory, finding alternative sources, and using technology. The role of government policies and the potential of machine learning in strengthening supply chains are also discussed. The goal is to provide insights that help in crisis preparation, policymaking, and promoting sustainable supply chains, contributing to a better understanding of supply chain resilience. This research aims to help stakeholders build more robust and adaptable supply chains for the future.

Keywords: *COVID-19, food supply chain, resilience, retailers, Malaysia.*

1. INTRODUCTION

The outbreak of the COVID-19 pandemic in late 2019 presented unprecedented challenges to global societies, impacting nearly every aspect of daily life (McKibbin & Fernando, 2023). While the pandemic served as a significant focal point, it's essential to recognize that disruptions within the food supply chain can stem from various sources (Alabi & Ngwenyama, 2023). These disruptions may include natural disasters, economic fluctuations, geopolitical tensions, and technological failures, all of which can severely affect the resilience of the food supply chain (Coleman, 2024).

This research arises from the unparalleled problems and disruptions caused by the unprecedented challenges to global societies, namely within the retail business. The current worldwide crisis has brought attention to weaknesses in the systems that provide food, emphasizing the importance of comprehending how businesses, particularly merchants, manage and react to these difficulties (Aday & Aday, 2020). This include :

a) **Critical Role of Retailers:**

Retailers play a pivotal role in ensuring the availability and accessibility of essential goods, particularly food products (Macfadyen et al., 2015). Understanding how these businesses address disruptions in their supply chains is essential for both immediate crisis management and long-term resilience.

b) **Knowledge Gap in Retail Resilience:**

There exists a gap in understanding how retailers, particularly in Malaysia, have coped with the challenges posed by the pandemic. This research seeks to bridge that knowledge gap by investigating the specific disruptions faced by retailers and evaluating the effectiveness of their strategies.

c) **Business Continuity and Economic Stability:**

In times of crisis, ensuring the continuity of businesses, especially in the food sector, is crucial for economic stability. This research seeks to provide insights that can guide businesses in maintaining operations, safeguarding employment, and contributing to overall economic resilience (Aday & Aday, 2020).

1.1. Problem Statement

The COVID-19 pandemic caused substantial changes in the world's food supply lines, which brought about several problems. The problems include food availability and supply chain disruptions, border restrictions and trade implications, food security and safety concerns, government policies and interventions, stockpile strategies for food security,

supplier availability and localized supply chains. reaching rural areas and last-mile delivery. These problems affected the whole supply chain, from production to distribution. By looking at all of these aspects in depth, this article aims to not only help us understand the many problems that come up when there is not enough food during crises, but also to give policymakers, industry stakeholders, and communities useful information that they can use to make food supply systems better and more flexible in the future.

1.2. Research Objectives

The retail industry is only one of several that has felt the effects of the huge challenges caused by the COVID-19 outbreak on global supply chains. Because of their significant role in the food supply chain, retailers have been the target of major disruptions, demanding for an analysis of the effects and solutions. This research seeks to comprehend all aspects of these difficulties from the larger perspective of Malaysian retailers.

- a) To identify and analyse the disruptions experienced by Retailer's food supply chain.

This objective aims to identify and analyse the disruptions encountered by the food supply chain of retailers while emphasizing resilience. These disruptions may include interruptions in the flow of goods due to various factors such as transportation delays, labour shortages, or unforeseen events like natural disasters and pandemics.

- b) To assess the extent of the impact of disruption on the availability and accessibility of food products within Retailers' supply chain.

This objective seeks to evaluate the resilience of the food supply chain of retailers by assessing the extent to which disruptions impact the availability and accessibility of food products. The analysis will focus on understanding how disruptions affect the ability of retailers to maintain a consistent supply of food items to meet consumer demand during crises.

- c) To give recommendation to mitigate the effects of disruptions on their food supply chain during the crisis.

In line with resilience, this objective aims to provide actionable recommendations to mitigate the effects of disruptions on the food supply chain of retailers during crises. These recommendations will focus on enhancing the resilience of the supply chain through measures such as diversifying sourcing options, implementing contingency plans, and leveraging technology to improve agility and responsiveness.

1.3. Research Questions

- a) What are the main disruptions that the food supply chain of retailers has experienced, and how have these disruptions impacted the chain's resilience?
- b) What extent do disruptions within the food supply chain of retailers impact the availability and accessibility of food products, and what role does the chain's resilience play in mitigating this impact?
- c) What actionable recommendations can be provided to enhance the resilience of the food supply chain of retailers and mitigate the effects of disruptions during crises?

1.4. Significance of Study

After the COVID-19 pandemic, the world, including the retail sector, has faced problems that have never been seen before. Focusing on the group of retailers as a whole, this study starts an important look into the effects and workable solutions in the Malaysian retail market. The importance of this study lies in its ability to give us useful information about how food supply chains work during a crisis and how well retailers' mitigation strategies work.

- a) Informing Crisis Preparedness and Response.

By examining the specific challenges and successful strategies employed by Retailers in navigating the disruptions caused by the COVID-19 pandemic, this study provides valuable insights that can inform future crisis preparedness and response efforts within the food supply chain sector (Burgos & Ivanov, 2021).

b) Policy Formulation and Implementation.

The research findings can serve as a basis for policy recommendations at both the organizational and governmental levels. This includes policies related to supply chain management, government interventions, stockpiling strategies, and support mechanisms for businesses during crises.

c) Enhancing Resilience in Supply Chain Systems.

Understanding how Retailers managed to maintain the flow of food products during a global crisis can contribute to the development of more resilient supply chain systems. This knowledge is pertinent not only for the retail sector but also for the broader food industry.

d) Promoting Sustainable Supply Chain Practices.

Insights gained from this study can be used to promote sustainability within the food supply chain. This includes evaluating the environmental impacts of disruptions and resilience strategies and identifying opportunities for more sustainable practices.

e) Supporting Business Continuity and Economic Stability.

The research can offer critical guidance for businesses in the food sector on strategies to ensure continuity during crises. This, in turn, contributes to maintaining economic stability and safeguarding jobs within the industry.

f) Addressing Food Security and Access Issues.

Understanding how disruptions affect food availability and access can inform efforts to ensure food security for vulnerable populations, especially in times of crisis. Lessons learned can guide policies and interventions aimed at mitigating food insecurity.

g) Advancing Knowledge in Supply Chain Resilience.

This study contributes to the body of knowledge on supply chain resilience, offering a real-world case study that can be used for comparative analyses and theoretical development in the field of supply chain management.

h) Facilitating International Collaboration and Learning

The findings from this research may be of interest to other countries and businesses grappling with similar challenges. Sharing insights and best practices can facilitate international collaboration and mutual learning in the realm of supply chain resilience.

i) Contributions to Academic Knowledge.

This study contributes to the academic understanding of how global events, such as the COVID-19 pandemic, impact supply chains within a specific national context. It adds to the growing body of knowledge on crisis management, supply chain resilience, and strategic responses in the retail sector.

1.5. Scope and Limitation of the Study

The scope of your study on food supply chain disruptions and resilience during COVID-19, focusing on Retailers who manage food supply chain, encompasses several key dimensions:

- a) Geographic Scope: The study primarily focuses on Retailers in Lembah Klang.
- b) Temporal Scope: The study primarily examines the time frame from 2017 to 2022, emphasizing the specific disruptions and responses that arise during this period. This could encompass various events, from economic downturns to natural disasters, and subsequent recovery phases.
- c) Functional Scope: The study delves into various aspects of the food supply chain, including but not limited to production, procurement, transportation, warehousing, distribution, and retail operations within Retailers.

- d) **Stakeholder Perspective:**The study considers the perspectives and actions of key stakeholders involved in Retailer's food supply chain, including the organization itself, its suppliers, government agencies, regulatory bodies, and consumers.
- e) **Disruptions and Resilience Factors:**The research centres on disruptions induced by various factors, including but not limited to the COVID-19 pandemic. These disruptions may involve challenges such as labour shortages, transportation constraints, shifts in consumer behaviour, and bottlenecks in the supply chain. Furthermore, it explores the strategies and interventions implemented by retailers to address these disruptions and bolster resilience.
- f) **Policy Analysis:**The study may analyse government policies and interventions that affected Retailer's food supply chain during the COVID-19 pandemic, with a specific emphasis on how these policies influenced the organization's operations.
- g) **Supplier Relationships:**The research may examine the relationships and interactions between Retailers and its suppliers, particularly in the context of supplier availability, closures, and the development of contingency plans.
- h) **Last-Mile Delivery and Rural Access:**The study may include an assessment of Retailer's efforts in ensuring the availability of food products in remote and rural areas, including the effectiveness of last-mile delivery strategies and community-based distribution networks.

While conducting this study, several limitations are acknowledged:

- a) **Single Retailer Focus:**The research focuses on a specific retailer, limiting the generalizability of findings to the entire retail sector.
- b) **Data Availability:**The study is contingent on the availability of accurate and comprehensive data from the selected retailer, which may pose challenges due to proprietary or sensitive information.
- c) **External Factors:**External factors beyond the scope of the study, such as broader economic conditions or geopolitical events, may influence the findings.
- d) **Generalization to Other Regions:**Findings may not be universally applicable to retail environments in other regions due to variations in market structures, regulations, and responses to the pandemic.
- e) **Limited Stakeholder Perspectives:**While efforts are made to consider various stakeholders, certain perspectives may be underrepresented, impacting the comprehensive understanding of the subject.

2. LITERATURE REVIEW

2.1 The Impact of disruptions on Global Food Supply Chain

The impact of the COVID-19 pandemic on global food supply chains has been profound, affecting various facets and prompting a reassessment of strategies to ensure resilience (Aljuneidi et al., 2023). Labor shortages emerged as a significant challenge due to lockdowns and safety concerns, disrupting agricultural and processing activities (Balwinder-Singh et al., 2020). Transportation constraints, including border closures, resulted in delays and logistical challenges, hindering the efficiency of food distribution (Karunarathna et al., 2023). Shifts in consumer behaviour, marked by panic buying and online shopping, created challenges for retailers and suppliers in adapting to fluctuating demand (Stanca et al., 2023). The pandemic emphasized the importance of supply chain resilience, leading to strategies like diversification and technological investments (Wang et al., 2023). Government interventions and policy changes have been implemented globally to address immediate challenges and foster long-term resilience, though their effectiveness varies. In conclusion,

the pandemic exposed vulnerabilities in global food supply chains, necessitating adaptive strategies to enhance resilience (Fan et al., 2021).

2.2 Types of Disruption to Food Supply Chain

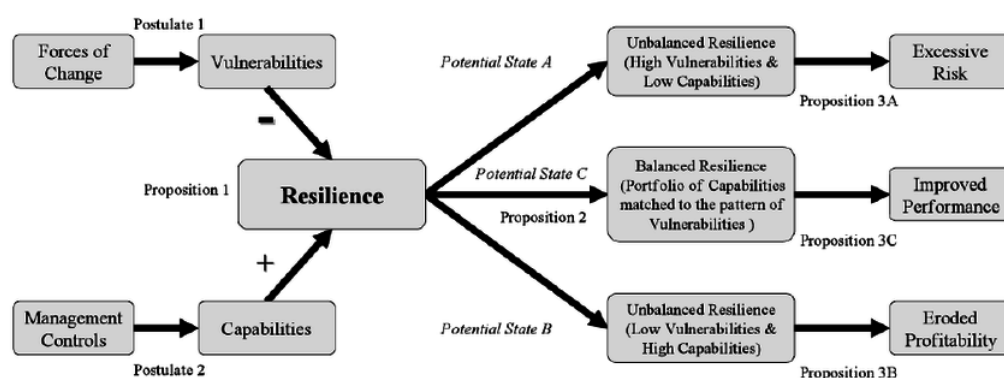
Various disruptions can significantly impact the food supply chain in Malaysia, with real-world examples illustrating the challenges faced by the industry. For instance, natural disasters like floods are frequent occurrences in Malaysia, particularly in states like Kelantan and Selangor. According to a report by the Malaysian Meteorological Department, Kelantan experienced severe flooding in December 2014, affecting over 200,000 people and causing significant damage to infrastructure and agricultural lands (Source: "Climate Change Impacts, Vulnerability, and Adaptation in Malaysia" by R. R. Zulkipli et al., 2017). The inundation of farmlands and disruption of transportation networks resulted in crop losses, affecting the availability and affordability of food products in local markets.

Moreover, Malaysia faced disruptions in the food supply chain due to the COVID-19 pandemic, which led to lockdowns, movement restrictions, and changes in consumer behaviour. For example, panic buying and stockpiling of essential food items occurred during the early stages of the pandemic, leading to temporary shortages of staple foods like rice and flour in supermarkets (Source: "Malaysians rush to stock up on food after lockdown announced" by M. L. Chai, 2020, The Star). The closure of borders and restrictions on international trade also affected the importation of food products, leading to supply chain bottlenecks and price fluctuations.

2.3 Resilience in Food Supply Chain

Resilience in food supply chain disruptions is a critical concept that underscores the capacity of the food supply chain to anticipate, respond to, and recover from unforeseen challenges and disturbances (Stone & Rahimifard, 2018). The ability of the food supply chain to withstand shocks and adapt to changing circumstances is paramount in ensuring a continuous and reliable flow of food from producers to consumers (Fan et al., 2021).

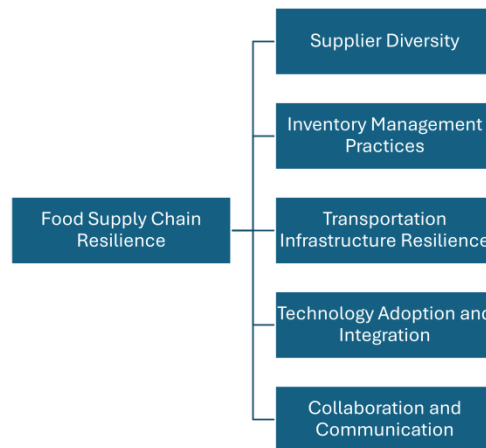
The resilience of the food supply chain involves multifaceted considerations, including adaptive capacity, robustness, flexibility, and the integration of comprehensive frameworks designed to navigate disruptions effectively (Habibi et al., 2023). The COVID-19 pandemic has particularly highlighted the importance of building resilience within food supply chains, emphasizing the need for strategies that balance stability and adaptability (Herold et al., 2021).



Supply Chain Resilience Framework (Hanke & Krumme, 2012.).

2.4 Factor Influencing Food Supply Chains Resilience

The literature on strategies employed by organizations to navigate disruptions in food supply chains reveals a diverse range of successful. Organizations have developed and implemented various strategies to enhance their resilience and mitigate the impact of disruptions. Key strategies include:



Strategies to enhance Food Supply Chain Resilience

- a) **Inventory Management:**Efficient inventory management is crucial for mitigating disruptions (Sarkar & Kumar, 2015). Organizations adopt practices such as demand forecasting, safety stock maintenance, and real-time tracking to optimize inventory levels (Dey, 2022).
- b) **Alternative Sourcing:**Diversifying sourcing channels is a widely recognized strategy to reduce vulnerability to supply chain disruptions (CagriGurbuz et al., 2023). Organizations explore and establish relationships with multiple suppliers, both locally and globally, to create redundancy (Dube et al., 2022).
- c) **Contingency Planning:**Contingency planning involves developing robust and flexible strategies to respond to disruptions promptly (Adobor& McMullen, 2018). This includes creating detailed contingency plans that outline specific actions to be taken in the event of disruptions.
- d) **Technology Integration:**Leveraging technology is essential for enhancing supply chain visibility and agility (Iranmanesh et al., 2023). Organizations invest in advanced technologies such as data analytics, Internet of Things (IoT), and blockchain to improve traceability, monitor inventory levels, and optimize overall supply chain operations.
- e) **Collaboration and Communication:**Establishing strong collaboration and communication channels with suppliers, distributors, and other stakeholders is critical for effective disruption management (Paula et al., 2020). Open lines of communication facilitate the exchange of information, enabling swift responses to changing circumstances.
- f) **Supplier Relationship Management:**Building resilient relationships with suppliers involves fostering trust, transparency, and collaboration (Faruquee et al., 2021). Organizations work closely with suppliers to understand their capabilities, assess risks, and jointly develop strategies to address potential disruptions.

2.5 Government Policies and Interventions in the Crisis Response

In view of the problems caused by the COVID-19 epidemic, it is clear that government policies play an essential and multi-faceted role in guaranteeing food security and managing the food supply chain (Friedman & Ormiston, 2022). During lockdowns, there was a constant supply of food because governments designated vital workers and made sure the food production, transportation, and retail sectors worked smoothly. Subsidies and direct payments to farmers were among the financial support measures implemented to lessen the economic impact of the pandemic on the agriculture sector and maintain production levels. Supply chain logistical issues were also addressed through the implementation of public-private partnerships and temporary regulatory modifications. To ensure that everyone has

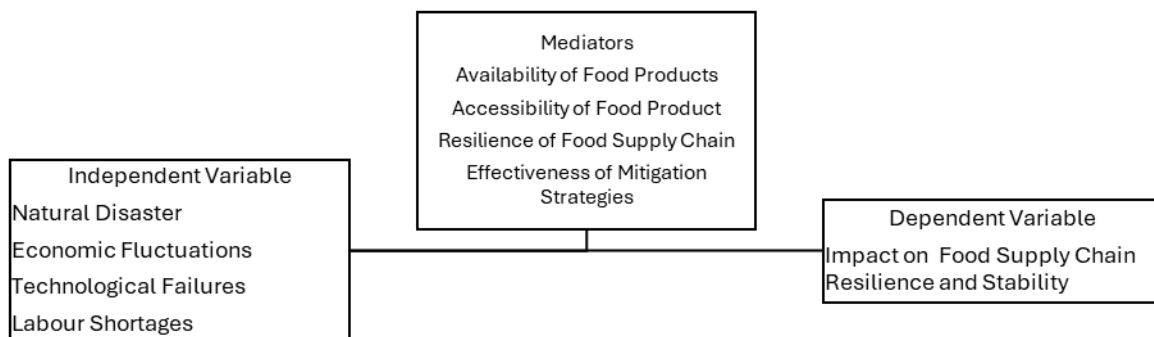
equal access to necessities, governments have instituted consumer protection measures like price limits and market practice monitoring. One important tactic that developed was international cooperation, in which countries worked together to ease the international trade and react to problems as a whole. To guarantee food security and preserve the stability of the food supply chain in the face of unprecedented challenges, these examples highlight the adaptability of government interventions, which are dynamic and comprehensive (Abu Hatab et al., 2019).

2.6 Machine Learning Strategy

A new strategy with many potential uses exists in the integration of machine learning into the food distribution network (Yaiprasert&Hidayanto, 2023). With the help of machine learning algorithms, retailers may use predictive analytics to predict possible interruptions and make proactive adjustments to inventory quantities and sourcing strategies (Tadayonrad& Ndiaye, 2023). By using machine learning models to improve demand forecasting, which can better match inventory with consumer demand, reducing the likelihood of overstocking or shortages caused by disruptions (Tadayonrad& Ndiaye, 2023).

Decision support systems powered by machine learning provide merchants with real-time insights, enabling them to quickly adjust strategy in response to the ever-changing nature of food supply chain disruptions. Taken as a whole, these uses highlight how machine learning may improve the food supply chain's capacity to adapt, be efficient, and recover back from shocks.

2.7 Development of Theoretical Framework



Theoretical Framework of Impact on Food Supply Chain Resilience and Stability

In the theoretical framework, several factors are identified as independent variables (IV) that can potentially disrupt the food supply chain. These factors include natural disasters such as floods or earthquakes, which can damage infrastructure and disrupt agricultural production and transportation networks. Economic fluctuations impact market dynamics, pricing, and consumer purchasing power, affecting the flow of goods within the supply chain (McKibbin & Fernando, 2023). Technological failures may disrupt digital supply chain systems and communication networks crucial for operations. Additionally, labour shortages resulting from demographic shifts or regulatory changes impact workforce availability and productivity in food production and distribution (Alabi & Ngwenyama, 2023).

These disruptions affect mediators within the food supply chain, such as the availability and accessibility of food products. They can cause shortages or delays in food availability, affecting consumer access to essential goods. Supply chain resilience, which involves the chain's ability to withstand shocks and maintain operations despite disruptions, is

crucial (Aday & Aday, 2020). The effectiveness of mitigation strategies also plays a vital role in how supply chains recover and adapt during crises (Burgos & Ivanov, 2021).

Ultimately, the impact of these disruptions on food supply chain resilience and stability serves as the dependent variable (DV). It reflects how these challenges collectively affect the supply chain's ability to operate reliably, meet consumer demand, and ensure food security during crises. Understanding these relationships is essential for developing strategies to enhance resilience and mitigate the adverse effects of disruptions in the food supply chain.

One critical gap in the current literature is the lack of detailed empirical research into the specific retailer strategies employed in Malaysia to effectively manage disruptions in the food supply chain caused by natural disasters, economic fluctuations, technological failures, and labor shortages. While these disruptions are acknowledged as significant challenges, there is limited understanding of how retailers in Malaysia tailor their operational and logistical approaches to mitigate these disruptions and maintain food supply resilience. Understanding these strategies and their effectiveness is crucial for informing policy and industry practices aimed at enhancing supply chain resilience and ensuring continuous food availability during crises in Malaysia.

3. METHODOLOGY

3.1 Research Methodology

Participants in the study are strategically chosen, with experts and retailers representing key stakeholders in the food supply chain. Semi-structured interviews with experts and retailers capture rich qualitative data. Thematic analysis is employed for qualitative data, identifying patterns and themes. The integration of qualitative results enhances the overall robustness and depth of the study's conclusions.

3.2 Research Instrument

The research instrument consists of a carefully crafted interview guide for semi-structured interviews with experts and retailers. The guide encompasses key themes related to disruptions' impact, response strategies, technology integration, and the role of government policies.

3.2.1 Semi-Structured Interviews (To Expert/Retailer):

Using semi-structured interviews with experts and retailers is justified as it allows for flexible questioning, in-depth exploration of experiences, probing for insights, understanding the complexity of disruptions, tapping into expertise and knowledge, and gaining a contextual understanding of factors influencing the management of food supply chain disruptions. This method enables researchers to capture rich and detailed insights into strategies, challenges, and opportunities, contributing to a comprehensive understanding of resilience in the food supply chain.

The interviews will be conducted via phone or online platforms, such as video conferencing software, to facilitate remote participation and ensure convenience for the participants. Prior to the interview, arrangements will be made with the participants to schedule a suitable time and to provide instructions for accessing the interview platform. During the interview, the same semi-structured approach described previously will be followed, with open-ended questions and probing for insights. The interviewer will use active listening techniques to engage with the participants and foster meaningful dialogue. Participants will have the option to choose their preferred mode of communication, whether it be phone or online, based on their preferences and accessibility. Additionally, measures will be taken to ensure confidentiality and privacy throughout the interview process, and participants will have the opportunity to consent to audio recording and data usage.

4.0 Conclusion

The COVID-19 widespread has highlighted the unstable situation of global supply networks. Recent events have prompted an increased amount of discussion regarding the future

potential of external shocks like natural disasters, political wars, and even pandemics, which threaten worldwide supply systems. The outcome has been a revived dedication to supply chain sustainability initiatives, as well as a greater emphasis on agility and resilience among business leaders and logistics provider.

5.0 Acknowledgement

The authors would like to express the gratitude to Ministry of Higher Education Malaysia for the Fundamental Research Grant Scheme 600-RMC/FRGS 5/3 (081/2022), the fund for this project, Research Management Center, UiTM, Faculty of Business and Management, UiTM and College of Computing, Informatics and Mathematics, UiTM for the support in the research. The authors would like to acknowledge late Dr Shahrin Nasir who contributed in the research too.

References

- Abu Hatab, A., Cavinato, M. E. R., Lindemer, A., & Lagerkvist, C. J. (2019). Urban sprawl, food security and agricultural systems in developing countries: A systematic review of the literature. *Cities*, *94*, 129–142. <https://doi.org/10.1016/j.cities.2019.06.001>
- Aday, S., & Aday, M. S. (2020). Impact of COVID-19 on the food supply chain. In *Food Quality and Safety* (Vol. 4, Issue 4, pp. 167–180). Oxford University Press. <https://doi.org/10.1093/fqsafe/fyaa024>
- Adobor, H., & McMullen, R. S. (2018). Supply chain resilience: a dynamic and multidimensional approach. *International Journal of Logistics Management*, *29*(4), 1451–1471. <https://doi.org/10.1108/IJLM-04-2017-0093>
- Alabi, M. O., & Ngwenyama, O. (2023). Food security and disruptions of the global food supply chains during COVID-19: building smarter food supply chains for post COVID-19 era. In *British Food Journal* (Vol. 125, Issue 1, pp. 167–185). Emerald Publishing. <https://doi.org/10.1108/BFJ-03-2021-0333>
- Aljuneidi, T., Bhat, S. A., & Boulaksil, Y. (2023). A comprehensive systematic review of the literature on the impact of the COVID-19 pandemic on supply chains. *Supply Chain Analytics*, *3*, 100025. <https://doi.org/10.1016/j.sca.2023.100025>
- Balwinder-Singh, Shirsath, P. B., Jat, M. L., McDonald, A. J., Srivastava, A. K., Craufurd, P., Rana, D. S., Singh, A. K., Chaudhari, S. K., Sharma, P. C., Singh, R., Jat, H. S., Sidhu, H. S., Gerard, B., & Braun, H. (2020). Agricultural labor, COVID-19, and potential implications for food security and air quality in the breadbasket of India. *Agricultural Systems*, *185*. <https://doi.org/10.1016/j.agsy.2020.102954>
- Burgos, D., & Ivanov, D. (2021). Food retail supply chain resilience and the COVID-19 pandemic: A digital twin-based impact analysis and improvement directions. *Transportation Research Part E: Logistics and Transportation Review*, *152*. <https://doi.org/10.1016/j.tre.2021.102412>
- CagriGurbuz, M., Yurt, O., Ozdemir, S., Sena, V., & Yu, W. (2023). Global supply chains risks and COVID-19: Supply chain structure as a mitigating strategy for small and medium-sized enterprises. *Journal of Business Research*, *155*. <https://doi.org/10.1016/j.jbusres.2022.113407>
- Dey, S. (2022). Surviving major disruptions: Building supply chain resilience and visibility through rapid information flow and real-time insights at the “edge.” *Sustainable Manufacturing and Service Economics*, *100008*. <https://doi.org/10.1016/j.smse.2022.100008>
- Dube, N., Li, Q., Selviaridis, K., & Jahre, M. (2022). One crisis, different paths to supply resilience: The case of ventilator procurement for the COVID-19 pandemic. *Journal of Purchasing and Supply Management*, *28*(5). <https://doi.org/10.1016/j.pursup.2022.100773>

- Fan, S., Teng, P., Chew, P., Smith, G., & Copeland, L. (2021). Food system resilience and COVID-19 – Lessons from the Asian experience. *Global Food Security*, 28. <https://doi.org/10.1016/j.gfs.2021.100501>
- Faruquee, M., Paulraj, A., & Irawan, C. A. (2021). Strategic supplier relationships and supply chain resilience: Is digital transformation that precludes trust beneficial? *International Journal of Operations and Production Management*, 41(7), 1192–1219. <https://doi.org/10.1108/IJOPM-10-2020-0702>
- Friedman, N., & Ormiston, J. (2022). Blockchain as a sustainability-oriented innovation?: Opportunities for and resistance to Blockchain technology as a driver of sustainability in global food supply chains. *Technological Forecasting and Social Change*, 175. <https://doi.org/10.1016/j.techfore.2021.121403>
- Habibi, F., Chakraborty, R. K., & Abbasi, A. (2023). Evaluating supply chain network resilience considering disruption propagation. *Computers and Industrial Engineering*, 183. <https://doi.org/10.1016/j.cie.2023.109531>
- Hanke, T., & Krumme, K. (n.d.). *RISK AND RESILIENCE IN SUSTAINABLE SUPPLY CHAIN MANAGEMENT-CONCEPTUAL OUTLINES BACKGROUND: THE CHALLENGE OF SUSTAINABILITY*.
- Herold, D. M., Nowicka, K., Pluta-Zaremba, A., & Kummer, S. (2021). COVID-19 and the pursuit of supply chain resilience: reactions and “lessons learned” from logistics service providers (LSPs). *Supply Chain Management*, 26(6), 702–714. <https://doi.org/10.1108/SCM-09-2020-0439>
- Iranmanesh, M., Maroufkhani, P., Asadi, S., Ghobakhloo, M., Dwivedi, Y. K., & Tseng, M. L. (2023). Effects of supply chain transparency, alignment, adaptability, and agility on blockchain adoption in supply chain among SMEs. *Computers and Industrial Engineering*, 176. <https://doi.org/10.1016/j.cie.2022.108931>
- Karunaratna, N., Siriwardhane, D., & Jayarathne, A. (2023). Exploring the measurements of COVID-19-induced supply chain disruptions and their implications on the economic vulnerability of small-scale farmers. *International Journal of Industrial Engineering and Operations Management*. <https://doi.org/10.1108/ijieom-03-2023-0028>
- Macfadyen, S., Tylionakis, J. M., Letourneau, D. K., Benton, T. G., Tittonell, P., Perring, M. P., Gómez-Creutzberg, C., Báldi, A., Holland, J. M., Broadhurst, L., Okabe, K., Renwick, A. R., Gemmill-Herren, B., & Smith, H. G. (2015). The role of food retailers in improving resilience in global food supply. In *Global Food Security* (Vol. 7, pp. 1–8). Elsevier. <https://doi.org/10.1016/j.gfs.2016.01.001>
- McKibbin, W., & Fernando, R. (2023). The global economic impacts of the COVID-19 pandemic. *Economic Modelling*, 129. <https://doi.org/10.1016/j.econmod.2023.106551>
- Paula, I. C. de, Campos, E. A. R. de, Pagani, R. N., Guarnieri, P., & Kaviani, M. A. (2020). Are collaboration and trust sources for innovation in the reverse logistics? Insights from a systematic literature review. In *Supply Chain Management* (Vol. 25, Issue 2, pp. 176–222). Emerald Group Holdings Ltd. <https://doi.org/10.1108/SCM-03-2018-0129>
- Sarkar, S., & Kumar, S. (2015). A behavioral experiment on inventory management with supply chain disruption. *International Journal of Production Economics*, 169, 169–178. <https://doi.org/10.1016/j.ijpe.2015.07.032>
- Stanca, L., Dabija, D. C., & Câmpian, V. (2023). Qualitative analysis of customer behavior in the retail industry during the COVID-19 pandemic: A word-cloud and sentiment analysis approach. *Journal of Retailing and Consumer Services*, 75. <https://doi.org/10.1016/j.jretconser.2023.103543>
- Stone, J., & Rahimifard, S. (2018). Resilience in agri-food supply chains: a critical analysis of the literature and synthesis of a novel framework. In *Supply Chain*

Management (Vol. 23, Issue 3, pp. 207–238). Emerald Group Holdings Ltd. <https://doi.org/10.1108/SCM-06-2017-0201>

Tadayonrad, Y., & Ndiaye, A. B. (2023). A new key performance indicator model for demand forecasting in inventory management considering supply chain reliability and seasonality. *Supply Chain Analytics*, 3, 100026. <https://doi.org/10.1016/j.sca.2023.100026>

Wang, Q., Zhou, H., & Zhao, X. (2023). The role of supply chain diversification in mitigating the negative effects of supply chain disruptions in COVID-19. *International Journal of Operations and Production Management*. <https://doi.org/10.1108/IJOPM-09-2022-0567>

Yaiprasert, C., & Hidayanto, A. N. (2023). AI-driven ensemble three machine learning to enhance digital marketing strategies in the food delivery business. *Intelligent Systems with Applications*, 18. <https://doi.org/10.1016/j.iswa.2023.200235>