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Original research article

Supply chain viability as a driver of FMCG reconfiguration post-disruption: A regional comparison

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ABSTRACT

Supply chain disruptions pose persistent challenges to operational continuity, cost efficiency, and adaptive decision-making, particularly in fast-moving consumer goods (FMCG) industries characterized by volatile demand and complex logistics networks. While prior studies have examined resilience, agility or sustainability as individual capabilities, limited empirical evidence explains how these dimensions jointly support supply chain reconfiguration across different disruption phases and economic contexts. This study aims to examines supply chain viability (SCV) as an integrative construct encompassing resilience, agility, and sustainability, and to analyze its role in driving supply chain reconfiguration before and after disruption across developed and developing regions. A quantitative research design was employed using survey data collected from FMCG firms, which were analyzed using partial least squares structural equation modelling with multi-group analysis. The results demonstrate that the relative influence of SCV dimensions varies across disruption phases and regional contexts. Resilience plays a more prominent role prior to disruption by supporting operational stability, whereas agility and sustainability emerge as stronger drivers of supply chain reconfiguration in the post-disruption phase. Furthermore, sustainability exerts a greater impact in developed regions, while agility is more critical in developing regions due to differences in institutional maturity and operational constraints. These findings advance supply chain viability theory by clarifying its dynamic and contextual mechanisms and provide managerial insights for designing reconfiguration strategies that enhance long-term operational performance and adaptability under disruptive conditions.

1. Introduction

The role of the Fast-Moving Consumer Goods (FMCG) industry is essential for the economy and the daily needs of society. When disruptions occur, the Fast-Moving Consumer Goods (FMCG) sector experiences significant pressure. Disruptions such as pandemic crises, geopolitical issues, climate change, and rapid technological changes have become challenges for the FMCG sector. Indonesia's FMCG, as a developing country, experienced a significant decline in growth during the global pandemic disruption, from 8.8% to 5.9% [1]. Dependence on the global supply chain network has caused many FMCG companies to be unprepared for the structural reconfiguration needed to survive in disruptive conditions. The transition of the supply chain needs to be directed from mere resilience to supply chain viability, which encompasses the ability to endure, adapt, and sustain [2]. Supply chain viability serves as a strategic framework that bolsters the supply chain's reconfiguration capabilities, preparing it to confront future uncertainties [3], [4].

Recent empirical studies show that each dimension of viability has a unique contribution, but their approach remains partial. The resilience strategy for small and medium-sized enterprises (SMEs) in the bread sector in Indonesia is still reactive, focusing on risk mitigation rather than long-term supply chain strategies [5]. In the agility approach, a global study indicates that the integration of descriptive and predictive data through analytical dashboards enhances retail decision-making speed, but it has not yet been integrated with a strategically adaptive supply chain management system [6]. In the concept of

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sustainability, one study in India revealed that only 40% of FMCG companies actively implement sustainability practices amidst consumer and regulatory pressures [7]. This finding is reinforced by a study in the Pakistani packaging sector, where eco-friendly packaging has not succeeded in shaping brand perception as a pioneer of sustainability due to the lack of integration between marketing strategies and the supply chain [8]. Study [9] found that the digitalization of the frozen food supply chain only reduces cycle time but has not yet been able to fully support reconfiguration capabilities when disruptions occur. From these recent empirical studies, a conceptual and empirical gap is evident regarding supply chain viability, which is the integration of resilience, agility, and sustainability that can support supply chain reconfiguration, particularly in the context of developing countries with structural supply chain limitations.

The research gap on the integration of resilience, agility, and sustainability as factors for supply chain viability is becoming increasingly clear in cross-country studies. In developed countries, supply chain and logistics infrastructure are more mature, yet they still face challenges in maintaining agility and social sustainability. Innovative products in Italy only have a success rate of 13% due to poor integration between retailers and manufacturers [10]. In Egypt, 82% of FMCG retailers are reluctant to share data due to weak trust and governance in supply chain collaboration, leading to poor agility and resilience during disruptions. FMCG companies in developed countries have not yet fully integrated resilience-agility-sustainability as an approach to supply chain viability.

The urgency of this research is to examine the differences in characteristics between developing and developed countries in managing supply chain viability to create supply chain reconfiguration capabilities. While developing countries still face limitations in supply chain infrastructure, trust between supply chain nodes, and regulations that are not always supportive, developed countries have more established supply chain process capabilities. However, some literature states that FMCG companies in developed countries are not always responsive to sudden changes that require supply chain structural agility [10], [11]. Therefore, this study delves into the contributions of resilience, agility, and sustainability to the reconfiguration of supply chains between FMCG companies in developing and developed countries.

Despite the growing body of literature on supply chain resilience, agility, and sustainability, existing studies predominantly examine these dimensions in isolation or treat them as operational capabilities rather than as an integrated strategic system. Prior empirical works tend to focus on single-dimensional responses to disruption, such as reactive resilience mechanisms, short-term agility improvements, or compliance-oriented sustainability initiatives, without adequately explaining how these dimensions jointly enable structural supply chain reconfiguration, particularly across different disruption phases and country contexts [7], [8], [10], [11], [12], [13], [14].

This study explicitly addresses this gap by positioning supply chain viability as an integrative construct that simultaneously incorporates resilience, agility, and sustainability as complementary drivers of supply chain reconfiguration. Unlike prior studies, this research advances literature in three important ways. First, it empirically examines the differentiated roles of SCV dimensions across pre- and post- disruption conditions, capturing the dynamic shift from survival-oriented responses to adaptive and sustainability-driven reconfiguration. Second, it adopts a cross-country comparative perspective, systematically contrasting developed and developing economies to reveal how institutional maturity, infrastructural constraints, and strategic priorities shape the effectiveness of SCV dimensions. Third, by employing a multi-group PLS approach, this study provides robust empirical evidence on how the relative importance of resilience, agility, and sustainability evolves across disruption phases and regional contexts within the FMCG sector.

The purpose of this study is, first, to analyze the influence of the dimensions of viability (resilience, agility, and sustainability) on supply chain reconfiguration in the context of pre- and post-disruption. Second, to compare the contributions of the three dimensions of viability between developing and developed countries. Based on this exposition, there are two main research questions, namely:

1. How do the dimensions of viability (resilience, agility, and sustainability) affect supply chain reconfiguration before and after disruption?
2. Is there a difference in the contribution of the viability dimension in developing and developed countries in supporting supply chain reconfiguration?

2. Literature review

2.1. Supply chain viability (SCV)

The concept of viability in supply chains began to develop during the Covid-19 pandemic [3]. Supply chain viability is the ability of a supply chain to sustain itself and endure in an ever-changing environment while meeting demand during disruptions [3]. The SCV concept not only refers to short-term recovery but also to the long-term shift toward a "new normal" after a disruption [15]. SCV evolves toward a hierarchical and multidimensional construct, including elements of organizational structure, resources, dynamic design capabilities, and operational aspects [4].

To be able to survive amidst the dynamics of disruptions, the viability of the supply chain that integrates resilience-agility-sustainability is a strong approach in supply chain design that can endure, adapt, and be sustainable [16], [17]. This integration model combines these three perspectives within the supply chain ecosystem, providing a theoretical and practical

foundation for the development of supply chain management practices [17]. With the resilience-agility-sustainability integration, a viable supply chain will be able to reconfigure its supply chain structure adaptively to face the continuously evolving dynamics [4], [18], [19].

2.2. Supply chain reconfiguration (RR)

Supply chain reconfiguration is the ability to adjust and reallocate resources in response to external disruptions [20], [21]. RR involves restructuring business resources and operations to create new operational competencies [22]. The ability to reconfigure operational resources is crucial for the survival and superior performance of the company [20], [21]. In the context of disruptions, RR becomes a key factor in finding a way to survive and mitigate the impact of disruptions [21], [23].

Scholars show that supply chain resilience (SR) can respond to supply chain disruptions by reconfiguring the supply chain [24], [25]. An empirical study in Qatar indicates that supply chain resilience has a strong influence on reconfiguration to enhance the reactive and proactive dimensions of supply chain resilience [24]. SR plays a role in ensuring operational continuity and minimizing the negative impact of disruptions. Resilience is the ability of the supply chain to continue operating and recover quickly from disruptions that occur [26]. Before the pandemic disruption, resilience was often the main foundation for strengthening resistance and initial response to disturbances [27]. Therefore, the first hypothesis is:

H1: The influence of supply chain resilience on supply chain reconfiguration is positive, with the level of impact increasing after disruption compared to before disruption.

Meanwhile, supply chain agility (SA) affects supply chain reconfiguration by enhancing responsiveness to market changes [28]. SA reflects the company's ability to respond quickly to changes in demand and market dynamics [29]. Flexible processes and the ability to quickly adapt to changes enhance supply chain agility [30]. Post-disruption, agility supported by data analytics accelerates the reconfiguration process more effectively than passive resilience [9], [13]. Preliminary hypotheses indicate that the contribution of agility to reconfiguration increases post-disruption, reflecting a shift in focus from survival to adaptation. Therefore, the second hypothesis is:

H2: The impact of supply chain agility on supply chain reconfiguration is positive, with the level of impact increasing after disruption compared to before disruption.

Supply chain sustainability (SS) affects the reconfiguration of supply chains by encouraging the adoption of environmentally friendly practices and integrating environmental considerations into operational frameworks [31]. Sustainability emphasizes a long-term commitment to environmental, social, and economic sustainability; corporate reputation; and employee well-being [32]. Sustainability plays a strategic and increasingly stronger role in post-disruption because consumers and regulators demand social responsibility, green innovation, and transparency [33]. The role of sustainability before a disruption is very limited to the compliance phase and instead becomes the main driver of reconfiguration innovation post-disruption [34]. Therefore, the hypothesis regarding the impact of sustainability on reconfiguration is as follows:

H3: The impact of supply chain sustainability on supply chain reconfiguration is positive, with the level of impact increasing after disruption compared to before disruption.

2.3. Comparative analysis of SCV in developing and developed countries

Disruption creates different viability patterns in supply chain strategies between developed and developing countries. In developed countries, resilience is built through formal systems and established digital infrastructure. However, empirical evidence shows the limitations of structural adaptation capabilities, such as in Italy, where only 13% of new products in FMCG manage to survive due to weak coordination among supply chain actors [12]. The lack of initiative to share strategic data in empirical studies conducted in Egypt indicates that technology has not yet ensured the necessary agility to support reconfiguration [11]. On the other hand, in developing countries like Indonesia, India, and Pakistan, viability patterns are more adaptive despite limited resources. In Indonesia, agility enhances the use of analytical dashboards that accelerate retail responses to market dynamics [6]. A study in Pakistan confirms that eco-friendly packaging is becoming part of operational strategies and company reputation [8]. In India, research has demonstrated that a brand's commitment to sustainability influences female consumer loyalty [14]. This difference underscores how the country's context shapes the contribution of the SCV dimension to the reconfiguration of the supply chain. Developed countries excel in system efficiency but tend to be rigid in structural changes. Meanwhile, developing countries show dynamic and decentralized viability potential that is more responsive to disruptions. Therefore, the comparative hypothesis is formed.

H4: The influence of supply chain viability dimensions (resilience, agility, and sustainability) on supply chain reconfiguration differs significantly between developed and developing countries.

3. Material and method

3.1. Research design

This research was conducted in various countries classified as developed and developing. Respondents are spread across five regions, namely Asia, America, Australia, Europe, and Africa. The respondents come from various countries such as Brazil, Mexico, Canada, the USA, India, Indonesia, Israel, Japan, South Korea, Australia, New Zealand, Germany, England, the Netherlands, Poland, Portugal, South Africa, and others.

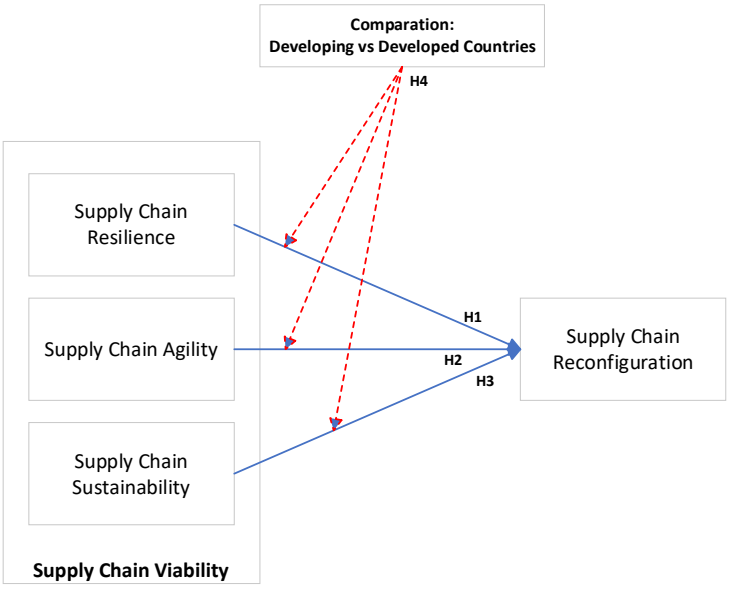

Fig. 1. Research framework

This research was conducted in various countries classified as developed and developing. Respondents are spread across five regions, namely Asia, America, Australia, Europe, and Africa. The respondents come from various countries such as Brazil, Mexico, Canada, the USA, India, Indonesia, Israel, Japan, South Korea, Australia, New Zealand, Germany, England, the Netherlands, Poland, Portugal, South Africa, and others. The respondents of this research are OSCM managers working in the FMCG sector who are part of the Prolific application. Researchers utilize Prolific, a UK-based crowdsourcing platform, to link participants with specific study design specifications [35], [36]. Prolific has become a reliable and valid data collection tool, especially in social science research, such as supply chain management studies. With the main benefits of wide respondent coverage and time and cost efficiency, the crowdsourcing platform is recognized by scholars and has a significant research impact, as seen in various social science studies [37], [38], [39], [40]. Fig. 1 shows the research framework for the hypotheses and comparative analysis of this study.

3.2. Measures

This research consists of exogenous variables: supply chain resilience (SR), agility (SA), and sustainability (SS) as dimensions of the concept of supply chain viability; and the endogenous variable: supply chain reconfiguration (RR). The endogenous variable is measured through five main dimensions: integration, renewal, realignment, reconfiguration, and restructuring [19], [22], [41]. Supply chain resilience is measured with indicators of renewal, reorientation, recovery, and resistance [42], [43]. Supply chain agility is measured with indicators of swiftness, flexibility, decisiveness, accessibility, and alertness [29]. Supply chain sustainability is measured with indicators of profitability, employee satisfaction, company reputation in the industry, corporate social responsibility, and commitment to environmental sustainability [44], [45].

The questionnaire is divided into two parts, pre- and post-disruption, with the same indicators. Respondents were asked to imagine and recall the conditions during the pre- and post-disruption periods. Each indicator is measured using a 7-point Likert scale. The influence analysis was conducted using SEM smartPLS, and the comparative analysis was conducted using MGA-PLS smartPLS to compare the conditions of developed and developing countries on each path of influence between variables.

4. Results and discussions

4.1. Demographic Profiles

The total number of research respondents is 1100, classified into developed and developing country categories. The respondents are employees of companies operating in the FMCG sector with job specifications in the fields of operations, supply chain,

distribution, logistics, and production management. Most respondents focus on the field of operations (37.6%) and supply chain management (32.3%). With dominance of employees in middle and junior management positions, the respondents have more than 15 years of experience (74.2%). The operational scope of FMCG companies is balanced between local and multinational companies, with the number of companies predominantly in the range of 251–500 employees, totaling 448 out of 1100. The characteristics of the respondents show that they are representatives of FMCG companies holding positions in operations and supply chain management. Details of the respondents' characteristics can be seen in in Table 1.

Table 1
Demographic profiles.

Job function	Developing country	Developed country	Total
Distribution management	28	20	48
Logistics management	98	80	178
Operations management	185	229	414
Production management	48	57	105
Supply chain management	196	159	355
Grand total	555	545	1100
Position in the company	**Developing country**	**Developed country**	**Total**
Top management	56	47	103
Middle management	211	224	435
Junior management	288	274	562
Grand total	435	562	1100
Work period	**Developing country**	**Developed country**	**Total**
5 - 10 years	36	74	110
11 - 15 years	82	92	174
> 15 years	437	379	816
Grand total	555	545	1100
Scope of operations	**Developing country**	**Developed country**	**Total**
Local	279	258	537
Multinational	276	287	563
Grand Total	555	545	1100
Number of employes	**Developing country**	**Developed country**	**Total**
< 250 employes	193	193	386
251 - 500 employes	209	239	448
501 - 1000 employes	82	64	146
> 1001 employes	71	49	120
Grand total	555	545	1100

Table 2
Loadings, CR, Cronbach's Alpha, and AVE – complete, developed, and developing country group_pre disruption.

Var	ID	Complete group				Developed country group				Developing country group			
		FL	CR	CA	AVE	FL	CR	CA	AVE	FL	CR	CA	AVE
RR	RR1	0.813	0.924	0.898	0.701	0.843	0.930	0.905	0.725	0.787	0.920	0.891	0.697
	RR2	0.854				0.854				0.855			
	RR3	0.867				0.864				0.869			
	RR4	0.830				0.836				0.825			
	RR5	0.848				0.862				0.836			
SA	SA1	0.780	0.913	0.881	0.678	0.785	0.917	0.887	0.688	0.776	0.910	0.876	0.669
	SA2	0.807				0.828				0.789			
	SA3	0.841				0.865				0.820			
	SA4	0.840				0.830				0.848			
	SA5	0.846				0.839				0.852			
SR	SR1	0.786	0.901	0.854	0.694	0.774	0.894	0.845	0.679	0.794	0.906	0.862	0.707
	SR2	0.838				0.826				0.848			
	SR3	0.878				0.874				0.880			
	SR4	0.829				0.821				0.838			
SS	SS1	0.732	0.888	0.841	0.612	0.701	0.880	0.831	0.596	0.767	0.894	0.852	0.628

SS2	0.780	0.766	0.790
SS3	0.804	0.795	0.812
SS4	0.817	0.812	0.822
SS5	0.778	0.786	0.772

4.2. Analysis of pre-disruption conditions

This study begins with an analysis of the influence of endogenous variables on exogenous variables in pre- and post-disruption situations. Each condition is analyzed per group, including the complete group, the developing countries group, and the developed countries group. In the pre-disruption period, the results of the measurement model analysis appeared valid and reliable. The validity and reliability tests were conducted using outer loading analysis, composite reliability, Cronbach's alpha, and average variance extracted (AVE). The Fornell-Larcker ratio and Heterotrait-Monotrait (HTMT) ratio indicate discriminant validity. Next, the path analysis of influence uses p-value path coefficients. Meanwhile, the MGA-PLS comparative analysis is conducted through the comparison of t-values and path coefficients (diff MGA-PLS) between the groups of developing and developed countries.

4.2.1. Measurement model pre-disruption

Data analysis shows that data construction meets good validity and reliability criteria. Tables 2 show the results of factor loadings, CR, Cronbach's Alpha, and AVE during the pre-disruption period, both from the complete group, developing group, and developed country group. Convergent validity is analyzed from the loading factor and Average Variance Extracted (AVE). All indicators in each variable show loading values > 0.70 in all three groups. This indicates that each indicator has a high correlation with its variable and is worth retaining in this study. Meanwhile, the AVE values are above 0.50 (0.596-0.725) in all three groups, which meets the criteria for good convergent validity [46]. AVE appears in the RR variable in the developed country group. This indicates that the RR variable is most consistently explained by the indicators in the context of developed countries. Meanwhile, the lowest AVE is found in the SS variable in the developed country group (0.596), but it is still within an acceptable range.

The reliability of the construct is evaluated through the Composite Reliability (CR) and Cronbach's Alpha values. All variables in the three groups show CR > 0.70, even exceeding 0.90. This indicates a satisfactory level of internal reliability. The highest CR is on the RR variable in the developed country group (0.93) and the complete group, which shows that the RR variable is measured with high consistency. Meanwhile, the lowest CR is seen on the SS variable in the developed country group (0.880), but it is still well above the minimum threshold of 0.70. Cronbach's Alpha values for all variables are above 0.80, indicating that the indicators for each variable have high internal consistency. This value indicates that the reliability of the research measurement tool, in this case the survey can measure the constructions of viability and supply chain reconfiguration before disruption.

In general, the three groups firmly confirmed the convergent validity and internal reliability of this study during the pre-disruption period. All variables meet the criteria for satisfactory measurement (loading > 0.70; CR > 0.70; AVE > 0.50; Cronbach's alpha > 0.80). The strength of developed countries is evident in their understanding and consistency when measuring the SA and RR variables. Meanwhile, developing countries excel in the areas of SR and SS before any disruptions occur. Subchapter 4.4 will provide a more in-depth discussion on the comparative analysis.

The results of the R^2 analysis in the pre-disruption phase are shown in Table 3. R^2 indicates the variation in the model's ability to explain RR based on the country context. The highest value is seen in the group of developing countries (0.531). This indicates that the supply chain viability dimensions—SA, SR, and SS—in developing countries have a strong influence in explaining the readiness of companies to reconfigure their supply chains before a disruption occurs. Meanwhile, the group of developed countries shows a lower R-square value (0.406), indicating the presence of other factors beyond SCV, such as digital capabilities, intrapreneurship, structural stability, and other factors that play a more dominant role in driving supply chain reconfiguration. These findings illustrate the importance of a contextual approach in strengthening supply chain strategies, where the SCV model is more relevant and impactful in developing countries compared to developed countries in the pre-disruption phase. The pre-disruption R^2 results are shown in Table 3.

4.2.2. Discriminant validity of pre-disruption

Discriminant validity is analyzed using two approaches, namely Fornell-Larcker and Heterotrait-Monotrait (HTMT). The results of the Fornell-Larcker analysis show that the square root of AVE (diagonal value) is higher than the correlation between variables within each group. Each variable in this study shows favorable discrimination against other variables, meaning that each variable significantly measures a different concept. The highest AVE root value appears in the RR variable (0.843) and the lowest in the SS

variable (0.783), but all still meet the required threshold (>0.70).

The HTMT results show values below the conservative threshold of 0.85 in all three groups [47]. The highest HTMT value is found in the SA-SR pair, which is 0.850 in the complete group and developed group and 0.849 for developing countries. This value is still acceptable and does not indicate multicollinearity between variables. It can be concluded that the measurement model in this study meets the criteria for discriminant validity both conceptually and empirically in the context of developing and developed countries in the pre-disruption phase.

Table 3
R-square complete, developing country, developed country group – pre disruption.

Group	R-square	R-square adjusted
Complete group	0.469	0.468
Developing group	0.531	0.528
Developed group	0.406	0.403

Table 4
Fornell larcker –all group_pre disruption.

	Complete group				Developing group				Developed group			
	RR	SA	SR	SS	RR	SA	SR	SS	RR	SA	SR	SS
RR	0.843				0.843				0.843			
SA	0.640	0.823			0.640	0.823			0.640	0.823		
SR	0.559	0.745	0.833		0.559	0.745	0.833		0.559	0.745	0.833	
SS	0.601	0.664	0.619	0.783	0.601	0.664	0.619	0.783	0.601	0.664	0.619	0.783

Table 5
Heterotrait monotrait (HTMT) complete group_pre disruption.

	Complete group				Developing group				Developed group			
	RR	SA	SR	SS	RR	SA	SR	SS	RR	SA	SR	SS
RR												
SA	0.715				0.769				0.654			
SR	0.627	0.850			0.672	0.849			0.573	0.850		
SS	0.691	0.770	0.730		0.731	0.788	0.689		0.645	0.748	0.779	

Table 6
Result of hypothesis (p-value and t-value).

Variable path	Complete group			Developing group			Developed group		
	t-value	p-value	status	t-value	p-value	status	t-value	p-value	status
SA->RR	7.672	0.000	accepted	6.593	0.000	accepted	4.978	0.000	accepted
SR->RR	2.606	0.009	accepted	2.786	0.006	accepted	0.986	0.325	rejected
SS->RR	7.796	0.000	accepted	6.474	0.000	accepted	5.136	0.000	accepted

The evaluation of the structural model fit was conducted using the Standardized Root Mean Square Residual (SRMS), d_ULS, d_G, Chi-Square, and Normed Fit Index (NFI) indices. Table 8 shows that the SRMR value is below the threshold of 0.08, with the best values in the complete group and the developing country group. The d_ULS and d_G values reflect the distance between the empirical and theoretical models, which are also relatively small and consistent, indicating the data's fit to the model. The NFI value indicates the degree of fit of the structural model to the data, with a range of 0.854 to 0.880. The highest NFI is observed in the complete group, followed by the developing country group and the developed country group. Overall, the results indicate that the structural model of the pre-disruption phase has a satisfactory fit to the data in all three groups, with the best performance in the developing country group, followed by the overall group. Discriminant validity pre-disruption is shown in Tables 4 and 5.

4.2.3. *Hypothesis of pre-disruption*

The results of the hypothesis test show that, in general, the three dimensions of supply chain viability, namely SA, SR, and SS, significantly influence supply chain reconfiguration in the pre-disruption phase, with varying patterns of influence among country groups. In the complete group, the supply chain viability dimensions indicate their contribution to the company's readiness to reconfigure the supply chain, significantly influencing it ($p < 0.05$ and high $t > 1.96$).

The group of developing countries also shows a significant influence pattern between the three dimensions of viability in reconfiguration ($p < 0.05$, with a high t). This emphasizes that in the context of more vulnerable and dynamic countries, companies heavily rely on a combination of agility, resilience, and sustainability to adjust their supply chain structure. This reflects that viability is relevant as a supply chain strategy before disruptions occur in developing countries.

Meanwhile, in the group of developed countries, only two variables show a significant influence on RR, namely SA and SS. Meanwhile, the influence of SR on RR is not significant (t = 0.986 and p > 0.01). This indicates that the aspect of resilience has not yet become a major contributor to the reconfiguration of companies in developed countries before disruption. The reason for the absence of significance could be that the supply chain structure in developed countries is already stable and does not rely on reactive strategies such as resilience but is more oriented toward process agility and long-term commitment to sustainability. These findings underscore the importance of a contextual approach in strengthening supply chain reconfiguration capacity, where developing countries require the entire spectrum of SCV as an adaptation lever, while developed countries rely more on agility and sustainability rather than resilience in the pre-disruption phase.

4.3. Analysis of post-disruption conditions

Data analysis in the post-disruption phase is conducted similarly to the data analysis in the pre-disruption phase. We begin by utilizing the measurement model to verify the validity and reliability of the data, as well as the suitability of the research model for subsequent analysis. The post-disruption phase was also conducted on three groups, namely the complete group, developing group, and developed group. Table 7 show the results of the loading factor, CR, Cronbach's Alpha, and AVE for each group.

4.3.1. Measurement model post disruption

The main variables in the post-disruption phase testing show strong measurement validity and reliability in all three groups of countries. The factor loading values are above 0.70, which means each indicator has a significant contribution to the measured variable. The Composite Reliability (CR) and Cronbach's Alpha values are above the threshold of 0.70, with most being above 0.90. The result indicates a very high level of internal consistency. Meanwhile, the highest CR values were found for the RR variable in the developed countries group (0.935) and the SA variable in the developing countries group (0.932). The result confirms that the ability to measure this variable has improved after the disruption.

All variables meet the AVE criteria above 0.50. This indicates good convergent validity. The highest AVE is found in the SR variable in developed countries (0.757), indicating that supply chain resilience is increasingly internalized consistently in post-disruption measurements. Meanwhile, SS in all three groups experienced a significant increase in AVE compared to the pre-disruption phase. This emphasizes that the aspect of sustainability has become more prominent and consistent in the post-disruption context.

In general, the post-disruption measurement model shows an improvement in measurement quality across all variables and all three groups. This indicates that disruption encourages companies to clarify the roles of viability dimensions in supply chain reconfiguration strategies. Table 7 shows the detailed results of the measurement model post-disruption.

The results of the coefficient of determination analysis show that the contribution of the SCV dimension after the disruption can explain the company's reconfiguration capability, particularly in most groups. The coefficient of determination value for the developed countries group is the highest, reaching 0.564. This indicates that the SCV dimension explains 56% of the variance in reconfiguration capability. Following the disruption, companies in developed countries have begun to incorporate viability elements into their supply chain structural adaptation strategies. The coefficient of determination in the complete group also shows an increase from 0.469 in the pre-disruption phase to 0.526 post-disruption. This confirms that, in aggregate, companies are beginning to rely on a combination of agility, resilience, and sustainability for their reconfiguration processes. In developing countries, the coefficient of determination experienced a slight decrease from 0.531 pre-disruption to 0.497 post-disruption. This indicates a shift in the structure of influence or the emergence of other factors outside of SCV, such as market pressure, digitalization, or regional policies. These factors can drive the reconfiguration of the supply chain after a disruption occurs. Table 8 shows R-Square post disruption phases.

4.3.2. Discriminant validity of post-disruption

The discriminant validity test based on the Fornell-Larcker criterion shows that all variables meet the criteria for satisfactory discriminant validity in all three groups. The square root of the AVE value for all variables is higher than the correlation between them. In the group of developed countries, the highest diagonal values are for the RR variable (0.861) and the SR variable (0.870), while the highest correlation value is for SA-RR (0.695). Both the group of developing countries and the entire group exhibit the same pattern.

Table 7
Loadings, CR, Cronbach's Alpha, and AVE – complete, developed, and developing country group_post disruption.

Var	ID	Complete group				Developed country group				Developing country group			
		FL	CR	CA	AVE	FL	CR	CA	AVE	FL	CR	CA	AVE
RR	RR1	0.843	0.933	0.910	0.735	0.852	0.935	0.913	0.742	0.835	0.931	0.907	0.728
	RR2	0.854				0.865				0.867			
	RR3	0.864				0.863				0.865			

	RR4	0.836				0.870				0.846			
	RR5	0.862				0.857				0.854			
SA	SA1	0.785	0.929	0.904	0.723	0.838	0.925	0.898	0.711	0.832	0.932	0.908	0.732
	SA2	0.828				0.829				0.849			
	SA3	0.865				0.822				0.865			
	SA4	0.830				0.873				0.877			
	SA5	0.839				0.853				0.855			
SR	SR1	0.774	0.922	0.888	0.747	0.850	0.926	0.893	0.757	0.840	0.917	0.881	0.736
	SR2	0.826				0.879				0.813			
	SR3	0.874				0.888				0.901			
	SR4	0.821				0.862				0.875			
SS	SS1	0.701	0.910	0.876	0.670	0.786	0.908	0.873	0.664	0.787	0.910	0.876	0.670
	SS2	0.766				0.797				0.793			
	SS3	0.795				0.853				0.872			
	SS4	0.812				0.834				0.851			
	SS5	0.790				0.802				0.785			

The HTMT value is at the conservative threshold of 0.85, which means there are no discriminant issues between variables. The highest HTMT is found in the relationship between SA-SR in the developed countries group (0.807). The HTMT values between RR and other variables range from 0.655 to 0.766 across all groups. This indicates that the conceptual construction of each variable remains well-maintained even in post-disruption conditions. In general, the results of discriminant validity affirm that the research model in the post-disruption phase maintains conceptual clarity between variables, allowing for a more confident interpretation of causal relationships in the structural model.

Model fit evaluation in this study was conducted to ensure the alignment between empirical data and the theoretical model, especially in the post-disruption phase. The SRMS values for all groups are satisfactory, being below the threshold of 0.08, which means the model fit is very good [45], [46]. The values of d_ULS and d_G show low and identical numbers between the saturated and estimated models, indicating no significant misfit in the model structure. The NFI value indicates adequate model fit across all groups, approaching the ideal value of 0.90. Overall, the indicators show that the structural model in the post-disruption phase has a satisfactory fit, both in the global context and among country groups. Table 9 shown the result of discriminant validity of HTMT post-disruption.

4.3.3. *Hyphothesis of post disruption*

The results of the hypothesis test during the disruption phase indicate a shift in the influence of the supply chain viability dimension on the supply chain reconfiguration capability. Supply chain agility consistently shows a highly significant positive effect on RR in all country groups, with the highest t-value in the complete group (11.424), followed by the developing country group (9.786), and the developed country group (7.693), supported by a p-value < 0.001 across all groups. This confirms that supply chain agility is a key determinant in facing disruptions and quickly and adaptively adjusting supply chain reconfigurations.

On the contrary, after the disruption, supply chain resilience no longer shows a significant influence on RR. The t-value is relatively low, below the threshold of 1.96, and the p-value is above 0.05 in all groups (complete = 1.489/0.137; developing = 0.753/0.452; developed = 1.182/0.238). This circumstance causes the SR->RR hypothesis to be rejected. These findings indicate that the previously dominant role of resilience has become statistically irrelevant. There is a possibility that the more reactive nature of SR is less supportive of the need for structural reconfiguration in complex and rapidly changing situations.

Meanwhile, supply chain sustainability remains significantly influential on RR with a high t-value and p-value < 0.001. This emphasizes that sustainability practices play a strategic role in strengthening the company's readiness to face external pressures post-disruption. These findings point to a more dynamic and agility- and sustainability-based SCV strategy, rather than relying on conventional resilience. Table 10 shown the results of hyphothesis.

4.4. *Comparative Analysis*

The results of the inter-group influence test in both time phases, pre- and post-disruption, show intriguing dynamics regarding the impact of supply chain viability dimensions on supply chain reconfiguration capabilities. The agility dimension proved significant in both contexts in the country during the pre-disruption phase. The strength of agility continued to increase significantly in the post-disruption phase, especially in developing countries. Meanwhile, the dimension of resilience undergoes a change in role. Initially significant in developing countries during the pre-disruption phase, its significance universally diminishes over time after the disruption. Such behavior indicates the limitations of conventional resilience in the context of complex structural changes. The sustainability dimension has become a consistently influential dimension in reconfiguration with increasing strength, especially in developed countries after disruption. This evidence indicates that companies in developed countries are increasingly integrating sustainability into their supply chain reconfiguration

strategies. The findings comparing developing and developed countries in pre- and post-disruption situations highlight that post-disruption reconfiguration strategies are context dependent. Developed countries embed sustainability in structural resilience, while developing countries rely on improvisational agility and flexible resources to cope with volatility. Institutional maturity is the determining factor in the differences between these two groups. Advanced economies reflect regulatory compliance and ESG-driven transformation. Emerging economies emphasize responsiveness and cost efficiency. Table 11 summarizes the comparison of the pre- and post-phase impacts in developed and developing countries.

Table 8
R-square complete, developing country, developed country group – post disruption.

Group	R-square	R-square adjusted
Complete group	0.526	0.525
Developing group	0.497	0.494
Developed group	0.564	0.562

Table 9
Heterotrait monotrait (HTMT) complete group_post disruption.

	Complete group				Developing group				Developed group			
	RR	SA	SR	SS	RR	SA	SR	SS	RR	SA	SR	SS
RR												
SA	0.758				0.750				0.765			
SR	0.643	0.804			0.615	0.800			0.670	0.807		
SS	0.708	0.765	0.777		0.655	0.744	0.772		0.766	0.788	0.779	

Table 10
Results of hypothesis (p-value dan t-value).

Variable path	Complete group			Developing group			Developed group		
	t-value	p-value	status	t-value	p-value	status	t-value	p-value	status
SA->RR	11.424	0.000	accepted	9.786	0.000	accepted	7.693	0.000	accepted
SR->RR	1.489	0.137	rejected	0.753	0.452	rejected	1.182	0.238	rejected
SS->RR	7.749	0.000	accepted	4.457	0.000	accepted	7.425	0.000	accepted

Table 11
Comparation summary.

Dimension	Pre-disruption		Post-disruption	
	Developing country	Developed country	Developing country	Developed country
Agility (SA)	Significant	Significant	Significant and stronger	Significant and still stronger
Resilience (SR)	Significant	Not significant	Not significant	Not significant
Sustainability (SS)	Significant	Significant	Significant	Significant and stronger

Table 12
MGA PLS results.

Path	Pre disruption			Post disruption		
	Path coefficients-diff	P-value original (1-tailed)	P-value new	Path coefficients-diff	P-value original (1-tailed)	P-value new
SA->RR	0.012	0.453	0.907	0.118	0.052	0.103
SR->RR	0.084	0.135	0.270	-0.035	0.668	0.663
SS->RR	0.010	0.442	0.884	-0.141	0.976	0.048 (sig.)

Table 12 presents the MGA-PLS (Multi-Group Analysis Partial Least Squares) analysis, which reinforces the comparative findings of this study. In the pre-disruption phase, no differences were observed between developing countries and developed countries across all paths of the research model. This is indicated by the new p-value, all of which are > 0.05. However, after the disruption, a significant difference emerged in the sustainability of the reconfiguration path (SS->RR) with a new p-value of 0.048. This indicates that the influence of sustainability on supply chain reconfiguration is statistically stronger in developed countries compared to developing countries.

On the contrary, on the agility to reconfiguration path (SA->RR), there is a tendency for an increase in the difference in influence strength (path coefficient diff

0.118), with the original p-value approaching the significance threshold of 0.052, but it cannot yet be said to be significantly different. The SR->RR path still does not show a significant difference in both phases, reinforcing the finding that resilience has limitations in driving reconfiguration in both developed and developing countries post-disruption.

This study indicates that the main differences between countries' post-disruption lie in the role of sustainability, where companies in developed countries demonstrate a higher readiness to integrate sustainability dimensions as part of their supply chain reconfiguration strategies. This reflects a higher level of strategic and regulatory maturity in the context of ESG (Environmental, Social, and Governance). In contrast, developing countries show a strengthening in agility aspects but have not yet been able to optimize sustainability equally, which poses an important challenge to consider in enhancing the long-term viability of supply chain.

4.5. Discussion

The findings of this study confirm that supply chain viability (SCV) is an integrative and dynamic capability that enhances FMCG firms' readiness to cope with disruption through adaptive and sustainable supply chain reconfiguration. Consistent with prior studies emphasizing resilience, agility, and sustainability in turbulent environments, this research extends existing literature by empirically demonstrating that these dimensions are most effective when conceptualized and deployed as an integrated system rather than as isolated capabilities [2], [3], [4], [17], [18]. In doing so, the study responds to recent call in supply chain management literature to move beyond resilience-dominant perspectives toward more holistic and adaptive frameworks capable of addressing prolonged and systemic disruptions.

A key contribution of this study lies in revealing how the relative importance of SCV dimensions shift across disruption phases. Before disruption, resilience plays a critical role in supporting operational continuity, aligning with earlier resarch that highlights redudancy, buffer capacity, and preparedness as mechanisms for absorbing shocks [12], [16], [25]. However, post-disruptions conditions demand a different strategic emphasis. The results show that agility emerges as the most influential driver of reconfiguration across both developed and developing countries. This finding reinforces prior arguments that agility-manifested through rapid decision-making, process flexibility, and speed of response-is essential for reconfiguring supply chain under volatile demand and shortened product life cycles, which are characteristic of the FMCG sector. From a practical standpoint, this suggests that managers should prioritize investments in flexible processes, real-time information sharing, and cross-functional coordination to enable faster reconfiguration when disruption occurs.

The increasing importance of sustainability in the post disruption phase further enriches existing theory and practices. While sustainability has traditionally been framed as a compliance-driven or normative concern [7], [8], [45], the findings of this study indicate that it has evolved into a strategic capability that supports long-term operational continuity and adaptive reconfiguration. FMCG firms that embed environmental and social considerations into supply chain design, such as supplier selection, logistic optimization, and packaging decisions are better positioned to respond to regulatory pressures and shifting consumer expectations afer disruption. Practically, this implies that sustainability initiatives should not be treated as peripheral programs, but rather as integral components of reconfiguration strategies that enhance both adaptability and competitiveness.

The comparative analysis provides additional explanatory depth by clarifying how institutional and structural context conditions the effectiveness of SCV dimensions. In developing countries, agility exerts a stronger influence on reconfiguration, reflecting firms' need to compensate for weaker infrastructure, limited formal systems, and higher operational uncertainty through rapid and flexible responses. In contrast, sustainability plays a more decisive role in developed countries, driven by stronger institutional pressures, stricter ESG regulations, and more mature digital ecosystems that embed sustainability into strategic decision-making. These findings help reconcile inconsistencies in prior cross-country studies and offer practical guidance for managers to tailor SCV deployment according to regional conditions rather than adopting uniform reconfiguration strategies.

An important theoretical and practical implication of this study concerns the diminishing role of resilience in post disruption reconfiguration. While resilience remains relevant for initial shock absorption, its reliance on redudancy and buffer-based strategies appears insufficient for supporting structural reconfiguration under prolonged disruptions [19], [20], [21]. This challenges earlier resilience centric views and underscores the need for a strategic shift toward more proactive, technology-enabled, and sustainability-oriented approaches embedded within the SCV framework. For practitioners, this implies that resilience mechanisms should be compelemented rather than relied upon exlusively, by agility and sustainability. Overall, the findings demonstrate that supply chain viability is not a static construct but an adaptive system in which the dominance of its dimensions evolves across disruption phases, thereby promoting sustained reconfigurability in complex and uncertain environments.

5. Conclusions

This study aims to examine supply chain viability (SCV) as a key driver of supply chain reconfiguration capacity in the FMCG sector, particularly in the context of global disruptions. By adopting an integrative

perspective based on resilience, agility, and sustainability, this study provides empirical evidence that SCV significantly enhances firms' readiness to reconfigure their supply chains in response to disruption. The findings confirm that SCV functions as a dynamic capability framework that supports adaptive and sustainable reconfiguration, while also revealing that the relative contribution of its dimensions varies across disruption phases and contextual settings. These results underscore the importance of viewing supply chain reconfiguration not merely as a reactive response, but as a strategic outcome enabled by an integrated viability-oriented approach.

The findings offer important managerial and theoretical implications. From a managerial perspective, FMCG firms are encouraged to embed SCV within their core supply chain strategies by prioritizing adaptation speed, process flexibility, and operational sustainability. Managers should reorient resilience strategies from passive, buffer-based mechanisms toward more proactive approaches supported by digital technologies and employee-driven initiatives. Sustainability should be treated not only as an external compliance requirement but also as a strategic capability that enhances agility and long-term reconfiguration value. Theoretically, this study contributes to literature by reinforcing SCV as an evolving integrative construct and by encouraging its further alignment with dynamic capabilities theory and viable systems thinking, particularly in explaining adaptive supply chain behaviour under prolonged and systemic disruptions.

Dspite its contributions, this study has several limitations that open avenues for future research. Cross-sectional and quantitative design limits the ability to capture the dynamic evolution of SCV dimensions over time, while the reliance on retrospective assessments may introduce respondent memory bias when comparing pre- and post- disruption conditions. In addition, this study does not incorporate potential SCV drivers, such as digital transformation or internal entrepreneurship, that may strengthen or mediate the relationship between SCV and reconfiguration. The broad country classification may also limit contextual specificity. Future research is therefore encouraged to adopt longitudinal or mixed method designs, refine regional classifications to capture more granular institutional and cultural contexts, and integrate additional driving variables. Employing predictive approaches such as Q^2 predict and CVPAT, as well as comparing alternatives analytical frameworks, may further enhance the robustness and generalizability of SCV research.

CRediT author statement

Sherlywati: conceptualization, methodology development, formal data analysis, and original manuscript writing. **Eliot Simangunsong, Fathony Rahman, Hesti Maheswari**: writing-review, research validation, and overall process supervision

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Data availability statement

The authors confirm that the data supporting the results of this study can be found in the article or accompanying supplementary materials.

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