FACTA UNIVERSITATIS
Series: **Economics and Organization** Vol. 22, Nº 1, 2025, pp. 1 - 15
https://doi.org/10.22190/FUEO241116001G

Original Scientific Paper

SUPPLY CHAIN RESILIENCE PRACTICE OF MANUFACTURING COMPANIES IN DEVELOPING COUNTRIES: A META-ANALYSIS

UDC 658.7:658.5(1-773)

Solomon Amsalu Gesese[1], Rajwinder Singh[2]

[1]Ambo University, College of Business and Economics, Ambo, Ethiopia
[2]Punjabi University, School of Management Studies, Patiala, India

ORCID iDs: Solomon Amsalu Gesese https://orcid.org/0000-0003-2254-4132
Rajwinder Singh https://orcid.org/0000-0001-8048-4751

Abstract. *Supply chain resilience (SCR) is an adaptive capability that responds to unexpected disruptions. This meta-analysis presents manufacturing companies' supply chain resilience practice in developing countries, considering a sample of 25 studies published from 2014 to 2023. Data were analyzed using a random effects model with the help of Jamovi version 2.4 and SPSS version 23 software's. The result infers that, especially during the last four years (2020-2023), the SCR practice of manufacturing companies in developing countries has been significantly enhanced (20%). This study also found that Indonesia is a better engaged (24%) developing country in supply chain resilience practice, followed by Kenya (16%). Moreover, this study revealed that the most widely used data analysis model in SCR practice studies was the structural equation model (40%), followed by multiple linear regression (24%). The weighted average effect size of the studies was 57%, which portrays that the SCR practice in developing nations encourages manufacturing companies to implement diverse resilience strategies to overcome supply chain disruptions. Further study of supply chain resilience practice in developed countries is suggested to compare the difference in effect size between developed and developing nations.*

Key words: *supply chain resilience, manufacturing companies, developing countries, random effects model.*

JEL Classification: H12, M11, O14

Received November 16, 2024 / Revised May 08, 2025 /Accepted May 15, 2025
Corresponding author: Solomon Amsalu Gesese
Ambo University, College of Business and Economics, Ambo, Ethiopia | E-mail: amsalusolomon@yahoo.com

1. INTRODUCTION

Managing the supply chain has become one of the most critical subjects of management research, and organizational managers are more interested in mitigating disturbances in the supply chain (Varzandeh *et al*., 2016). The performance of a worldwide supply chain expands supply chain networks, which also enhances an organization's exposure to supply chain disruption (Bode and Wagner, 2015). The vulnerability of supply chain disruptions worldwide has emerged as an escalating worry in the last few years (Langat and Karanja, 2021). Disruptions in the supply chain cause a company to suffer significant losses in sales, manufacturing capacity, shareholder value, and reputation. This effect has put high pressure on developing countries to achieve service excellence, and provide an efficient supply chain flow (Yang *et al*., 2016). Despite companies' strong knowledge of supply chain risks, over 80% are worried about the resilience of the supply chain (Langat and Karanja, 2021).

Resilience is a crucial supply chain competency due to the growing frequency and effects of disruptions (Brandon-Jones *et al.*, 2014; Gunasekaran *et al*., 2015). Supply chain resilience (SCR) is an adaptive capability that responds quickly to unexpected disruptions, maintains functionality, and recovers (Ali *et al*., 2017; Tukamuhabwa *et al*., 2015). Moreover, by implementing SCR, companies can control the risk of supply chain interruptions, return to their previous operational level, or achieve improved conditions (Wieland and Wallenburg, 2012). As a result, SCR is now a crucial dynamic capability for the growth of companies in nebulous circumstances when environmental uncertainty keeps increasing, and disruptive occurrences have an abruptly adverse effect on companies (Ali *et al*., 2017).

The progress of manufacturing sector within industry is indispensable to build national technological capacity, industrial capability and make broad-based job opportunity as well as improve income (Eshetie, 2018). However, manufacturing companies in developing countries have been facing unprecedented competitive pressures generated by new business trends (Hosseini *et al*., 2012). In emerging countries, the ever-changing and unpredictable nature of business landscapes, coupled with institutional shortcomings, hinder supply chains from adapting, learning, and fostering innovation. Moreover, issues such as corruption, inadequate infrastructure, prevalent social challenges in urban settings, and the prevalence of informal economies are recognized as key characteristics of developing countries that impede the efficiency of supply chains (Silvestre, 2015).

Although developing nations hold a significant position in the global supply chain, they also often face disruptions. Companies in these regions are vulnerable to various risks and interruptions due to the prevailing political, economic, and cultural conditions (Tukamuhabwa *et al*., 2015). That is why strengthening SCR in developing countries is critical for sustainable development, economic growth, and poverty reduction.

This meta-analysis, hence, enables the identification of trends, patterns, and commonalities in SCR practices across different contexts and settings. Such exposure can reveal insights into effective strategies, challenges, and opportunities specific to developing countries. This study further provides a valuable resource for academic researchers by consolidating existing literature and identifying gaps for future research endeavours. It helps guide research agendas and priorities, facilitating the improvement of knowledge in the field of supply chain resilience. Therefore, the researchers are initiated to conduct a meta-analysis on SCR practice of manufacturing companies in developing countries. This study, particularly, addressed the following research questions: What is the status of SCR practice in developing countries? Which developing country has engaged more in SCR studies? Which model is most commonly used in SCR practice studies?

2. Literature Review

Supply chain resilience (SCR) refers to a company's resilience in overcoming disruptive circumstances. To be precise, SCR signifies the capacity of systems to adapt and withstand temporary disruptions (Soni *et al*., 2014). It is also defined as the capacity to uphold, carry out, and adjust planned execution while achieving the intended performance, whether original or adapted to suit circumstances (Ivanov and Dolgui, 2021). Moreover, scholars observed that SCR entails a company's ability to endure, adapt, and bounce back from disruptions, ensuring customer demand is met, performance goals are attained, and operations are sustained in precarious conditions (Hosseini *et al*., 2019)

SCR is considered the ability of a supply chain to adjust to unforeseen circumstances, address disruptions, and rebound from them while sustaining operations with the desired level of connectivity and control over its structure and functionality (Ponomarov and Holcomb, 2009). SCR practice covers strategies, processes, and actions organizations undertake to ensure the continuity, adaptability, and robustness of their supply chains in the face of disruptions, uncertainties, and risks (Ali *et al*. 2017; Fiksel *et al*., 2015). It involves proactive measures to anticipate, mitigate, respond, and recover from various disruptions that can affect the supply chain network's flow of goods, information, and finances (Pu *et al*., 2022; Tukamuhabwa *et al*., 2015).

Furthermore, SCR practices are essential for companies to ensure the continuity and stability of their supply chains in the face of various disruptions (Brandon-Jones *et al*., 2014). To effectively manage disruptions, identifying and assessing potential risks and vulnerabilities within their supply chains (Wieland and Wallenburg, 2012). Further, it is mandatory to continuously monitor, evaluate, and refine their SCR strategies based on lessons learned from past disruptions, changing market dynamics, and emerging threats (Pettit *et al*., 2013). Through successful SCR practice, organizations can enhance their resilience and effectively navigate disruptions to maintain business continuity and competitive advantage.

SCR practices involve identifying and assessing potential risks and vulnerabilities within the supply chain. By understanding potential disruptions, organizations can implement proactive measures to mitigate their impact (Chowdhury and Quaddus, 2017; Ponomarov and Holcomb, 2009). Companies embracing continuous improvement and learning are better equipped to anticipate, adapt, and recover from disruptions effectively (Pettit *et al*., 2013; Yang *et al*., 2016). By adopting proactive measures and investing in resilience-building strategies, organizations can reduce the effect of disruptions and maintain operational continuity in dynamic and unpredictable environments.

The resilience of a supply chain plays a significant role in determining the success or failure of firms (Ambulkar *et al*., 2015; Hohenstein *et al*., 2016). It is instrumental in promptly measuring the effect of hazards on the supply chain and the potential for recovery during disruptions (Soni *et al*., 2014). Companies can handle the possibility of supply chain disruptions and regain their previous operational level or improve their current status by establishing SCR (Bugvi and Mughal, 2022; Wieland and Wallenburg, 2012). SCR has evolved into a crucial dynamic capability for the growth of businesses in nebulous circumstances where environmental uncertainty is only going to grow, and disruptive occurrences could have an abruptly detrimental impact on firms (Ali *et al*., 2017). Hence, conducting a meta-analysis on the SCR practice of manufacturing companies in developing countries contribute to advancing knowledge in the field, supporting informed decision making, and guiding future research endeavours.

3. Paper Structure

This article is mainly arranged as an introduction, methods of analysis, results and discussion, conclusion, implications and future agendas.

4. Materials and Methods

4.1. Identification

This meta-analysis used articles that were published from 2014 to 2023. The articles were found through searches on Google Scholar, Science Direct, and Semantic Scholar. During the first stage, 1,664 articles from all around the world were found to be relevant to the case in question. To preserve methodological consistency across all studies, the analysis process did not take into account exclusion criteria such as duplicate papers, theses, and dissertations, nor did it take into account the lack of supply chain resilience metrics in articles. After a rigorous screening procedure, a small number of studies were ultimately chosen and added to a list for meta-analysis. Figure 1 illustrates how Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) was utilized to find 25 papers for the meta-analysis (Page et al., 2021).

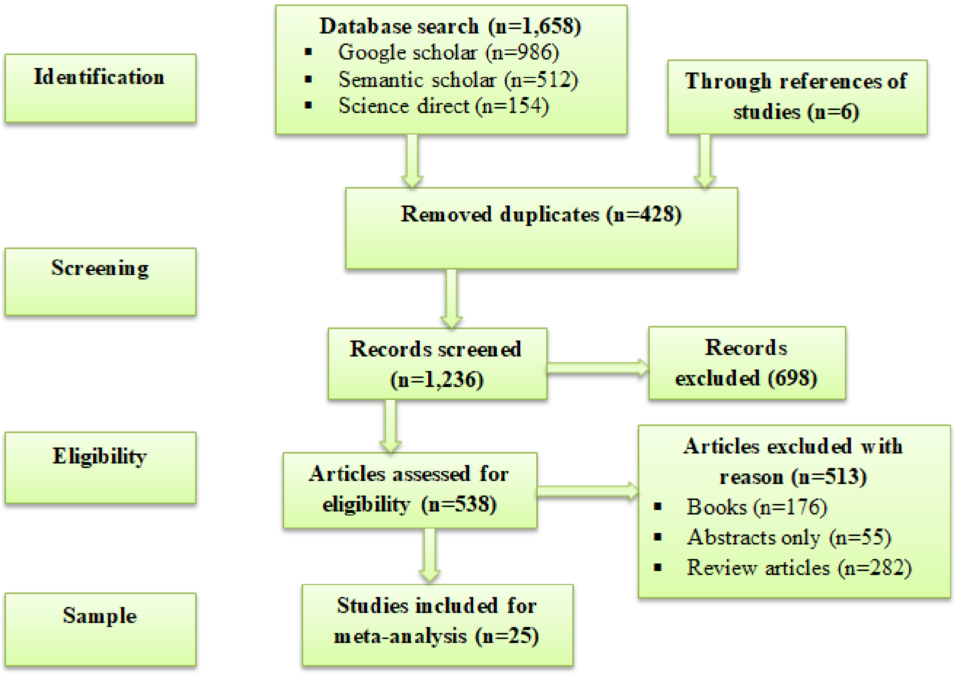

Fig. 1 PRISMA flow chart
Source: Authors' computation

4.2. Protocol

A research protocol is a crucial document that establishes the parameters of a meta-analysis and systematic review study design (Shakarchi, 2022). As a result, publications that addressed the objectives of the meta-analysis were found using the inclusion and exclusion criteria (McGaghie *et al*., 2011). Before identifying articles, the desired result was ascertained. For this meta-analysis, it was important to identify articles related to supply chain resilience (SCR) of manufacturing companies in developing countries and other regions. Thus, research from underdeveloped countries and a select few other places that were published in reputable journals met the inclusion criterion. The SCR practices used by manufacturing companies across multiple countries are highlighted in this meta-analysis. The exclusion criteria for other countries were established using a scale-up technique (McGaghie *et al*., 2011) based on review papers, books, and other data.

4.3. Browsing

The authors searched the Google Scholar, Science Direct, and Semantic Scholar databases exhaustively during data browsing. The search was made for the articles that were published from 2014 to 2023. The authors conducted a search using keywords like "supply chain resilience", "supply chain strategies", and "supply chain resilience practices" based on high-quality publications. Then the criteria of inclusion and exclusion were employed to filter the retrieved articles.

4.4. Extraction

The data extraction process helps us to take information from sources to be further refined or analyzed (Robson *et al*., 2019). Data were extracted from the reports for the meta-analysis based on the study's design, geographical scope, sample size, number of variables, and statistical information. Additionally, each supply chain issue was thoroughly examined during the data extraction process. This meta-analysis, however, focused primarily on supply chain resilience, which is the ability to tolerate and bounce back from disturbances. These were reported as cases after deletion and pooling of data.

4.5. Statistics

SPSS version 23 and Jamovi version 2.4 software's were used for data analysis. The random effects model and the fixed effects model are the two most widely used statistical models in meta-analyses. Choosing an appropriate model is important to ensure the correct estimation of different statistics (Borenstein *et al*., 2010). Between-study heterogeneity includes all differences between individual studies. This heterogeneity may be due to differences in research areas, models used, sample sizes, and the number of variables used in the studies (Deeks *et al*., 2019; Melsen *et al*., 2014). This meta-analysis used classifications of I^2 values which show approximately 25% ($I^2 = 25$) would indicate moderate heterogeneity, 50% ($I^2 = 50$) would indicate medium heterogeneity, and 75% ($I^2 = 75$) would indicate high heterogeneity (Higgins and Thompson, 2002). Because of the significant heterogeneity amongst studies, a random effects model based on within-study inconsistency (Cheung, 2008) was selected for this meta-analysis. The log-likelihood ratio was employed to signify the effect size of the 25 pooled observations. Fail-safe N calculation using the Rosenthal approach was used for publication bias assessment. A p-value plot curve was employed to identify the non-significant results.

The Fisher *r-to-z* transformed correlation coefficient was used as the outcome metric in the investigation. The constrained maximum-likelihood estimator was used to determine the level of heterogeneity, or tau² (Viechtbauer, 2010). Together with the *tau²* estimate, the *I²* value and the *Q-test* for variability (Cochran, 1954) are provided. If heterogeneity of any kind is seen (that is, $tau^2 > 0$, independent of the *Q-test* findings), a prediction interval for the actual results is also given. Cook's distances and studentized residuals were used to assess if studies were significant or outliers within the model. A Bonferroni correction with two-sided $alpha = 0.05$ for each of the *k* studies included in the meta-analysis is used to identify studies that are potentially outliers. Research studies are considered important if Cook's distance exceeds the interquartile range plus six times the median (Viechtbauer, 2010). Two methods are used to search for asymmetry in funnel plots. These were the rank correlation test and the regression test, which uses the standard error of the observed outcomes as predictors.

5. Results and Discussion

5.1. Descriptive statistics

The mean sample size for the studies was 224.64, with the lowest and maximum sample sizes of 76 and 460, respectively (see Table 1). Additionally, the research employed 3.32 independent variables on average, ranging from 2 to 5. Supply chain resilience (SCR) practices had a substantial influence on at least one and up to four independent variables while manufacturing companies were in practice.

Table 1 List of continuous variables

Items	N	Mean	SD	Minimum	Maximum
Independent variables	25	3.32	0.748	2	5
Significant variables	25	2.96	0.889	1	4
Sample size	25	224.64	108.481	76	460

Source: Authors' computation

Table 2 shows that the studies under consideration used different models for data analysis. These were two-stage least scales (2SLS), multiple linear regression (MLR), partial least squares path modelling (PLS-SEM), structural equation modelling (SEM), and Smart partial least squares (Smart PLS). The majority of the studies used the SEM (40%) model, followed by the MLR (24%) model and the PLS-SEM (20%) model. This suggests that the most popular data analysis approach in SCR practice studies is structural equation modelling (SEM).

Table 2 Models used by the studies

Model	Freq.	%	Valid %	Cumulative %
2SLS	1	4.0	4.0	4.0
MLR	6	24.0	24.0	28.0
PLS-SEM	5	20.0	20.0	48.0
SEM	10	40.0	40.0	88.0
Smart PLS	3	12.0	12.0	100.0
Total	25	100.0	100.0	

Source: Authors' computation

As per Figure 2, 28% of the supply chain resilience practice (SCR) studies were published in the year 2023, followed by 2021 (24%) and 2022 (16%) which shows that recently, especially from 2020 to 2023, the SCR practice of manufacturing companies in developing countries has been significantly increasing. During the range of the specified period, the practice showed 20% growth.

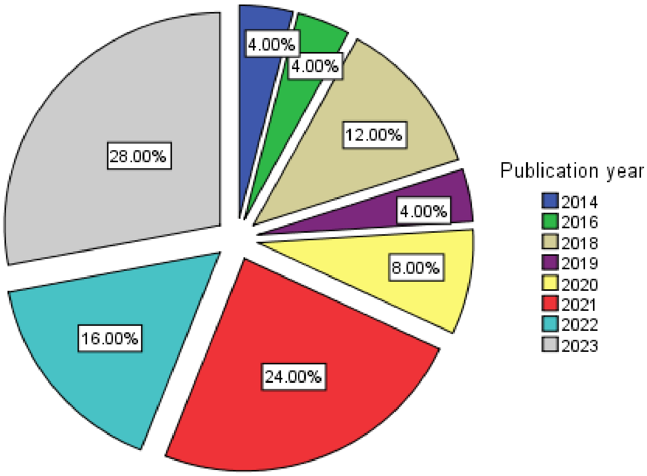

Fig. 2 Publication year of the studies
Source: Authors' computation

Table 3 displays that Indonesia conducted the majority of the supply chain resilience (SCR) practice studies (24%), followed by Kenya (16%). This result indicates that Indonesia is relatively more engaged in studies that focus on the SCR practice of manufacturing companies. This result, moreover, shows that Indonesia has better SCR practices compared to other emerging nations.

Table 3 Area and frequency of the studies

Study Area	Freq.	%	Valid %	Cumulative %
China	2	8.0	8.0	8.0
Ethiopia	1	4.0	4.0	12.0
Ghana	1	4.0	4.0	16.0
India	1	4.0	4.0	20.0
Indonesia	6	24.0	24.0	44.0
Iran	1	4.0	4.0	48.0
Islamabad	1	4.0	4.0	52.0
Jordan	1	4.0	4.0	56.0
Kenya	4	16.0	16.0	72.0
Saudi Arabia	1	4.0	4.0	76.0
Sri Lanka	1	4.0	4.0	80.0
Taiwan	3	12.0	12.0	92.0
UK	1	4.0	4.0	96.0
USA	1	4.0	4.0	100.0
Total	25	100.0	100.0	

Source: Authors' computation

5.2. Inferential statistics

This analysis included a sum of k=25 studies (see Fig. 3). The majority of estimates were positive (100%), as the Fisher r-to-z converted correlation coefficients that were observed showed a range of 0.2237 to 1.2562. According to the random-effects model indicated in Table 4, the estimated average Fisher r-to-z transformed correlation coefficient was \hat{\mu} = 0.5693 (95% CI: 0.4598 to 0.6788). Consequently, the average result was significantly different from zero ($z = 10.1884$, $p < 0.0001$). The true results seem to be diverse based on the Q-test ($Q(24) = 346.0786$, $p < 0.0001$, $tau^2 = 0.0724$, $I^2 = 94.0793\%$). The true results have a 95% prediction range ranging from 0.0307 to 1.1079 as supported with prior study (Cheung, 2008). Therefore, although there can be some variation, the actual research results typically follow the estimated average result.

Table 4 Random effects model (k=25)

Item	Estimate	se	Z	p	CI Lower Bound	CI Upper Bound
Intercept	0.569	0.0559	10.2	< .001	0.460	0.679
	.	.	.	.	.	.

Note: Tau^2 Estimator: Restricted Maximum-Likelihood
Source: Authors' computation

As shown in Table 5, the *p*-value is less than 0.001, indicating significant heterogeneity among the studies included in the analysis, with Tau^2 representing the amount of between-study variance. The high values of I^2 and the significant p-value indicate substantial variability in effect estimates across studies beyond what would be expected by chance, and in agreement with previous research (Cheung, 2008; Higgins and Thompson, 2002).

Table 5 Heterogeneity statistics of the studies

Tau	Tau^2	I^2	H^2	R^2	df	Q	p
0.269	0.0724 (SE= 0.0225)	94.08%	16.890	.	24.000	346.079	< .001

Source: Authors' computation

The analysis's conclusion indicates that the data were fitted with a random-effects model (see Table 6). In this study, the studentized residual exceeds a typical normal distribution's 100 x (1 – 0.05/(2 X k))th percentile. The result indicates that Cook's distance exceeds the interquartile range plus six times the median. Hence, the studies considered were important as reinforced by earlier research (Viechtbauer, 2010).

Table 6 Model fit statistics and information criteria

Items	log-likelihood	Deviance	AIC	BIC	AICc
Maximum-Likelihood	-3.210	92.494	10.421	12.859	10.966
Restricted Maximum-Likelihood	-3.567	7.133	11.133	13.489	11.705

Source: Authors' computation

Upon analysing the studentized residuals, it was found that all the studies had values less than or equal to ± 3.0902, indicating no outliers within this model. The Cook's distances imply that no study could be deemed unduly influential, which is supported by previous study (Borenstein *et al*., 2010). In other words, no individual study has a disproportionately large impact on the overall regression analysis or model (see Figure 3).

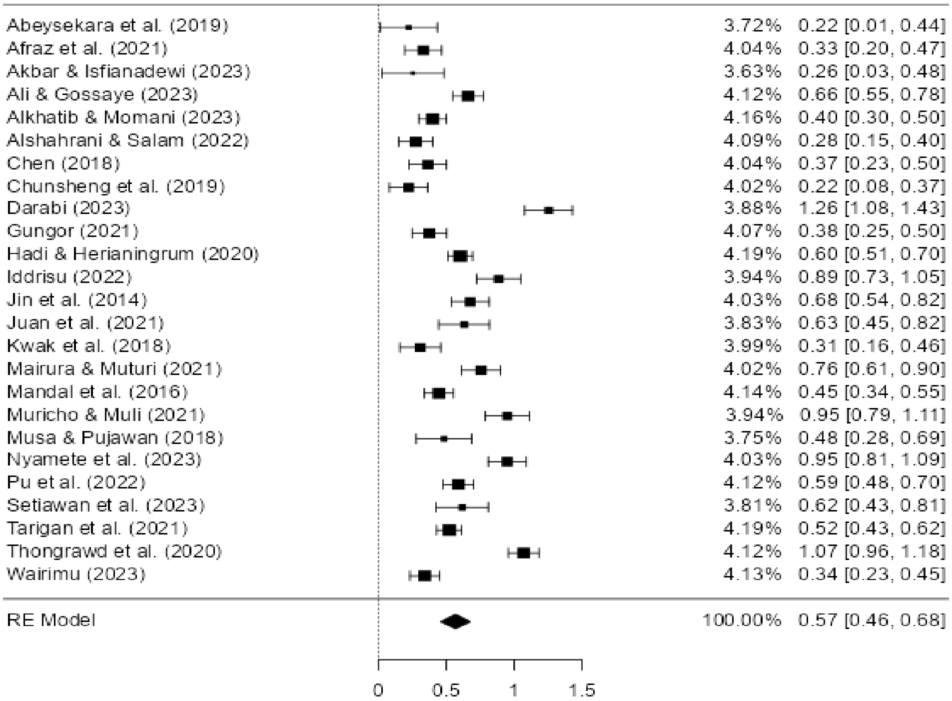

Fig. 3 Forest plot of the random effect model output
Source: Authors' computation

As shown in , and are consistent with prior research (Deeks *et al*., 2019).

Table 7, the p-value associated with the Fail-Safe N is less than 0.001. This indicates that there is a statistically significant asymmetry in the distribution of studies, indicating potential publication bias. The p-value associated with the Begg and Mazumdar test is 0.595, which is > 0.05. Further, the p-value associated with Egger's regression is 0.979, which is greater than 0.05. These tests show no evidence of publication bias, and are consistent with prior research (Deeks *et al*., 2019).

Table 7 Assessment of publication bias

Test Name	value	p
Fail-Safe N	15447.000	< .001
Begg and Mazumdar Rank Correlation	0.080	0.595
Egger's Regression	-0.026	0.979
Trim and Fill Number of Studies	2.000	.

Note: Fail-safe N Calculation Using the Rosenthal Approach
Source: Authors' computation

Figure 4 portrays there was no evidence of funnel plot asymmetry in the regression test (p = 0.9793) or the rank correlation (p = 0.5948). Both statistical tests failed to detect significant funnel plot asymmetry. This result infers that there is no apparent publication bias or other asymmetrical distribution of data points in the funnel plot, at least according to the methods used in the analysis. However, the Trim and Fill method suggests that two studies need to be adjusted to correct for potential publication bias. This is in agreement with earlier study (Melsen *et al*., 2014).

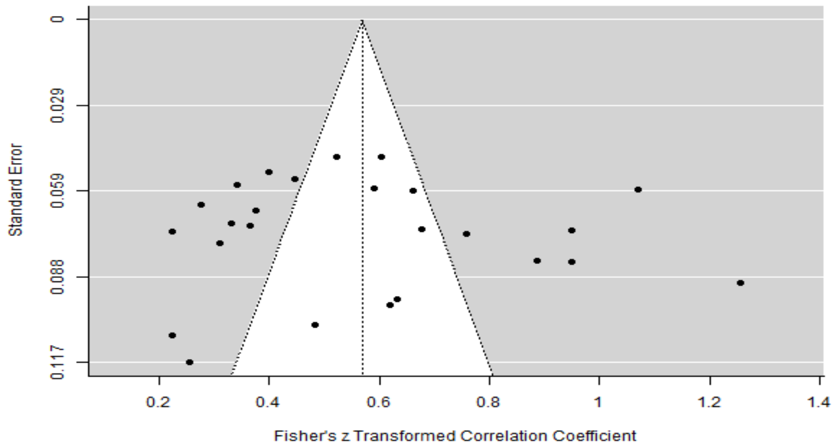

Fig. 4 Funnel plot of correlation coefficient against standard error
Source: Authors' computation

Figure 5 displays the distribution of observed p-values, highlighting a total of 25 statistically significant results (p < 0.05). Among these, 23 results have p-values below

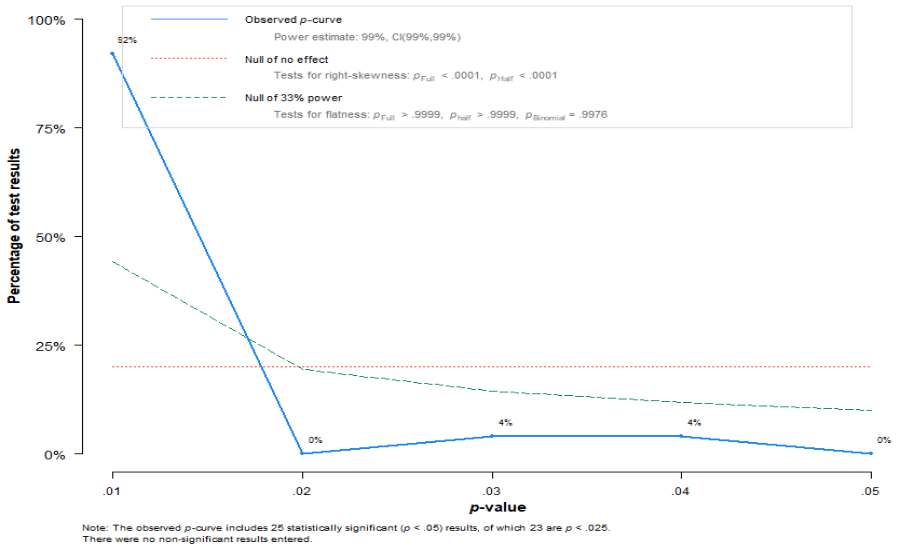

Fig. 5 Curve plot of p-value against percentage of test results
Source: Authors' computation

0.025, indicating a concentration of highly significant findings. This distribution suggests that non-significant outcomes ($p \geq 0.05$) may not have been reported or included in the analysis. The predominance of low p-values reflects a strong level of statistical confidence in the observed effects. Furthermore, the pattern of significance is consistent with previous research, supporting the credibility and robustness of the findings presented in this study (Hosseini *et al*., 2019).

6. CONCLUSION, IMPLICATIONS AND FUTURE AGENDAS

6.1. Conclusion

Resilience in supply networks is a critical competency due to disruptions' growing frequency and effects. Hence, prioritizing supply chain resilience (SCR) and developing strategies are crucial for companies to prepare for potential disruptions. This study emphasized on SCR practice of manufacturing companies in developing countries. Data extraction was done using a standardized process to ensure accuracy and consistency. The research design, study area, size of the sample, number of variables, and statistics in the studies were considered when processing the data. Twenty-five (25) studies were analyzed using a random effects model with the help of SPSS, and Jamovi software.

This study addressed three research questions. Firstly, what is the status of SCR practice in developing countries? The studies conducted on the SCR practice of manufacturing companies in developing countries have been significantly increasing, especially from 2020 to 2023. In the specified range of period, the studies increased from 8% to 28%, which shows a 20% growth in SCR practice of manufacturing companies in developing countries. Secondly, which developing country has engaged more in SCR practice? The majority of the SCR practice studies were conducted by Indonesia (24%), followed by Kenya (16%), indicating Indonesia is better engaging in supply chain resilience practice compared to other developing nations. Lastly, which model is most commonly used in SCR practice studies? The study found that the structuring equation model (40%) was the most usually used to analyze data in SCR practice studies of developing countries, followed by multiple linear regression (24%). Moreover, the random effects model found a 0.57(57%) weighted average effect size of the studies, indicating the SCR practice encourages manufacturing companies in developing nations to implement diverse resilience strategies to overcome supply chain disruptions.

6.2. Implications

This meta-analysis has theoretical and practical implications. Theoretically, this study can allow researchers to synthesize findings from multiple studies, providing a comprehensive overview of the current state of research on supply chain resilience practice in developing countries. Moreover, this research finding can help to address knowledge gaps and contribute to a deeper understanding of the subject matter. Practically, insights generated from this meta-analysis can inform policy-making and managerial decision-making of manufacturing sectors related to supply chain resilience in developing countries. Policymakers, industry practitioners, and managers can use evidence-based findings to design and implement effective resilience strategies and interventions.

6.3. Limitations and future agendas

While this study adds to the current body of knowledge, particularly in the field of supply chain resilience (SCR) practice in developing countries, it is important to acknowledge its limitations. Firstly, this meta-analysis was mainly conducted based on the studies from developing countries' perspectives. Further studies are suggested from a global perspective to fully understand the estimated weighted average effect size of SCR practice studies worldwide and compare differences in the degree of effects between developed and developing nations. Secondly, this study solely focused on research published in English. Future investigations could broaden their scope to include SCR practice studies published in other languages. Furthermore, the study exclusively depended on quantitative data, potentially overlooking qualitative insights that could enrich comprehension of the phenomenon. Subsequent research endeavours might benefit from integrating qualitative data to enlarge the quantitative findings.

REFERENCES

Abeysekara, N., Wang, H., & Kuruppuarachchi, D. (2019). Effect of supply-chain resilience on firm performance and competitive advantage: A study of the Sri Lankan apparel industry. *Business Process Management Journal, 25*(7), 1673–1695. https://doi.org/10.1108/BPMJ-09-2018-0241

Afraz, M. F., Bhatti, S. H., Ferraris, A., & Couturier, J. (2021). The impact of supply chain innovation on competitive advantage in the construction industry: Evidence from a moderated multi-mediation model. *Technological Forecasting and Social Change, 162*, 120370. https://doi.org/10.1016/j.techfore.2020.120370

Akbar, H. M., & Isfianadewi, D. (2023). The role of supply chain resilience to relationships supply chain risk management culture and firm performance during disruption. *International Journal of Research in Business and Social Science (2147- 4478), 12*(2), 643–652. https://doi.org/10.20525/ijrbs.v12i2.2392

Ali, Mahfouz, A., & Arisha, A. (2017). Analysing supply chain resilience: integrating the constructs in a concept mapping framework via a systematic literature review. *Supply Chain Management: An International Journal, 22*(1), 16–39. https://doi.org/10.1108/SCM-06-2016-0197

Ali, E., & Gossaye, W. (2023). The effects of supply chain viability on supply chain performance and marketing performance in case of large manufacturing firm in Ethiopia. *Brazilian Journal of Operations and Production Management, 20*(2), 1–17. https://doi.org/10.14488/BJOPM.1535.2023

Alkhatib, S. F., & Momani, R. A. (2023). Supply chain resilience and operational performance: The role of digital technologies in jordanian manufacturing firms. *Administrative Sciences, 13*(2), 40. https://doi.org/10.3390/admsci13020040

Alshahrani, M. A., & Salam, M. A. (2022). The role of supply chain resilience on SMEs' performance: The Case of an Emerging Economy. *Logistics, 6*(3), 1–20. https://doi.org/10.3390/logistics6030047

Ambulkar, S., Blackhurst, J., & Grawe, S. (2015). Firm's resilience to supply chain disruptions: Scale development and empirical examination. *Journal of Operations Management, 33–34*(1), 111–122. https://doi.org/10.1016/j.jom.2014.11.002

Bode, C., & Wagner, S. M. (2015). Structural drivers of upstream supply chain complexity and the frequency of supply chain disruptions. *Journal of Operations Management, 36*(2015), 215–228. https://doi.org/10.1016/j.jom.2014.12.004

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2010). A basic introduction to fixed-effect and random-effects models for meta-analysis. *Research Synthesis Methods, 1*(2), 97–111. https://doi.org/10.1002/jrsm.12

Brandon-Jones, E., Squire, B., Autry, C. W., & Petersen, K. J. (2014). A contingent resource-based perspective of supply chain resilience and robustness. *Journal of Supply Chain Management, 50*(3), 55–73. https://doi.org/10.1111/jscm.12050

Bugvi, S. A., & Mughal, K. H. (2022). Role of supply chain resilience in mitigating sustainable risks. *Central Asian Journal of Environmental Science and Technology Innovation, 3*(4), 98–107. https://doi.org/10.22034/CAJESTI.2022.04.01

Chen, C. J. (2018). Developing a model for supply chain agility and innovativeness to enhance firms' competitive advantage. *Management Decision, 57*(7), 1511–1534. https://doi.org/10.1108/MD-12-2017-1236

Cheung, M. W. L. (2008). A model for integrating fixed-, random-, and mixed-effects meta-analyses into structural equation modeling. *Psychological Methods, 13*(3), 182–202. https://doi.org/10.1037/a0013163

Chowdhury, M. M. H., & Quaddus, M. (2017). Supply chain resilience: Conceptualization and scale development using dynamic capability theory. *International Journal of Production Economics, 188*(4), 185–204. https://doi.org/10.1016/j.ijpe.2017.03.020

Chunsheng, L., Wong, C. W. Y., Yang, C. C., Shang, K. C., & Lirn, T. cherng. (2020). Value of supply chain resilience: roles of culture, flexibility, and integration. *International Journal of Physical Distribution and Logistics Management, 50*(1), 80–100. https://doi.org/10.1108/IJPDLM-02-2019-0041

Cochran, W. G. (1954). The Combination of Estimates from Different Experiments. *Biometrics, 10*(1), 101–129. https://doi.org/10.2307/3001666

Darabi, B. (2023). *Effect of supply chain resilience on competitive advantage and firm performance under environmental uncertainty in the dairy industry of Iran*. Thesis, University of Turku.

Deeks, J., Higgins, J., & Altman, D. (2019). Analysing data and undertaking meta-analyses. In W. V. Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ (Ed.), *Cochrane Handbook for Systematic Reviews of Interventions* (2nd Editio, pp. 241–284). John Wiley & Sons. https://doi.org/doi:10.1002/9781119536604.ch10

Eshetie, T. (2018). Ethiopia's manufacturing industry opportunities, challenges and way forward: A sectoral overview. *Novel Techniques in Nutrition & Food Science, 2*(2), 143–149. https://doi.org/10.31031/ntnf.2018.02.000532

Fiksel, J., Polyviou, M., K. L., C., & J., P. T. (2015). From risk to resilience: Learning to deal with disruption. *MIT Sloan Management Review, 56*(2), 79–86. http://mitsmr.com/1uOW55d

Gunasekaran, A., Subramanian, N., & Rahman, S. (2015). Supply chain resilience: Role of complexities and strategies. *International Journal of Production Research, 53*(22), 6809–6819. https://doi.org/10.1080/00207543.2015.1093667

Gungor, A. (2021). The mediating role of flexibility and agility in the effect of supply chain integration on firm performance. *International Journal of Business and Economic Studies, 3*, 102-111. https://doi.org/10.54821/uiecd.980955

Hadi, N. H., & Herianingrum, S. (2020). The influence of supply-chain resilience on competitive advantage and firm performance. *International Journal of Supply Chain Management, 9*(4), 440–446.

Higgins, J. P. T., & Thompson, S. G. (2002). Quantifying heterogeneity in a meta-analysis. *Statistics in Medicine, 21*(11), 1539–1558. https://doi.org/10.1002/sim.1186

Hohenstein, N.-O., Feisel, E., Hartmann, E., & Giunipero, L. (2016). Research on the phenomenon of supply chain resilience: A systematic review and paths for further investigation. *International Journal of Physical Distribution & Logistics Management, 46*(2), 153–176. https://doi.org/doi.org/10.1108/IJPDLM-05-2013-0128

Hosseini, S., Ivanov, D., & Dolgui, A. (2019). Review of quantitative methods for supply chain resilience analysis. *Transportation Research Part E: Logistics and Transportation Review, 125*, 285–307. https://doi.org/10.1016/j.tre.2019.03.001

Hosseini, S. M., Azizi, S., & Sheikhi, N. (2012). An investigation on the effect of supply chain integration on competitive capability: An empirical analysis of Iranian Food Industry. *International Journal of Business and Management, 7*(5). https://doi.org/10.5539/ijbm.v7n5p73

Iddrisu Y. (2022). *Supply chain resilience and operational performance: The moderating role of supply chain benchmarking*. Thesis, Kwame Nkrumah University of Science and Technology.

Ivanov, D., & Dolgui, A. (2021). A digital supply chain twin for managing the disruption risks and resilience in the era of Industry 4.0. *Production Planning and Control, 32*(9), 775–788. https://doi.org/10.1080/09537287.2020.1768450

Jin, Y., Vonderembse, M., Ragu-Nathan, T. S., & Smith, J. T. (2014). Exploring relationships among IT-enabled sharing capability, supply chain flexibility, and competitive performance. *International Journal of Production Economics, 153*, 24–34. https://doi.org/10.1016/j.ijpe.2014.03.016

Juan, S. J., Li, E. Y., & Hung, W. H. (2022). An integrated model of supply chain resilience and its impact on supply chain performance under disruption. *International Journal of Logistics Management, 33*(1), 339–364. https://doi.org/10.1108/IJLM-03-2021-0174

Kwak, D.-W., Seo, Y.-J., & Mason, R. (2018). Investigating the relationship between supply chain innovation, risk management capabilities and competitive advantage in global supply chains. *International Journal of Operations & Production Management, 38*(1), 2–21. https://doi.org/10.1108/IJOPM-06-2015-0390

Langat, E. K., & Karanja, P. W. (2021). Effects of supply chain disruptions on customer service performance in Beverage Industry: A case of East African Breweries, Kenya. *International Journal of Economics, Commerce and Management, 9*(2), 177–194.

Mairura, L., & Muturi, W. (2021). Effect of corporate strategies on the performance of manufacturing firms in Nairobi city county, Kenya. *International Journal of Social Science and Humanities Research, 9*(3), 530–551. https://doi.org/10.61426/sjbcm.v6i2.1088

Mandal, S., Sarathy, R., Korasiga, V. R., Bhattacharya, S., & Dastidar, S. G. (2016). Achieving supply chain resilience: The contribution of logistics and supply chain capabilities. *International Journal of Disaster Resilience in the Built Environment, 7*(5), 544–562. https://doi.org/10.1108/IJDRBE-04-2016-0010

McGaghie, W. C., Issenberg, S. B., Cohen, E. R., Barsuk, J. H., & Wayne, D. B. (2011). Does simulation-based medical education with deliberate practice yield better results than traditional clinical education? A meta-analytic comparative review of the evidence. *Academic Medicine, 86*(6), 706–711. https://doi.org/10.1097/ACM.0b013e318217e119

Melsen, W. G., Bootsma, M. C. J., Rovers, M. M., & Bonten, M. J. M. (2014). The effects of clinical and statistical heterogeneity on the predictive values of results from meta-analyses. *Clinical Microbiology and Infection, 20*(2), 123–129. https://doi.org/10.1111/1469-0691.12494

Muricho, M. W., & Muli, S. (2021). Influence of supply chain management practices on performance of food and beverage manufacturing firms in Kenya. *International Journal of Business and Social Research, 11*(1), 36–55. https://doi.org/https://doi.org/10.18533/ijbsr.v11i1.1356

Musa, I., & Pujawan, I. . (2018). The relationship among the resiliency practices in supply chain, financial performance, and competitive advantage in manufacturing firms in Indonesia and Sierra Leone. *IOP Conference Series: Materials Science and Engineering, 337*, 012029. https://doi.org/10.1088/1757-899X/337/1/012029

Nyamete, L. K., Gudda, P., & Keitany, P. (2023). Effect of supply chain resilience strategies on the performance of floricultural firms in Kenya. EPRA International Journal of Economics, *Business and Management Studies, 10*(10), 51–60. https://doi.org/10.36713/epra1013

Page, M. J., McKenzie, J. E., Bossuyt, P., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The prisma 2020 statement: An updated guideline for reporting systematic reviews. *Medicina Fluminensis, 57*(4), 444–465. https://doi.org/10.21860/medflum2021_264903

Pettit, T. J., Croxton, K. L., & Fiksel, J. (2013). Ensuring supply chain resilience: Development and implementation of an assessment tool. *Journal of Business Logistics, 34*(1), 46–76. https://doi.org/10.1111/jbl.12009

Ponomarov, S. Y., & Holcomb, M. C. (2009). Understanding the concept of supply chain resilience. *The International Journal of Logistics Management, 20*(1), 124-143. https://doi.org/10.1108/09574090910954873

Pu, G., Li, S., & Bai, J. (2022). Effect of supply chain resilience on firm's sustainable competitive advantage: a dynamic capability perspective. *Environmental Science and Pollution Research, 30*(2), 4881–4898. https://doi.org/10.1007/s11356-022-22483-1

Robson, R. C., Pham, B., Hwee, J., Thomas, S. M., Rios, P., Page, M. J., & Tricco, A. C. (2019). Few studies exist examining methods for selecting studies, abstracting data, and appraising quality in a systematic review. *Journal of Clinical Epidemiology, 106*, 121–135. https://doi.org/10.1016/j.jclinepi.2018.10.003

Setiawan, H. S., Tarigan, Z. J. H., & Siagian, H. (2023). Digitalization and green supply chain integration to build supply chain resilience toward better firm competitive advantage. *Uncertain Supply Chain Management, 11*(2), 683–696. https://doi.org/10.5267/j.uscm.2023.1.012

Shakarchi, J. Al. (2022). How to write a systematic review or meta-analysis protocol. *Journal of Surgical Protocols and Research Methodologies, 3*(4), 1–2. https://doi.org/10.1093/jsprm/snac015

Silvestre, B. S. (2015). Sustainable supply chain management in emerging economies: Environmental turbulence, institutional voids and sustainability trajectories. International *Journal of Production Economics, 167*, 156–169. https://doi.org/10.1016/j.ijpe.2015.05.025

Soni, U., Jain, V., & Kumar, S. (2014). Measuring supply chain resilience using a deterministic modeling approach. *Computers and Industrial Engineering, 74*(1), 11–25. https://doi.org/10.1016/j.cie.2014.04.019

Tarigan, Z. J. H., Siagian, H., & Jie, F. (2021). Impact of internal integration, supply chain partnership, supply chain agility, and supply chain resilience on sustainable advantage. *Sustainability (Switzerland), 13*(10). https://doi.org/10.3390/su13105460

Thongrawd, C., Ramanust, S., Narakorn, P., & Seesupan, T. (2020). Exploring the mediating role of supply chain flexibility and supply chain agility between supplier partnership, customer relationship management and competitive advantage. *International Journal of Supply Chain Management, 9*(2), 435–443.

Tukamuhabwa, B. R., Stevenson, M., Busby, J., & Zorzini, M. (2015). Supply chain resilience: Definition, review and theoretical foundations for further study. International *Journal of Production Research, 53*(18), 5592–5623. https://doi.org/10.1080/00207543.2015.1037934

Varzandeh, J., Farahbod, K., & Jake Zhu, J. (2016). Global logistics and supply chain risk management. *Journal of Business Behavioral Sciences, 28*(1), 124–130.

Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor. *Journal of Statistical Software, 36*(3), 1–48. https://doi.org/10.18637/jss.v036.i03

Wairimu, D. M. (2023). *Relationship between dynamic supply chain capabilities and resilience of retail chain of stores in Kenya* [Jomo Kenyatta University]. http://localhost/xmlui/handle/123456789/6196%0A

Wieland, A., & Wallenburg, C. M. (2012). Dealing with supply chain risks: Linking risk management practices and strategies to performance. *International Journal of Physical Distribution & Logistics Management, 42*(10), 887–905. https://doi.org/10.1108/09600031211281411

Yang, Y., Pan, S., & Ballot, E. (2016). Mitigating supply chain disruptions through interconnected logistics services in the Physical Internet. *International Journal of Production Research, 55*(14), 1–13. https://doi.org/10.1080/00207543.2016.1223379

OTPORNOST LANCA SNABDEVANJA PROIZVODNIH KOMPANIJA U ZEMLJAMA U RAZVOJU: META-ANALIZA

Otpornost lanca snabdevanja (Supply chain resilience =SCR) je sposobnost adaptacije koja reaguje na neočekivane smetnje. Ova meta-analiza prikazuje praksu otpornosti lanca snabdevanja u proizvodnim kompanijama u zemljama u razvoju, uzimajući u obzir uzorak od 25 studija objavljenih od 2014 do 2023. Podaci su analizirani korišćenjem modela slučajnih efekata uz pomoć softvera Jamovi verzije 2.4 i SPSS verzije 23. Rezultati ukazuju da, naročito tokom poslednje četiri godine (2020-2023), SCR praksa u proizvodnim kompanijama u zemljama u razvoju je značajno povećana (20%). Ova studija je otkrila da je u studijama o praksi otpornosti lanca snabdevanja, Indonezija bolje angažovana zemlja (24%) a sledi je Kenija (16%). Štaviše, ova studija je otkrila da je najčešće korišćeni model analize podataka u studijama prakse održivosti lanca snabdevanja model strukturnih jednačina (40%), a zatim višestruka linearna regresija (24%). Ponderisana prosečna veličina efekta studija bila je 57%, što pokazuje da praksa održivosti lanca snabdevanja podstiče proizvodne kompanije da primenjuju različite strategije otpornosti kako bi prevazišle poremećaje u lancu snabdevanja. Predlažu se dalja istraživanja prakse otpornosti lanca snabdevanja u razvijenim zemljama kako bi se uporedila razlika u veličini efekta između razvijenih i zemalja u razvoju.

Ključne reči: *otpornost lanca snabdevanja, proizvodne kompanije, zemlje u razvoju, model slučajnih efekata*