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Why do resilient supply chains not always perform better? Evidence from Lebanese SMEs in a crisis-affected emerging economy

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Abstract: Despite its prominence in supply chain management research, supply chain resilience does not consistently deliver the performance benefits it is often assumed to generate. This study challenges the prevailing assumption that resilience is inherently performance-enhancing by empirically examining the conditions under which resilience contributes to organizational outcomes. Drawing on Dynamic Capabilities Theory and survey data from small and medium-sized enterprises (SMEs) operating in a crisis-affected emerging economy, the study investigates the interrelationships among supply chain resilience, sustainability, and performance. Using structural equation modeling (SEM), the findings reveal that resilience alone does not improve firm performance. Instead, its performance effects materialize only when resilience is deliberately translated into sustainability-oriented practices encompassing economic, environmental, and social dimensions. Supply chain sustainability is found to fully mediate the resilience–performance relationship, providing empirical evidence of a resilience–performance paradox. By reconceptualizing sustainability as a value-conversion mechanism rather than a complementary outcome, this study advances resilience theory beyond adaptive capacity and clarifies why resilience investments may fail to yield returns in volatile contexts. The findings offer critical insights for both scholars and practitioners by demonstrating that resilience without strategic sustainability integration risks becoming a costly capability rather than a source of sustained performance advantage, particularly for resource-constrained firms operating under persistent disruption.

Keywords: *Chronic crisis, Small and medium-sized enterprises, Structural equation modeling, Supply chain performance, Supply chain resilience, Supply chain sustainability.*

1. Introduction

With the escalating disruptions that organizations are encountering worldwide – whether financial collapses, geopolitical turbulences, or pandemics – supply chain resilience has gained attention as a critical capability enabling organizations' endurance, adaptation, and recovery in disruptive contexts [1-3]. It has become a key focus in supply chain management research, especially in volatile, uncertain environments.

Yet, upon performing a comprehensive review of the literature, it has been noted that the connection between supply chain resilience and performance is still unclear – where some researchers like Wieland and Wallenburg [2] and Chowdhury and Quaddus [4] confirm that resilience results in positive performance outcomes, while other studies contradict these findings, demonstrating statistically weak insignificant correlations between these two constructs [5, 6]. With these discrepancies, a critical underexplored question arises: Why does supply chain resilience not consistently translate into positive performance outcomes?

These empirical contradictions reflect a performance paradox whereby resilience, according to Ivanov and Dolgui [7], has proven from a dynamic capabilities standpoint its crucial role in enhancing

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the organization's capacity to adapt and maintain its business continuity in disruptive times; yet, it's still insufficient as it does not necessarily yield improved performance outcomes such as economic gains or strategic values. As such, resilience should be further examined beyond its adaptive property to discover the mechanisms through which it contributes to the organization's performance goals.

In this context, supply chain sustainability serves as a pivotal mechanism through which resilience capabilities are translated into concrete performance benefits. In reference to Elkington [8] and Carter and Rogers [9], findings confirmed that sustainability practices, which integrate and prioritize environmental and social responsibility as well as financial viability, enable organizations to transform adaptive capabilities into long-term value creation. Although a large body of literature has shed light on the synergy between resilience and sustainability, demonstrating that resilient supply chains are more capable of implementing sustainability initiatives, while investments in sustainability can, in turn, strengthen adaptive capacity [3, 10], studies that investigate the mediating role of sustainability between resilience and performance are still scarce.

This gap is remarkably evident in research studying small and medium-sized enterprises (SMEs) operating in emerging economies. According to the research conducted by Gunasekaran et al. [11] and Chowdhury and Quaddus [4] SMEs encounter frequently severe financial, institutional, and infrastructural constraints which hinder their ability to convert resilience into tangible performance gains; in addition to the fact that most studies - one of which is Ivanov [12] - investigating the relationship between resilience and performance were conducted in relatively stable or developed economic contexts, limiting its applicability to contexts characterized by prolonged disruptions and crises [12].

In order to address this gap, the current study examines the mediating role of supply chain sustainability in the relationship between supply chain resilience and performance, based on empirical data from SMEs operating in a crisis-affected emerging economy, aiming to explore the resilience-performance paradox and to explain the conditions under which resilience contributes to performance enhancement.

This paper offers three major contributions: 1) it advances supply chain resilience theory by empirically proving that resilience does not directly enhance performance but rather operates through sustainability-oriented practices; 2) it conceptualizes supply chain sustainability as a value-transformation mechanism; 3) it adds value to the literature by providing evidence from an emerging economy experiencing stringent disruptions; and finally, 4) it offers actionable insights and guidance for business leaders whose strategy is to transform disruption absorption into sustained performance outcomes.

2. Theoretical Background and Literature Review

2.1. Theoretical Foundation: Dynamic Capabilities Perspective

Originally developed by Teece et al. [13], Dynamic Capabilities Theory (DCT) provides a robust theoretical foundation for examining how supply chain resilience evolves into sustainability-oriented practices and performance outcomes. It extends the Resource-Based View by emphasizing organizations' abilities to sense environmental changes, seize opportunities, and transform resource configurations in volatile, disruptive contexts [14].

As resilience embodies the organization's capability to sense and adapt to disruptions in unpredictable, unstable, and turbulent environments, DCT argues that adaptive capacities are not sufficient alone without the help of value-creating transformation mechanisms represented by sustainability-adopted approaches, which in turn support organizations in reconfiguring their resources toward long-term economic viability, environmental sustainability, and social responsibility [9, 15].

Supply chain resilience, from a dynamic capabilities' perspective [14], allows organizations to respond, absorb, and adapt to disruptions while maintaining their business operations; and, hand in hand, supply chain sustainability facilitates transforming adaptive responses into structured, long-term

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practices and approaches that yield positive, improved performance. This theoretical rationale supports studying the mediating role of supply chain sustainability between resilience and performance.

2.2. Conceptualization of Core Constructs

2.2.1. Supply Chain Resilience

As earlier studies defined supply chain resilience as the organization's ability to anticipate, absorb, adapt to, and recover from disruptions while maintaining business continuity [16, 17] research has then advanced this conceptualized definition to emphasize proactive anticipation, responsiveness, and adaptive learning as demonstrated by Ponomarov and Holcomb [1] and Pettit et al. [18] more recently research highlight resilience as a dynamic and transformative capability, rather than a static recovery mechanism. As an example, Wieland and Durach [19] demonstrate that adaptation alone without transformation constraints provides long-term benefits. Likewise, studies conducted by Ivanov and Dolgui [7] argue that digital technologies enable predictive modeling and rapid response, reinforcing resilience through data-driven decision-making. Currently, research focus spans around the relationship between resilience and sustainability, and this emphasis is supported by recent studies like Negri et al. [20] and Rahman et al. [21], who demonstrate the significance of supply chain sustainability practices in reinforcing resilience via enhancing resource efficiency and maintaining environmental and social responsibilities during disturbing conditions.

2.2.2. Supply Chain Sustainability

According to Carter and Rogers [9] supply chain sustainability is conceptualized as the integration of economic, environmental, and social initiatives across all supply chain operations to achieve long-term value creation; this conceptualization aligns with the triple bottom line framework advanced by Elkington [15] which argues that organizations should evaluate performance beyond financial indicators and incorporate social responsibility and environmental stewardship as crucial performance dimensions.

Subsequent studies have enriched sustainability definitions to encompass governance mechanisms, risk management strategies, and dynamic capabilities. According to Pagell and Wu [22], sustainability is conceptualized as a decision-making logic incorporated across supply chain operations, while Chowdhury and Quaddus [4] highlight the essential role of adaptive abilities and governance mechanisms in managing sustainability challenges and risks. Recent contributions by Dubey et al. [23] and Sarkis et al. [24] have advanced research and extended these insights by integrating digitalization and circular economy approaches into sustainability frameworks, demonstrating how resource reconfiguration, waste reduction, and transparency improve sustainability and performance.

2.2.3. Supply Chain Performance

Supply chain performance measures the effectiveness of how supply chain activities achieve efficiency, responsiveness, and long-term competitiveness. While conventional definitions prioritize cost efficiency, delivery reliability, and customer satisfaction [25, 26], contemporary scholars like Govindan et al. [27] and Zhu and Wu [28] advance a performance construct to encompass adaptability and sustainability-based outcomes.

Recently, research highlights that enhanced performance now relies heavily on the organization's ability to maintain its business operations amid disruptions while advancing sustainability agendas and targets, as sustainable supply chain practices – based on studies advanced by Yang et al. [29] and Govindan et al. [27] – demonstrate positive impacts on operational productivity, stakeholder trust, and financial outcomes.

2.3. Hypothesis Development

2.3.1. Supply Chain Resilience and Supply Chain Sustainability

Research demonstrates the importance of resilience capabilities that empower organizations to adopt and embed sustainability practices and initiatives within their supply chains, confirming that

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resilient supply chains are highly capable of maintaining environmental and social initiatives in turbulent times through strategic resource reallocation, waste reduction, and operational continuity [12, 30].

It's evident in the literature, like studies advanced by Bag et al. [31], Govindan et al. [32] and Cui et al. [33], that there is a positive relationship between resilience and sustainability across various industries and crisis contexts, demonstrating that resilience serves as an enabling capability that facilitates the adoption and implementation of sustainability initiatives in disrupting conditions.

H_1: Supply chain resilience has a significant positive impact on supply chain sustainability.

2.3.2. Supply Chain Sustainability and Supply Chain Performance

An extant body of literature - as demonstrated by studies advanced by Zhu and Sarkis [34], Vachon and Klassen [35], and Govindan et al. [27] - confirms that organizations adopting sustainability-driven initiatives experience enhanced performance across their supply chains, reflected in increased operational efficiency, minimized costs, improved organizational reputation, and sustained financial results. Recent research further confirms the positive impact of sustainability on performance by enabling operational consistency and continuity during crises, which reinforces stakeholders' trust and confidence [28, 29].

H_2: Supply chain sustainability has a significant positive impact on supply chain performance.

2.3.3. The Mediating Role of Supply Chain Sustainability

Contemporary research provides empirical evidence on the indirect effect of resilience on performance, whereby resilience impacts performance through sustainability-oriented initiatives and mechanisms; this is extensively supported by the empirical analysis of Zhu and Wu [28], who demonstrate the indirect relationship and influence of resilience on performance that is fully mediated by sustainability initiatives. Similarly, Negri et al. [20] and Dubey et al. [36] reinforce this argument, identifying sustainability as the crucial pathway or mechanism through which resilience capabilities yield organizational long-term value. These mediation-related findings resonate with the Dynamic Capabilities Theory, which argues that adaptive capabilities must undergo transformation into structured, formalized practices to result in performance benefits [14]; within this theoretical framework, sustainability functions as the mediating mechanism that transforms resilience into sustained performance gains.

H_3: Supply chain sustainability mediates the relationship between supply chain resilience and supply chain performance.

3. Materials and Methods

3.1. Research Design and Context

A quantitative, cross-sectional research design was employed in this study to investigate the relationships among supply chain resilience, supply chain sustainability, and supply chain performance within Lebanese small and medium-sized enterprises (SMEs). Since the aim is testing theoretically grounded relationships from existing literature rather than establishing new theory, a deductive research approach was adopted [37], following a positivist epistemological stance, emphasizing systematic data collection and statistical hypothesis testing [38].

Lebanon was deliberately selected given its relevant context characterized by persistent disruptions and crisis conditions, whereby SMEs constitute the unit of analysis, considering their significant role in Lebanese supply chains as they account for around 95% of Lebanon's officially registered businesses, as well as their increased vulnerability to the country's instability.

3.2. Measurement Instrument

Data were collected using a structured questionnaire measured on a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The original survey instrument comprised 60 items

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measuring six latent constructs as part of a broader research project: supply chain collaboration, supply chain governance, supply chain risk management, supply chain resilience, supply chain sustainability, and supply chain performance. All measurement items were adapted from validated scales in prior studies: supply chain collaboration [39], supply chain governance [40], supply chain risk management [41], supply chain resilience [21], supply chain sustainability [42], and supply chain performance [28].

While the broader research project examined all six constructs, this article reports results for a theoretically defined sub-model focusing specifically on supply chain resilience, supply chain sustainability, and supply chain performance.

3.3. Population and Sample

The target sample included SMEs operating across Lebanon's diverse industry sectors, noting that SMEs were identified as enterprises employing between 10 and 250 employees, in line with the European Commission's classification adapted to the Lebanese context. The sampling frame was established in collaboration with Elka Lebanon S.A.R.L, a professional research consultancy firm, which granted access to authenticated business databases from multiple official registries.

The study utilized a stratified purposive sampling strategy with proportionate allocation to ensure adequate representation across geographic regions, enterprise sizes, and industry sectors; the sample targeted key individuals who are experts in the field of supply chain, occupying senior positions with decision-making roles like general managers, supply chain managers, operations managers, procurement managers, or business owners.

3.4. Data Collection

Survey invitations were disseminated electronically to 800 potential participants, accompanied by systematic telephone follow-up communications. Following comprehensive data screening, 200 valid responses were deemed suitable for analysis, resulting in an effective response rate of approximately 25%, consistent with response rates reported in comparable survey-based studies within Middle Eastern contexts [43].

3.5. Data Analysis

Data Screening and Preparation. Before performing model estimation, the dataset was checked for missing values, distributional normality, and multicollinearity – whereby missing values were addressed using mean substitution on the condition that they account for less than 10% of the dataset; normality was evaluated according to Hair et al. [44] using skewness and kurtosis statistics with acceptable thresholds of values between −2 and +2 for skewness and between −7 and +7 for kurtosis; and, in order to improve indicator distinctiveness and support model stability, multicollinearity was evaluated using variance inflation factors (VIF), with indicators exceeding the conservative threshold of VIF > 3 identified for potential removal.

Measurement Model Evaluation. Utilizing Confirmatory Factor Analysis (CFA) in AMOS 26, the measurement model was assessed, after which model refinement was conducted through a theory-driven iterative process, which included: 1) eliminating indicators with standardized factor loadings below 0.50, 2) reviewing modification indices to identify theoretically justifiable correlated error terms, and 3) examining standardized residual covariances. All refinements were implemented incrementally, supported by both statistical evidence and theoretical considerations. In reference to thresholds established by Hair et al. [44], the model fit was assessed using multiple indices, including chi-square to degrees of freedom ratio (CMIN/DF), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR).

Reliability and Validity Assessment. Using Cronbach's alpha and composite reliability (CR), the internal consistency reliability was evaluated, applying a minimum acceptable threshold of 0.70.

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Convergent validity was evaluated by examining factor loadings with a cutoff of 0.50, along with the average variance extracted with a threshold of 0.50. Discriminant validity was assessed using the Fornell-Larcker criterion, whereby the square root of each construct's AVE should exceed its correlations with other constructs.

Structural Model and Hypothesis Testing. After validating the measurement model, the structural model was estimated using structural equation modeling (SEM) with maximum likelihood estimation in AMOS 26. Both direct and indirect paths were estimated to test the proposed hypotheses. The significance of effects was evaluated using bootstrapping with 2,000 resamples and bias-corrected 95% confidence intervals; this analytical approach - based on the mediation analysis guidelines of Baron and Kenny [45] and Zhao et al. [46] - facilitated the evaluation of the mediation effects and the differentiation between full and partial mediation effects.

3.6. Ethical Considerations

The study was conducted based on established ethical standards and Institutional Review Board (IRB) principles governing research involving human participants, where respondents' participation was voluntary and informed consent was secured from all participants prior to data collection. Anonymity and confidentiality were assured, and no identifying personal data was collected. The collected data were used exclusively for scholarly research purposes, and it was managed in compliance with institutional ethical guidelines.

4. Results

4.1. Sample Characteristics

The foundation of this study is based on survey data collected from 200 small and medium-sized enterprises (SMEs) operating under economic instability and disruptive conditions, distributed across various sectors and regions in Lebanon, as depicted in Table 1, which presents the sample composition and illustrates the distribution of participating SMEs by size, sector, and geographic areas.

Table 1.
Sample Characteristics.

Characteristic	Category	Frequency	Percent (%)
Geographic Region			
	Beirut	50	25.0
	Bekaa	42	21.0
	Mount Lebanon	73	36.5
	North Lebanon	14	7.0
	South Lebanon	21	10.5
Respondent Gender			
	Female	44	22.0
	Male	156	78.0
Industry Type			
	Agri-industry	38	19.0
	Construction	22	11.0
	Food & Beverage	31	15.5
	Retail	41	20.5
	Services	31	15.5
	Trade	37	18.5
Enterprise Size			
	Micro (10-49 employees)	110	55.0
	Small (50-99 employees)	70	35.0
	Medium (100-250 employees)	20	10.0

In reference to section 3.5 (*Data Screening and Preparation*), data screening identified 213 missing values, accounting for less than 10% of the dataset, which were replaced using mean substitution.

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Multicollinearity diagnostics showed VIF values from 1.366 to 6.596, with seven indicators exceeding VIF > 3, which were eliminated to improve model stability.

4.2. Descriptive Statistics and Correlations

As depicted in Table 2, the mean results ranged from 3.61 to 3.93, representing moderate to moderately high levels across all constructs; and standard deviations ranged from 0.81 to 0.96, indicating acceptable variability across responses while showing heterogeneity in supply chain capabilities among participating SMEs.

Table 2.
Constructs Descriptive Statistics.

Construct	Mean	SD	Minimum	Maximum
Supply Chain Resilience	3.76	0.81	1.0	5.0
Supply Chain Sustainability	3.61	0.96	1.0	5.0
Supply Chain Performance	3.93	0.82	1.0	5.0

As depicted in Table 3, results demonstrate: a significant positive correlation between supply chain resilience and sustainability ($r = 0.73$, $p < .01$); a positive correlation between supply chain resilience and performance ($r = 0.54$, $p < .01$), and a significant correlation between supply chain sustainability and performance ($r = 0.63$, $p < .01$) – all of which are below 0.85 indicating adequate construct distinctiveness in reference to Kline [47].

Table 3.
Correlation Matrix.

Variable	1	2	3
1. Supply Chain Resilience	1.00		
2. Supply Chain Sustainability	0.73**	1.00	
3. Supply Chain Performance	0.54**	0.63**	1.00

4.3. Measurement Model Assessment

The original measurement model, initially comprising 60 items, was refined through theory-guided CFA. After multicollinearity screening, reducing to 53 items, iterative refinement removed indicators with loadings below 0.50 and examined modification indices for theoretically justifiable adjustments. The final model included 41 indicators across six constructs, with 22 indicators for the three focal constructs examined in this article: 7 for resilience, 10 for sustainability, and 5 for performance.

The refined measurement model demonstrated acceptable fit (Table 4A): $\chi^2/df = 1.865$, CFI = 0.842, TLI = 0.826, RMSEA = 0.066, SRMR = 0.065. While CFI and TLI fell below the ideal 0.90 threshold, they were considered acceptable given the complexity of models and the exploratory context [44].

Table 4.
Model Fit Indices.

Fit Index	Recommended Value	Measurement Model	Structural Model	Interpretation	Reference
χ^2/df	< 3.0	1.865	1.929	Good fit	Kline [47]
CFI	≥ 0.90	0.842	0.83	Acceptable	Hair et al. [44]
TLI	≥ 0.90	0.826	0.81	Acceptable	Hair et al. [44]
RMSEA	0.05–0.08	0.066	0.068	Acceptable	Browne et al. [48]
SRMR	< 0.08	0.065	0.071	Good fit	Hu and Bentler [49]

Note: Both models show an acceptable to good fit across all indices where χ^2/df ratios are well below 3.0, RMSEA values range between 0.05-0.08, and SRMR values are below 0.08. Although CFI and TLI are below the ideal 0.90 threshold, they are considered acceptable given model complexity and the exploratory context [44].

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Model Explanatory Power (Structural Model): Supply Chain Sustainability $R^2 = 0.745$ (74.5% variance explained); Supply Chain Performance $R^2 = 0.352$ (35.2% variance explained).

As depicted in Table 5, reliability and validity evaluations confirmed satisfactory internal consistency with all Cronbach's alpha and composite reliability values exceeding 0.70; and all factor loadings surpassed 0.50 (ranging from 0.544 to 0.824) with AVE values ranging from 0.39 to 0.52. Although supply chain sustainability had an AVE of 0.39, which is slightly below 0.50, it was retained given the strong CR with value 0.863 and taking into consideration the theoretical importance [50].

Table 5.
Reliability and Convergent Validity.

Construct	Items	Cronbach's α	CR	AVE	Factor Loading Range
Supply Chain Resilience	7	0.879	0.883	0.521	0.651–0.824
Supply Chain Sustainability	10	0.863	0.863	0.388	0.544–0.692
Supply Chain Performance	5	0.770	0.782	0.418	0.594–0.691

Note: All values meet the recommended thresholds ($\alpha > 0.70$, CR > 0.70, AVE ≥ 0.50).

Based on Fornell and Larcker [50], the discriminant validity was evaluated (√AVE: Resilience = 0.722; Sustainability = 0.623; Performance = 0.647). Resilience-sustainability (r = 0.73) and sustainability-performance (r = 0.63) pairs showed borderline overlap; however, this is theoretically justified and acceptable, taking into consideration their conceptual proximity, and as demonstrated by Kline [47], all correlations less than 0.85 confirm that the constructs are distinct despite being related.

4.4. Structural Model and Hypothesis Testing

Using SEM, the structural model was estimated with maximum likelihood estimation and bootstrapping (2,000 resamples, 95% bias-corrected confidence intervals) for mediation testing. The model fit was satisfactory as depicted in Table 4 and Figure 1: $\chi^2/df = 1.929$, CFI = 0.83, TLI = 0.81, RMSEA = 0.068, SRMR = 0.071. The model explained 74.5% variance in sustainability ($R^2 = 0.745$) and 35.2% in performance ($R^2 = 0.352$), demonstrating substantial explanatory power.

Figure 1 depicts the structural model, which shows three constructs with standardized path coefficients. The path from Resilience to Sustainability shows $\beta = 0.863^{***}$ ($p < .001$), indicating a very strong positive effect. The path from Sustainability to Performance shows $\beta = 0.349^{***}$ ($p < .001$). The direct path from Resilience to Performance is non-significant ($\beta = 0.067$, $p = .303$), while the indirect effect through Sustainability is significant ($\beta = 0.301^{**}$, 95% CI [0.168, 0.456]). R^2 values indicate that 74.5% of the variance in sustainability and 35.2% of the variance in performance are explained. *** $p < .001$; ** $p < .01$; ns = not significant.

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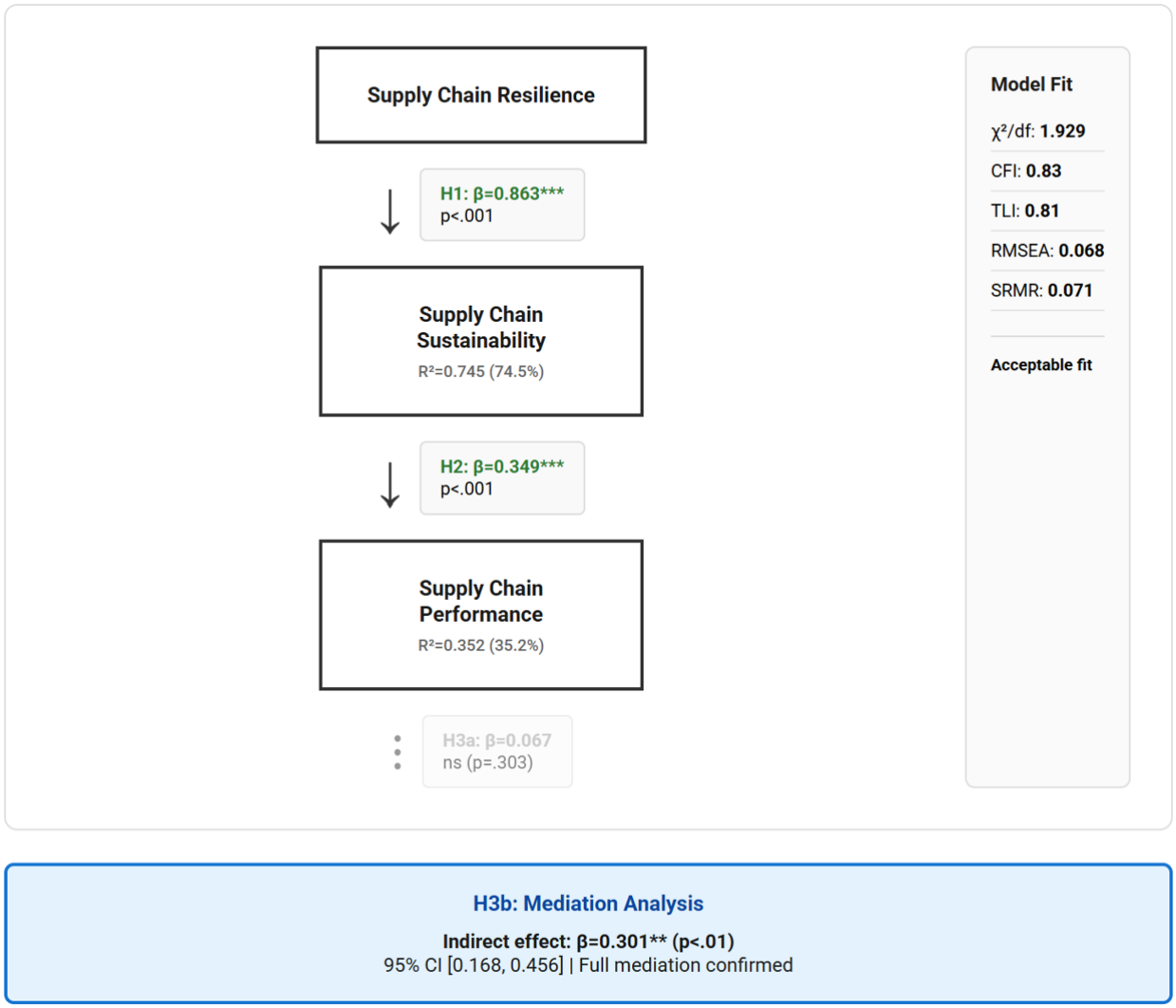

Figure 1.
Structural Model.

Direct Effects. The hypothesis testing results depicted in Table show demonstrate that: 1) supply chain resilience positively and significantly impacted sustainability ($\beta = 0.863$, $p < .001$) – which strongly supports H1, signifying that resilient SMEs are significantly more capable of preserving sustainability practices during crises; 2) supply chain sustainability impacted performance significantly ($\beta = 0.349$, $p < .001$) - which supports H2, confirming that sustainability practices contribute to enhanced performance outcomes in disrupting conditions.

Yet, the direct relationship between supply chain resilience and performance was non-significant ($\beta = 0.067$, $p = .303$), indicating that resilience alone does not directly improve performance - providing evidence of a resilience-performance paradox and suggesting an indirect pathway that operates through sustainability.

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Table 6.
Direct Effects and Hypothesis Testing.

Hypothesis	Structural Path	β	S.E.	C.R.	95% CI	p-value	Decision
H1	Resilience → Sustainability	0.863***	0.045	19.330	[0.763, 0.970]	< 0.001	Supported
H2	Sustainability → Performance	0.349***	0.071	4.936	[0.203, 0.509]	< 0.001	Supported
H3a	Resilience → Performance	0.067	0.065	1.029	[-0.098, 0.215]	0.303	Not supported

Note: β = Standardized path coefficient; S.E. = Standard error; C.R. = Critical ratio; *** p < .001.

Mediation Analysis. As depicted in Table 7, the indirect effect of supply chain resilience on performance through sustainability was positive and significant (β = 0.301, 95% CI [0.168, 0.456], p < .01). Combined with the non-significant direct effect, this confirms full mediation and supports H3b where supply chain sustainability fully mediates the resilience-performance relationship, indicating that resilience influences performance exclusively through sustainability practices.

Table 7.
Mediation Analysis.

Hypothesis	Indirect Path	β (Indirect)	S.E.	95% CI	Mediation Type
H3b	Resilience → Sustainability → Performance	0.301**	0.068	[0.168, 0.456]	Full Mediation

Note: Indirect effect estimated using bootstrapping (2,000 resamples, bias-corrected 95% CI); ** p < .01.

Among the four test hypotheses, it's evident that three were supported, out of which the effect of supply chain resilience on sustainability was the strongest (β = 0.863), followed by the indirect effect of supply chain resilience on performance through sustainability (β = 0.301), and the direct relationship between supply chain sustainability and performance (β = 0.349). In contrast, the direct relationship between supply chain resilience and performance was not statistically significant (β = 0.067). Combined with the significant indirect effect between them provide strong evidence that sustainability works as the critical value-conversion mechanism through which resilience capabilities transform into performance outcomes during crisis.

5. Discussion

The results enrich the theoretical knowledge and offer insights into the interconnectedness between resilience and performance in supply chains, highlighting the indirect causal effect of resilience on performance and demonstrating how this relationship is mediated through sustainability mechanisms – whereby resilience in supply chains yields tangible performance outcomes not directly but rather by upholding environmentally and socially responsible commitments and initiatives during turbulent conditions. This serves as empirical evidence of the resilience-performance paradox in supply chain contexts, where resilience capabilities are proven to be necessary yet insufficient alone for enhancing performance; and this is where the value of the conversion role of sustainability mechanisms comes to transform resilience into performance benefits. Such a finding – whereby the adaptive capability resilience, that's a critical enabler for an organization's success, fails to directly enhance performance – presents an underlying puzzle in the field of supply chain management that this paper aims to resolve.

5.1. The Resilience–Performance Paradox Explained

According to the findings, supply chain resilience is found to have a significant impact on sustainability practices (β = 0.863, p < .001) with no direct relationship with performance (β = 0.067, p = .303). However, resilience operates entirely through the mediating role of sustainability mechanism (indirect effect: β = 0.301, p < .01) demonstrating full mediation. With the absence of a direct relationship between resilience and performance - which in turn challenges the conventional predictions of practitioners regarding capability investments - a critical gap between capability development and value realization arises uncovering a worth noting resilience-performance paradox.

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Aligned with Ambulkar et al. [5], Scholten et al. [6], Chowdhury and Quaddus [4] research, this study demonstrates the inconclusive, mixed impact of resilience on performance, whereby resilience is proven to improve organizations' capability to endure, adapt, and recover from shocks to maintain business continuity; yet it doesn't directly result in enhanced performance outcomes. From a theoretical standpoint, these results reveal the key role of resilience as an adaptive, protective capability, not as a direct, superior performance transformer [2, 7], a paradox reflecting the difference between adaptive capabilities and value transformation mechanisms. This is apparent in prolonged, turbulent contexts during crises, where organizations utilize resilience capabilities and efforts to maintain operations, alleviate losses, and avoid catastrophic failures rather than generating returns or gains, as survival is prioritized over business growth.

5.2. Sustainability Functioning as a Value-Conversion Mechanism

Recognizing supply chain sustainability as the mediating value-transformation mechanism through which resilience generates performance outcomes is a key contribution of this study. The strong positive relationship between resilience and sustainability indicates that resilient supply chains are better equipped to implement sustainability-oriented practices, as demonstrated by prior research highlighting the complementary nature of resilience and sustainability [3, 10].

Furthermore, the positive impact of sustainability on performance re-emphasizes the existing empirical evidence that sustainability initiatives can enhance efficiency and long-term value creation [8, 9]. By embedding resilience within sustainability practices, organizations can convert adaptive responses into economically tangible performance outcomes, a finding that empirically extends prior conceptual assumptions suggesting that sustainability-oriented investments provide a pathway for translating resilience capabilities into sustained performance advantages [4, 51].

5.3. Explaining the Full Mediation Effect

The full mediation of supply chain sustainability between resilience and performance offers solid empirical evidence on the resilience–performance paradox and confirms alignment with contemporary research, which highlights the insufficient role of resilience solely in yielding performance outcomes unless it is institutionalized through sustainability practices that increase operational efficiency, strengthen stakeholder relationships, and ensure business longevity [12, 52]. From a dynamic capabilities perspective, resilience allows organizations to sense and respond to disruptions, and this is where sustainability initiatives are needed to reconfigure resources that, in turn, contribute to value creation [14].

As such, putting resilient efforts without simultaneously investing in sustainability initiatives builds capabilities that remain inefficient in yielding performance gains. Similarly, upholding sustainability commitments without sufficient resilience builds fragile grounds that collapse during crises. Thus, the joint integration of resilience as the underlying capability and sustainability as the mechanism of value transformation completes the causal chain from capacity to realized performance.

5.4. Lebanese SMEs in Chronic Crisis – Where Context Matters

The Lebanese context, within which the study has been conducted, offers valuable insights into the resilience-performance paradox in various ways that stable environments conceal. Lebanese SMEs operating in emerging economies encountered severe conditions characterized by prolonged instability and turbulence, such as currency devaluation, energy shortages, and political conflicts, which necessitated resilience capabilities for survival while revealing why resilience alone proves insufficient.

Investing in resilience in emerging economies facing prolonged disruptions consumes resources without yielding profit or gains, as organizations during these turbulent conditions function in survival mode rather than a growth mindset [11], tending to diversify their supplier base, build inventory buffers, and invest in flexible capacity, which in turn increases costs and decreases short-term efficiency. Sustainability practices address this issue by translating resilience investments from costs into revenue-

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generating capabilities. For example, Lebanese SMEs that incorporated resilience within sustainability frameworks transformed crisis-necessitated supplier diversification into ethical sourcing programs imposing premium pricing, converted inventory buffers into circular economy initiatives reducing waste costs, and leveraged flexible production for customized, environmentally responsible products that offered them a competitive advantage. Embedding resilience investments within a sustainability orientation enabled organizations to transform resilience costs into sustainability benefits, realizing performance gains that resilience alone could not attain. This insight is applicable to any context characterized by chronic turbulence, including climate change, geopolitical instability, pandemics, or technological disruptions, where embedding resilience and sustainability becomes a necessity for transforming survival capabilities into competitive advantages.

6. Conclusion and Limitations

By providing empirical evidence from an emerging economy, this study extends the largely developed-economy emphasis of earlier resilience research [7]. The results highlight the significance of context in shaping the resilience-performance relationship and emphasize the importance of sustainability as a strategic enabler in chronically volatile, uncertain, and turbulent environments.

This study provides actionable managerial implications for practitioners. First, managers should realize that investing in resilience alone is unlikely to yield immediate performance improvements or gains – a recommendation that aligns with prior scholarship [6] that advocates a shift beyond narrowly framed resilience-building strategies. Instead, resilience initiatives should be deliberately aligned with sustainability objectives to ensure that adaptive capabilities contribute to long-term value creation. Second, sustainability should be viewed as a strategic investment rather than a compliance obligation, particularly in crisis-prone contexts. Prior studies suggest that sustainability practices enhance operational efficiency and reputational capital, which in turn support performance [8, 9]. By integrating resilience and sustainability, managers can shift from reactive disruption management to proactive performance enhancement.

However, the study has three main limitations. First, the cross-sectional design constrains causal inference and limits understanding of how the relationship between resilience and sustainability evolves over time; future studies employing longitudinal designs would allow stronger temporal insights. Second, although rigorous measurement validation procedures were implemented, the use of self-reported perceptual measures may raise concerns regarding common method bias. Future research could triangulate survey data with objective performance indicators or archival data. Third, the empirical focus on Lebanese SMEs under prolonged crisis may limit generalizability to large firms or stable economies, despite the fact that the specificity of this context offers valuable insights into organizational behavior under extreme uncertainty.

Many promising directions for future research are worth investigating. First, future studies may examine additional mediating or moderating mechanisms such as digitalization, innovation capability, or organizational learning to gain a deeper understanding of the conditions under which resilience contributes to performance. Second, comparative studies across diverse institutional and economic settings could help identify boundary conditions of the proposed mechanism. Finally, decomposing sustainability into its economic, environmental, and social dimensions may provide finer-grained insights into which practices most effectively enable transforming resilience capabilities into performance outcomes.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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