

Exploring the Role of Supply Chain Leadership and Interorganizational Citizenship Behavior in Cultivating Supply Chain Security

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ABSTRACT

This paper tests the effect of supply chain leadership on security perceptions by explicitly considering how leadership characteristics directly and indirectly influence this relationship. Data obtained from 102 supply chain affiliates was analyzed using partial least squares path modeling. A mediated model where supply chain leadership has an indirect effect on supply chain security perceptions via supply chain citizenship behavior is tested. Results offer insight into the paths in which leadership can affect security perceptions and how these perceptions can be reinforced through citizenship behaviors. While supply chain leadership is necessary to enhance security perceptions in supply chains, interorganizational citizenship behaviors absorb part of the effect from leadership and contribute through a path that influences perceptions of security. Collaborative supply chain relationships, guided by transformational leadership actions that inspire citizenship behaviors amongst followers, can cultivate a more vigilant security climate that is better positioned to advance security practices and performance.

Keywords: *supply chain leadership, supply chain security, supply chain citizenship behavior, interorganizational citizenship behavior, security climate, collaboration*

1. INTRODUCTION

Countless firms and their immediate supply chain partners are encountering a barrage of complex challenges. Escalating risks stemming from geopolitical incidents, such as war, pandemics, trade conflicts, terrorist attacks, data breaches, and natural disasters, that threaten security, profitability, and sustainability of supply chains are on the rise globally (Kim, 2025; Moradlou et al., 2021; Tong et al., 2022). Security failures can disrupt supply chain networks and have adverse effects on business revenues and global economies (Ali et al., 2025; Roscoe et al., 2022). These risks test the resilience of a firm and its supply chain and often serve as the impetus for leaders to respond with new strategies that promote collaborative supply chain security and sustainability measures (Adu & Dorasamy, 2025; Goffnett & Williams, 2019; Ohmori et al., 2023; Ralston,

Richey & Grawe, 2017). Firms need leadership that invests in collaborative relationships that are capable of cultivating a security climate aimed at minimizing major risks and enhancing supply chain integration and performance (Goffnett & Williams, 2019; Gunasekaran et al., 2024; Min et al., 2005).

In challenging times, firms lean on the vision and motivation projected by leaders that aim at stimulating voluntary efforts, at both the interpersonal and interorganizational levels, to advance strategic initiatives and improve performance (Esper et al., 2015; Hult, Ketchen, & Chabowski, 2007). Leadership is critical to formulating new strategies and directing collaborative behaviors toward achieving strategic performance objectives within supply chain relationships (Azizi et al., 2025; Cao, Elking & Gu, 2023). Leadership has been shown to influence supply chain collaboration, particularly in periods of crises (Ali et al., 2025; Dubey, 2023). In recent years, leaders have had to modify their supply chain strategies in order to develop resilience capabilities that increase sustainability and security and to better respond to risks (Jia, Gong & Brown, 2019; Johnson & Haug, 2021; Prabhu & Srivastava, 2023; Roscoe et al., 2022; Shin & Park, 2021). An increasing number of studies have extended the view of leadership from the individual level to the supply chain level (Chen, Li & Zhang, 2021; Prabhu & Srivastava, 2023). However, it remains unclear whether and how transformational leadership can enable firms to develop social and collaborative behaviors capable of emphasizing supply chain security in the face of escalating risk (Kurniawan et al., 2017; Park, Min & Min, 2016; Speier et al., 2011).

Collaborative activities are receiving growing attention in supply chain research including interorganizational citizenship behavior (Cao, Elking & Gu, 2023; Esper et al., 2015; Pu, Yang & Wu, 2025) and security orientation, culture, and climate (Asamoah et al., 2022; Goffnett & Williams, 2019; Urciuoli & Hints, 2017). The interconnectedness of complex supply chains effectuates further investigation of interorganizational relationships and perceptions of risk and social activities, such as security and citizenship, in supply chains (Cao, Elking & Gu, 2023; Goffnett & Goswami, 2016; Pu, Yang & Wu, 2025; Ralston, Richey & Grawe, 2017; Williams et al., 2012). Recent studies have recommended more research of dyadic and triadic

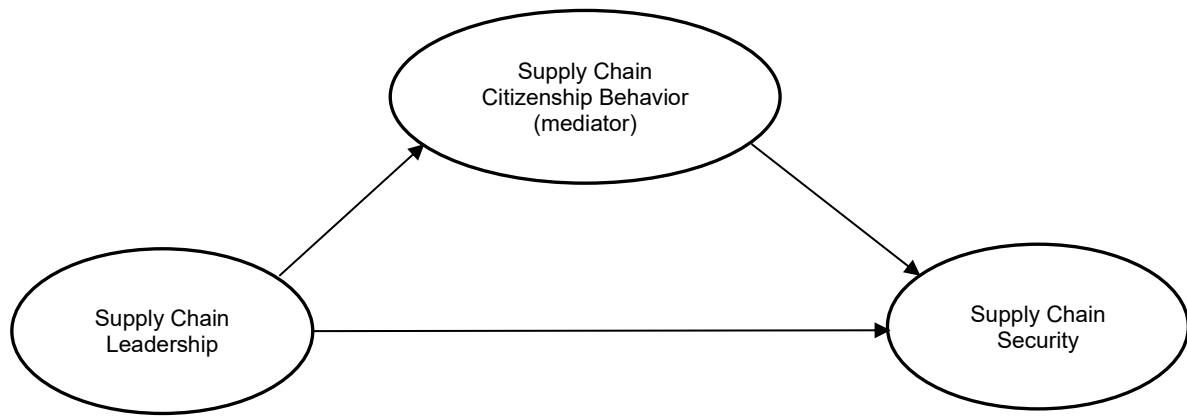


Figure 1 Conceptual Model of Association between Constructs

relationships to produce a richer assessment of supply chains (Childerhouse et al., 2013; Luo et al., 2011; Wynstra, Spring & Schoenherr, 2015). Despite growing concerns over supply chain security, some firms have placed little emphasis on it. This may be due to the fact that much of the research on supply chain security concentrates on outcomes with comparatively less focus on its antecedents (Urciuoli & Hints, 2017). Thus, this study adds to the literature by investigating the relationships between supply chain leadership, citizenship behavior, and security. The objective in this article is to explore the association between supply chain leadership and security climate in supply chain relationships through consideration of transformational leadership and its associated impact on interorganizational citizenship behavior as an explanatory mechanism in perceptions of supply chain security. A mediated model where supply chain leadership is positioned as an antecedent while having an ancillary effect on supply chain security perceptions through supply chain citizenship behavior is empirically tested that is illustrated in Figure 1.

The next section provides a brief literature review that describes the theoretical underpinnings of the hypotheses. The subsequent sections describe the methods, sample, and measures included in the study. The final sections give the results of the analyses and discuss implications, limitations, and future research.

2. LITERATURE REVIEW & HYPOTHESES DEVELOPMENT

2.1 Social Network Theory

Social network theory lays the groundwork for the present study of supply chains as it posits that network connections are both structural and relational, with the latter involving socializing, developing common goals, and sharing information between entities that result in joint actions and outcomes (Galaskiewicz, 2011; Gulati & Sytch, 2007). Social network theory continues to demonstrate relevance in supply chain management research (Carnovale, Yenyurt & Rogers, 2017). Supply chains are made of various networks of interdependent firms linked by dyadic and triadic relationships (Carter, Rogers & Choi, 2015; Kim et al., 2011). According to Ralston et al. (2023), operational interactions throughout the supply chain are driven by the actions of managers at the firm level and their social

encounters through business dealings with counterparts from other firms in the immediate supply chain relationship. An increasing number of studies in logistics and supply chain management have taken a network theoretical position in examining broader supply chain networks by looking beyond single firm assessments to a more complete supply chain dyad or triad relationship (e.g., Goffnett & Williams, 2019; Kim, 2017). Thus, this research takes a network approach in examining leadership, interorganizational citizenship behaviors and security perceptions in supply chain triad networks.

2.2 Supply Chain Leadership

Leadership plays a critical role in setting overarching goals and strategies for a firm to be successful. Leaders understand the importance of winning favor from followers and motivating them to reciprocate and willingly elevate performance. There are several leadership styles with two of the most common being transactional and transformational (Northouse, 2025). Transactional leadership is characterized by exchanges, specified roles, supervision, incentives, and consequences, whereas transformational leadership has four central characteristics: idealized influence, intellectual stimulation, individualized consideration, and inspirational motivation (Northouse, 2025). Transformational leadership advocates vision and purpose, provides a source for inspiration and motivation, and prioritizes the well-being of followers in developing them to their fullest potential (Banks et al., 2016; Bass & Avolio, 1994; Northouse, 2025). Transformational leadership is thereby a rational lens through which follower behaviors can be viewed.

Transformational leadership is a social activity from the standpoint that it involves a significant amount of communication, interaction, and collaboration (Dubey, 2023; Prabhu & Srivastava, 2023). Northouse (2025) asserts that transformational leaders are social architects for their firm and its followers with the ability to communicate ideals that inspire and transform values and that shape new organizational climates. Examples include leaders promoting an innovation climate, sustainability climate, or security climate, with the latter being a focal point of the current study. Innovation is a collaborative and social process that is well-researched, and studies have shown that transformational leadership can influence innovation at both the interpersonal level (e.g., Al Maalouf, El Achi & Balouza, 2025; Gui, Lei & Le, 2024) and the interorganizational level

(e.g., Defee, Stank & Esper, 2010; Gerke et al., 2017; Goffnett & Goswami, 2016; Yang et al., 2025; Zhang et al., 2023). Similarly, security has been studied at the interpersonal level (e.g., Cigolini, Pero & Sianesi, 2016) and the interorganizational level (e.g., Asamoah et al., 2022; Zailani et al., 2015).

Defee, Stank and Esper (2010, p.766) describe supply chain leadership at the interorganizational level and define it as “a relational concept involving the supply chain leader and one or more supply chain follower organizations that interact in a dynamic, co-influencing process.” Supply chain leadership is influential in advancing security and resilience capabilities throughout supply chain relationships (Shin & Park, 2021) and is critical to the process of projecting strategic imperatives and guiding supply chains through periods of crisis and insecurity (Dubey, 2023). recovery.

2.3 Supply Chain Security

Strategies, such as outsourcing and exporting, come with increased risk of security issues in global supply chains (Jüttner, Peck & Christopher, 2003). Many companies have adopted a security orientation that is aimed at elevating security and risk management to strategic levels throughout the supply chain (Williams et al., 2012). Research also demonstrates that supply chain security can have a positive impact on firm performance and is a needed area for future research (Tong et al., 2022; Williams et al., 2012; Yang & Wei, 2013; Zailani et al., 2015). Firms have increased security practices, such as conducting supplier audits and simulating security threats in the immediate supply chain, to identify vulnerabilities and minimize risk (Erkul, Kaynak & Montiel, 2015; Speier et al., 2011). In addition, firms are going to great lengths to select collaborative partners who are open to integrating policies and cultures (Williams et al., 2012; Zailani et al., 2015). Voss et al. (2009) investigated the role of security in supplier selection and found that firms have higher levels of satisfaction with suppliers that have a security orientation and choose to maintain higher levels of security.

Security orientation is described in the literature as a firm-level awareness of security-related issues that is facilitated by leadership through proper planning, relationships, communications, and adjustment (Autry & Bobbit, 2008). Autry and Bobbitt (2008) claim that supply chain security orientation stems from the culture of the leading firm and spreads to external partners and followers through shared purpose and practices. Security culture is akin to security orientation where leaders of firms will project norms, values, and behaviors that facilitate security-related policies and collaborative practices, including communication and responsiveness, that shape the culture (Lu et al. 2019; Cigolini, Pero & Sianesi, 2016; Williams, Ponder & Autry, 2009). Kim (2014) claims relational norms within a supply chain further collaboration among the firms to the extent that they share information, align policies, and commit resources that elevate security for the immediate supply chain partners. Researchers have argued that the socialization of security, i.e., cultivating a security climate and culture, is the most critical factor in developing a secure supply chain (Williams, Lueg & LeMay, 2008; Zailani et al., 2015). According to Goffnett & Williams (2019, p. 2), supply chain security climate reflects the “shared perceptions held by members of a supply chain about the way in which

security is managed and emphasized within the immediate supply chain relationship.” It follows that security climate would encompass an overall assessment of the security policies and norms observed in the security culture of the supply chain.

Maintaining a security climate is likely to be viewed positively when collaborating with the immediate supply chain and carrying out the overarching goals and strategies emphasized by leadership. Recent research shows that a security-oriented culture can have a significant effect on supply chain performance (Asamoah et al., 2022; Cigolini, Pero & Sianesi, 2016; Kurniawan et al., 2017; Lu et al., 2019; Zailani et al., 2015). The growing necessity of security is likely to create a heightened degree of attention and vigilance in the supply chain relationship thereby forming mutual initiatives and practices such as those capable of supporting and shaping a supply chain security climate (Goffnett & Williams, 2019).

While it is understood that internal initiatives (e.g., security planning, lean implementation) can improve firm performance, research suggests that a firm can strengthen the effects of strategic initiatives through proper leadership and collaboration with supply chain partners (Adams et al., 2014; Cao & Zhang, 2011). Leadership will search for supply chain partners that are willing to collaborate on initiatives that cultivate a supply chain security climate. Thus, transformational supply chain leadership will advance supply chain citizenship behavior perceptions given that motivation and vision are components of supply chain leadership. Accordingly, there is an expected positive relationship between leadership and supply chain security climate and between leadership and supply chain citizenship behavior.

2.4 Supply Chain Citizenship Behavior

Interorganizational citizenship behavior (ICB) in supply chain relationships is a collaborative and social manifestation viewed at the firm level that is receiving greater attention in literature (Davis-Sramek et al., 2022; Ralston, Richey & Grawe, 2017). ICB builds on organizational citizenship behavior (OCB) that is viewed at the interpersonal level (Autry, Skinner & Lamb, 2008; Esper et al., 2015). OCB is seen as individual behaviors that are discretionary and not directly recognized by formal reward systems (Organ, 1988, p. 4). The main dimensions of OCB include sportsmanship (tolerance), helping, organizational loyalty, and civic virtue. In the early work by Autry et al. (2008), the authors describe ICBs as interfirm behavioral activities that are often discretionary and not explicitly stated in formal policies or agreements and collectively promote a more efficient and effective supply chain. The authors go on to explain that discretionary means that the behavior is completely voluntary and not an enforceable requirement among the partner firms. The main dimensions of ICB align with OCB dimensions and include tolerance, altruism, loyalty, and compliance. Tolerance is the capacity to accept the fact that mistakes are inevitable and being understanding. Altruism involves helping the supply chain partners solve problems. Loyalty has to do with putting the supply chain ahead of individual firm interests and standing behind all the members in the supply chain. Compliance deals with adhering to social norms in the supply chain and respecting each member’s business policies and trying to abide by them.

Leaders inspire employees to go above and beyond their regular responsibilities on behalf of the organization (Mesu, Sanders & Riemsdijk, 2015). There is research at the interpersonal level confirming how workers involved in social activities shared by leadership are more likely to participate in volunteerism and other citizenship behaviors (Cycyota, Ferrante & Schroeder, 2016). Goffnett and Williams (2019) argue that workers who take part in security related activities are more likely to demonstrate secure behaviors and participate in security-related initiatives. Transformational leadership encourages information exchange within supply chains that leads to improved performance (Birasnav, Mittal & Loughlin, 2015). Qalati et al. (2022) found that transformational leadership is a significant predictor of employee performance, and that people who work for transformational leaders are more likely to engage in discretionary organizational citizenship behaviors. Koo and Lee (2022) found that transformational leadership can enhance commitment and organizational citizenship behavior more so when it is directed at the group level rather than at the individual level. Studies have shown that interorganizational citizenship behaviors are a significant predictor of performance in areas such as supply chain sustainability (Cao, Elking & Gu, 2023) and supply chain resilience (Pu, Yang & Wu, 2025). Cao and Zhang (2011) posited that mediators may exist between interfirm relationships and work outcomes, and these pathways are likely to produce a collaborative advantage. Cao, Elking and Gu (2023) found that ICBs are mediators in the relationship between leadership and sustainability performance. It is plausible that citizenship behaviors that occur within a supply chain triad will have an interceding effect in the interfirm relationship. Accordingly, supply chain leadership (SCL) will have an indirect effect on supply chain security (SCS) via supply chain citizenship behavior (SCCB).

Influenced by strategic vision and shared values received from transformational leadership, the members in the supply chain will be inspired to demonstrate their reciprocity to the broader supply chain through ICB and what is termed here as supply chain citizenship behavior (SCCB). In addition, leaders will support followers and motivate ICBs that foster a new or greater security climate that could help deploy higher levels of supply chain security that minimizes risk. Thus, transformational SCL will advance SCCB perceptions given that motivation and vision are components of SCL.

- H1: SCL will have a positive association with SCS.
- H2: SCL will have a positive association with SCCB.
- H3: SCCB will have a positive association with SCS.
- H4: SCCB will mediate the association between SCL and SCS

3. METHODOLOGY

3.1 Participants

This research measured the collective perspective of triad relationships called for in previous studies (Choi & Wu, 2009; Goffnett & Williams, 2019; Kim & Henderson, 2015). The current study assesses perceptions of leadership, citizenship behavior, and security in supply chain relationships by surveying managers and evaluating the collective perspective of triad relationships (cf. Goffnett &

Williams, 2019; Hult, Ketchen & Arrfelt, 2007; Zacharia, Nix & Lusch, 2009). This study followed Goffnett and Williams (2019) and Hult, Ketchen, and Arrfelt (2007) by having qualified single informants (e.g., senior buyer, supply chain manager) report the shared, collective perceptions of the triad by responding for the firm and its direct supply chain partners (customer and supplier). Informants were instructed that their supply chain assessment must reflect the collective view of the immediate members in a supply chain triad that they are most familiar with and that is important to the business. Informants were routinely prompted to provide the shared view of a critical supply chain triad that they are most familiar with.

Informants were first qualified by answering screening questions regarding their position (e.g., manager, director, senior specialist), their location, and whether their firm was ISO 28000 certified. Informants acknowledged that they could adequately assess the shared, collective view. Informants also specified how long they have collaborated with the supply chain partners and with their current firm (Luo, et al., 2011). Managerial levels were the target informants recruited for the study because they typically have close knowledge of their immediate supply chain partners and any joint collaborative initiatives, policies, or agreements that they are engaged in (e.g., sustainability, security) to the extent that they can confirm and report the joint perspective of the triad (Kaufmann & Saw, 2014; Whipple, Wiedmer & Boyer, 2015). Practically 95% of the sample was managerial level and above. The average length of employment or tenure with the informant's employing firm was nearly 15 years. The average years of experience with the immediate supply chain was over 13 years. Table 1 provides other details about the sample composition.

This study employed an online panel service to enlist participants. The vendor located in the United States aligns registered associates with research projects. Previous studies reported reliable service using the same or similar vendor (e.g., Goodman, Cryder & Cheema, 2013; Irak & Mantler, 2017; Scott et al., 2015). A requisition for 400 panelists from leadership roles was submitted to the vendor that resulted in 234 responses. More than half of the initial responses were removed because they did not complete most of the survey, or they did not meet the qualifying criteria and were disallowed because they did not work extensively with the immediate supply chain partners, both customer and supplier, or their firm was not from the United States or was not ISO 28000 certified. Only ISO 28000 certified firms were included in the sample to assure that supply chain security perceptions could be reasonably assessed. According to the International Organization for Standardization (www.iso.org), ISO 28000 is a standard that specifies the requirements for supply chain security management systems that firms can follow. The standard requires regular assessment of the security climate and environment in which a firm and its supply chain partners operate to determine if adequate security measures are in place. Given the exploratory nature of the supply chain study, it was decided to follow previous studies and focus on a specific country (e.g., Han et al., 2025; Sharma, Pandey & Manuj, 2025; Selvakumar, 2024; Shenoi, Dath & Rajendran, 2016; Yazici, 2013). One hundred and two (102) valid responses were retained and used in the analysis.

Table 1 Sample Description

Characteristics	Category / Measure	% / Mean
Title	Corporate Officer (CEO, COO, CFO)	17.6%
	President/Vice President	9.8%
	Director/Manager/Supervisor	66.7%
	Buyer/Planner/Analyst/Specialist	5.9%
Supply Chain Relationship Experience	Average length of relationship with key supplier (years)	13.9
	Average length of relationship with key customer (years)	13.7
	Average length of employment with firm (years)	14.8
Business Type	Manufacturer	60.8%
	Transportation/Warehousing/3PL	24.5%
	Wholesaler/Distributor/Retailer	14.7%
Sales Volume (Revenue)	\$1–999,999	4.9%
	\$1 Million–\$99.9 million	32.3%
	\$100 Million–\$999.9 million	34.3%
	\$1 Billion+	28.4%
Number of Employees	1–99	13.8%
	100–249	20.5%
	250–499	10.8%
	500+	54.9%

Note: $N = 102$.

3.2 Procedure – Path Analysis

The proposed model was examined using partial least squares modeling procedures that have been employed in previous supply chain research (e.g., Nyamah, Opoku & Kaku, 2022; Sahaf et al., 2021). This study utilized SmartPLS 4 path modeling software (Ringle, Wende & Becker, 2024). PLS modeling is robust to analyzing intricate models with small sample sizes (Hair et al., 2022). For example, in a recent study of a hospital supply chain, Sahaf et al. (2021) analyzed data from 100 users of an oncology department. Other examples include Azizi et al. (2025) that evaluated 100 supply chain leaders, and Kourt and Lhassan (2025) analyzed interorganizational factors in 100 supply chain partnerships. PLS has been utilized in several supply chain studies (Autry, Williams & Golcic, 2014; Goffnett & Williams, 2019) and is applicable for testing intricate models that include possible mediators (Hair et al., 2022) in supply chain networks (Rehman et al. 2025). PLS is highly suitable for this study because it provides superior statistical power with small samples and enables estimation of complex mediation paths. In PLS-SEM, a sample of 102 is statistically sufficient to detect medium-to-small effect sizes without risking high Type II errors. Moreover, PLS-SEM does not assume a normal distribution for the indirect effect. It utilizes non-parametric bootstrapping to generate percentile confidence intervals for the mediation pathway, which has become a standard for contemporary research. Lastly, PLS-SEM is preferred over Covariance-Based SEM (CB-SEM) because it does not require strict, well-established theoretical frameworks to achieve model fit.

3.3 Measurements

Structural The measurements were referenced from other supply chain studies and adapted where necessary to fit within the supply chain context. A questionnaire containing the various scales was configured for being administered online via Qualtrics survey software. Items were rated on a seven-point Likert-scale ranged from 1 (strongly disagree) to 7 (strongly agree).

3.3.1 Supply Chain Leadership (SCL)

Informants rated a seven-item SCL scale utilized in previous supply chain studies (e.g., Defee, Stank & Esper, 2010; Goffnett & Goswami, 2016). Informants indicated the degree to which they agreed with each item such as ‘articulates a compelling vision of the SC’s future’ and ‘clarifies the central purpose underlying actions of all supply chain members.’ Higher scores demonstrate greater transformational leadership behaviors are manifest in the supply chain.

3.3.2 Supply Chain Citizenship Behavior (SCCB)

Informants rated an eleven-item interorganizational citizenship behaviors scale developed by Skinner, Autry and Lamb (2009, p. 236) and adapted for this study that was used to measure the extent to which the supply chain triad engages in citizenship behaviors (e.g., altruism, compliance) collectively. Informants reported the extent to which they agree with statements such as, ‘we go out of our way to help the immediate supply chain members with business-related issues if we sense that they are in need’ and ‘we show respect for our immediate supply chain members’ business policies and try to abide by them ourselves.’ Higher scores indicate a higher level of citizenship behavior in the supply chain.

3.3.3 Supply Chain Security (SCS)

Informants reported the extent to which SCS is projected through shared values, policies, and activities using a 3-item scale from Goffnett and Williams (2019). Informants measured the extent to which they agree with statements such as ‘security is a central corporate mission of each immediate supply chain member organization.’ Higher scores show a higher degree of security is perceived in the policies and dealings in the supply chain.

3.3.4 Control Variables

Informants identified revenue and number of employees. Informants also indicated the length of time worked with the customer, with the supplier, and with the current employer that they responded on behalf of in their collaborative supply chain relationship (cf. Liu et al., 2012). study.

Table 2 Means, Standard Deviations, Intercorrelations and Fornell-Larcker Criterion

No	Construct	Mean	SD	1	2	3
1	Supply Chain Leadership	5.685	0.731	(0.753)		
2	Supply Chain Citizenship Behavior	5.578	0.652	0.663	(0.618)	
3	Supply Chain Security	5.820	0.788	0.577	0.567	(0.829)

Note: $N = 102$. Fornell-Larcker Criterion: Square root of construct's average variance extracted is on the diagonal.

Table 3 Measure Psychometric Properties and Model Evaluation

Construct/Indicators	Convergent Validity		Internal Consistency and Composite Reliability		Discriminant Validity
	LOAD	AVE	α	CR	HTMT
Supply Chain Leadership		0.568	0.872	0.901	YES
SCL1	0.810				
SCL2	0.705				
SCL3	0.729				
SCL4	0.732				
SCL5	0.645				
SCL6	0.818				
SCL7	0.814				
Supply Chain Security		0.688	0.773	0.869	YES
SCS1	0.818				
SCS2	0.840				
SCS3	0.830				
Supply Chain Citizenship Behavior		0.382	0.838	0.870	YES
SCCB1 - (tolerance)	0.860	0.796	0.749	0.886	
SCCB2 - (tolerance)	0.923				
SCCB3-(altruism)	0.828	0.582	0.648	0.802	
SCCB4 - (altruism)	0.855				
SCCB5 - (altruism)	0.574				
SCCB6 - (loyalty)	0.760	0.501	0.505	0.748	
SCCB7 - (loyalty)	0.596				
SCCB8 - (loyalty)	0.754				
SCCB9 - (compliance)	0.809	0.664	0.748	0.856	
SCCB10 - (compliance)	0.827				
SCCB11 - (compliance)	0.808				

Note: $N = 102$. LOAD = first-order loadings; α = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted; HTMT = Heterotrait-Monotrait Ratio; YES = Discriminant validity confirmed via right-tail test using bootstrap distribution (<0.90) with a 5% probability of error. Bootstrap confidence interval results of HTMT criterion demonstrate discriminant validity Hair et al., 2022, pp. 116-117.

4. RESULTS

4.1 Measure Scale Validity and Reliability

Table 2 shows the means, standard deviations, and intercorrelations of the various constructs. The reflective measurement scales were judged for validity and reliability. Assessment of item reliability shows most outer loadings above 0.80. Weaker indicators with outer loadings near 0.60 were retained because of their contribution to content validity (Hair et al., 2022, p. 118). Most of the average variance extracted measures are above the 0.50 threshold for convergent validity and deemed adequate (Hair et al., 2022). Table 3 shows Cronbach's alpha values and composite reliabilities of the constructs. Hair et al. (2022), however, explains that composite reliability is technically a more appropriate measure of internal consistency reliability because the Cronbach's alpha is sensitive to the number of items in a scale and can grossly underestimate internal consistency reliability as was the case here. The composite reliability figures ranged from 0.748 to 0.901, which meet the minimum acceptable threshold for construct reliability

(Nunnally & Bernstein, 1994). Discriminant validity was established for each higher-order construct. Examination of heterotrait-monotrait ratios (HTMT) disclosed that all values for the main constructs met the exploratory threshold of 0.90 as well as the more conservative threshold of 0.85 with the highest value being 0.751 (Hair et al, 2022). The loyalty sub-variable within the SCCB construct had a higher HTMT, indicating it may lack full discriminant validity from other sub-variables, such as altruism. This supports combining the citizenship dimensions into a unified theme and modelling SCCB as a single, higher-order construct. The measurement model and the given measures used in the current study demonstrate satisfactory reliability and validity.

4.2 Non-Response Bias and Common Method Variance

An independent means test of the dependent variables using data from early responders and late responders showed no significant difference between the two groups, which indicates there is likely no occurrence of non-response bias (Armstrong & Overton, 1977). Highly correlated constructs,

Table 4 Direct Model Assessments

Path to Endogenous Construct	β	SD	t	p	CI	f ²	R ²	Q ²	Conclusion
SCL → SCS	0.588	0.079	7.407	<0.001	[0.409;0.723]	0.529	0.346	0.290	H1 Supported
SCL → SCCB	0.663	0.057	11.728	<0.001	[0.508;0.745]	0.412	0.439	0.382	H2 Supported
SCCB → SCS	0.604	0.053	11.422	<0.001	[0.461;0.677]	0.575	0.365	0.310	H3 Supported

Notes: N =102. β = Path Coefficient; SE = Standard Error; CI = 95% Bias Corrected Confidence Interval

Table 5 Full Structural Model Assessment with Mediator

Path Relationships	β	SD	t	p-value	95% CI	VIF	f ²
SCL → SCS	0.336	0.125	2.680	0.007	[0.066;0.552]	1.775	0.107
SCL → SCCB	0.661	0.059	11.221	<0.001	[0.504;0.750]	1.000	0.775
SCCB → SCS	0.363	0.094	3.870	<0.001	[0.171;0.537]	1.775	0.125
Endogenous Constructs	Q ²	R ²					
SCS	0.286	0.407					
SCCB	0.391	0.437					

Notes: N =102.

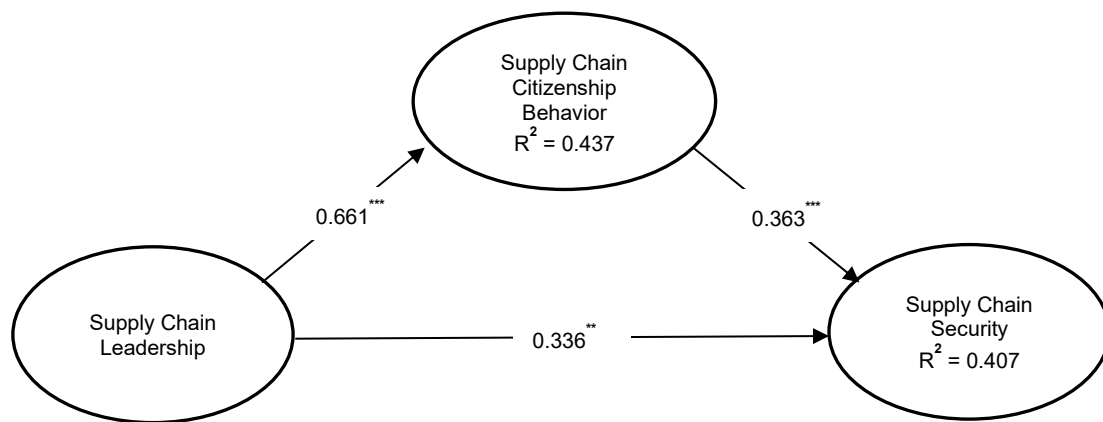


Figure 2 Assessment of Aggregate Structural Model with Mediator
***p < .001 **p < .01 *p < .05

at 0.90 or higher, indicate potential method variance (Podsakoff et al., 2003). The highest correlation of 0.663 is well below 0.90. Podsakoff et al. (2003) recommends using a single factor test to check for any risk of common method variance. Principle axis factor analysis without rotation was performed in IBM SPSS Statistics (Version 29). A single factor accounted for 33.791% of total variance, which is far less than 50% level of variance allowed before method variance is a concern.

4.3 Structural Modelling and Hypothesis Testing Results

This study followed PLS-SEM procedures for modelling, analyzing, and reporting results (Hair, et al., 2022; Sahaf et al., 2021). The mediation methods used to test the hypotheses follow the procedures recommended by Hair et al. (2022) and Zhao, Lynch and Chen (2010), which resemble the steps put forward in previous studies, including Baron and Kenny (1986) and Goffnett and Williams (2019). Direct effects were compared with the indirect effects in the full model to understand if SCCBs mediate the relationship between SCL and SCS. Step 1 measures the extent that SCL predicts SCS and SCCB to test hypotheses 1 and 2. Step 2 examines the extent that SCCB predicts the SCS to test hypothesis 3. Step 3 introduces the mediator, SCCB, to test hypothesis 4. This final step estimates the complete structural model by including both SCL and SCS to assess SCCB for mediating effects.

Results for steps 1 and 2 are shown in Table 4. PLS estimated the path coefficients and R2 values of the models. The VIF values for the path relationships were less than 5, indicating that multicollinearity is not present (Hair et al., 2022). Bootstrapping with 10,000 samples showed all coefficients were significant (p < 0.001). All endogenous constructs have sizeable and significant R2 values that confirm the predictive accuracy and explanatory power of each direct model. Results from conducting a blindfolding procedure with an omission distance of 10 show all Q2 values are above zero, which demonstrates each direct model's predictive relevance. The f2 values show that the effect of SCL on SCS and SCCB and the effect of SCCB on SCS were observed to be large (Cohen, 1988). Results are significant in estimating direct effects of SCL and SCCB and thereby validate Hypotheses 1, 2 and 3.

Step 4 estimates the complete path model with SCCB as a mediator that was put forward in Hypothesis 4. Figure 2 reflects the complete path model with the resulting path coefficients and explained variances (R2) of the endogenous constructs. After including SCCB as a mediator, SCL has a large and significant effect on SCCB, which, in turn, has a strong and significant effect on the dependent variable SCS. Table 5 shows the results of the complete structural model assessment. Table 6 shows the results of the analysis and assessment of the mediator.

Table 6 Analysis of the Mediating Effect

Supply Chain Citizenship Behavior (SCCB) Mediator Model									
Association to Endogenous Construct	Mediator Variable	Direct Effect	p-Value	95% CI Direct	Indirect Effect	p-Value	95% CI Indirect	Type of Mediation	Conclusion
SCL → SCS	SCCB	0.336	<0.001	[0.325;0.722]	0.240	<0.001	[0.110;0.370]	Partial	H4 Supported

Notes: $N = 102$. Mediation Analysis Procedures outlined in Hair et al (2022, p. 235) were followed. Variance Accounted For (VAF) was used to assess mediation. VAFs between 20% and 80% indicate partial mediation, whereas greater than 80% indicate full mediation ($0.240/0.576 = 0.417 = 41.7\%$ VAF).

The complete structural model was analyzed to determine direct and indirect effects of SCL on SCS. The VIF values in the complete model showed no concerns with multicollinearity. The large R^2 values of 0.407 for SCS and 0.437 for SCCB shown in Table 5 demonstrate the model's predictive accuracy. After blindfolding, the Q^2 values are above zero, indicating predictive relevance of the complete path model displayed in Figure 2. Nearly all of the indicators in the analysis yielded a smaller root mean square errors (RSME) compared to the linear regression model benchmark, indicating medium predictive power (Hair et al., 2022, p. 200-204). The f^2 effect sizes were significant and observed to be moderate to large. Results are significant ($p < 0.001$) in estimating the indirect effects of SCL through SCCB. The direct relationship between SCL and SCS is still significant, but the path coefficient is significantly diminished which shows the mediator has an intervening effect. A supplementary calculation was performed to determine the amount of variance in the dependent variable explained by the mediator through the indirect path. The Variance Accounted For (VAF) is the ratio of indirect effects to total effects, which provides an estimate of the amount of mediation present along a given path. VAFs between 20 percent and 80 percent indicate partial mediation (Hair et al., 2014, p. 225). Calculations show a significant amount of the total effect of SCL results from being drawn through the indirect path through SCCB to SCS. Both the direct and indirect effects were significant, indicating partial mediation. However, the direct effect was larger, suggesting that SCL influences SCS primarily through a direct pathway, with SCCB accounting for a smaller, but still meaningful, portion of the effect. Thus, it can be concluded that complementary mediation exists where SCCB partially mediates the relationship between SCL and SCS, which lends support to hypothesis 4.

After evaluating the path models, results show that:

- Hypotheses 1 and 2 are supported such that SCL has a significant and positive direct influence on SCS and SCCB;
- Hypothesis 3 is supported where SCCB has a significant and positive direct effect on SCS;
- Hypothesis 4 is supported such that SCCB presents a partial mediating effect on the relationship between SCL and SCS.

5. DISCUSSION

It is important that firms establish supply chain relationships with transformational leadership qualities that promote collaboration and shared vision and that support compliance citizenship behaviors. This approach can foster a supply chain security climate that promotes vigilance and supports procedures that make a supply chain more resilient and responsive to risk. The main objective of the current

study was to examine SCL and its relationship to SCS perceptions and SCCBs to address calls from previous research (e.g., Ali et al., 2025; Cao, Elking & Gu, 2023; Lu et al., 2019; Tong et al., 2022). All hypotheses were supported. SCL had an indirect effect on SCS through SCCB. SCCB was responsible for significant variance in the relationship between SCL and SCS. High SCCB likely triggers SCS because members that are motivated to comply with and contribute to security activities sense that their firm and its immediate SC partners understand the importance of developing a security climate that is more firmly articulated by leadership in mission statements and established in policies. Leaders who endorse high SCS are best situated to promote high SCCBs, such as altruism and compliance, that in turn help them advance SCS awareness and implementation. Results are consistent with those in related literature. Pu, Yang and Wu (2025) found connections between interorganizational citizenship behaviors and supply chain resilience through relationship learning and innovation capability. Cao et al. (2023) found a significant relationship between authentic leadership and sustainability that was mediated by interorganizational citizenship behavior. The results of the current study and those previously mentioned lend support for greater collaboration with supply chain leadership that inspires citizenship behavior in the supply chain to improve security, sustainability, resilience and performance.

5.1 Implications for Theory

The study aligns with social theories that assert that supply chain relationships are networks bolstered by collaborative activities between firms (Galaskiewicz, 2011). This study comes out of social network theory by extending leadership, security, and citizenship research from the intraorganizational view to the interorganizational supply chain view. It adds to the literature on interorganizational relationships by positioning transformational leadership and citizenship behaviors in that domain.

Beyond validating the hypothesized paths, these findings offer critical advancements to Social Network Theory (SNT) within an interorganizational context. While traditional SNT heavily stresses structural features like network density or centrality, this study demonstrates that macro-level network properties, such as a shared approach to supply chain security, are fundamentally driven by relational and behavioral mechanisms rather than structural arrangements alone. Specifically, transformational SCL operates as a network anchor that effectively translates structural ties into a collective behavioral alignment with immediate, interdependent supply chain entities or partners. The significant complementary partial mediation effect explicitly highlights that formal, direct leadership mechanisms are insufficient on their own. Instead, the findings show that creating a protective relational climate (SCS) depends on social mechanisms, i.e., the voluntary,

non-contractual citizenship behaviors (SCCB) exchanged between supply chain network partners. Ultimately, this research illustrates how effective leaders bridge supply chain networks by converting vulnerable business channels into highly collaborative and secure systems that safeguard supply chains from external disruptions. Moreover, SCL and SCCB are relational bridges that result in network capabilities with potential for generating a competitive advantage via superior supply chain security that cannot be easily replicated by competing companies and supply chains.

Leaders and other actors in a supply chain network will share information and objectives that encourage collaborative interorganizational citizenship behaviors that foster a more secure climate that benefits all members in a supply chain. Higher levels of citizenship within the supply chain draws on leadership as it motivates members to achieve higher levels of awareness and establish new values in support of security. This builds upon research that underscores interpersonal relationships among counterparts in supply chain networks (e.g. Butt, 2019; Gligor & Holcomb, 2013) and demonstrates how leadership exercising value-based strategy can increase discretionary efforts by followers who are willing to align behind a common goal that enables shared values to develop a security climate in the supply chain. This research highlights benefits that come from collaboration and integration of firms and individuals responsible for leadership, citizenship, and security in supply chains. The findings support prior research that both leaders and followers play an important role in risk management and promoting security (Ali et al., 2025; Goffnett & Williams, 2019; Prabhu & Srivastava, 2023) Finally, this research establishes the vital role both SCL and SCCB have with respect to enhancing SCS.

5.2 Implications for Practice

Results of this study reveal a dynamic that is critical to the effectiveness and overall security of collaborative supply chains. First, this study confirms the importance of supply chain leaders recognizing the value and benefits of collaboration (Adams et al., 2014; Cao & Zhang, 2011; Min et al., 2005). Leaders should create more collaborative opportunities that can be leveraged in the supply chain to help advance a security climate that has the potential of minimizing risk and thereby improving resilience and sustainability in the broader supply chain. Extensive communication between collaborative supply chain partners can reduce operational risk and enhance supply chain resilience (Wieteska, 2020). Goffnett and Williams (2019) suggest holding periodic meetings of special security councils that are made up of representatives from the supply chain network where collaboration on security developments can emerge. In addition, supply chain members could create development programs on leadership, citizenship, collaboration, and security for managerial ranks that are introduced in all the partnering firms. The results of this study suggest that leaders pursue a risk management strategy that fosters security. Leaders have an inherent obligation to their followers to maintain security throughout the supply chain. Policy and standard operating procedures are important measures in maintaining security but are not drivers of voluntary ICBs. Motivation and drive are incited by leadership. Leaders articulate the mission and objectives and are in the perfect position to enhance relationships and elevate security.

Second, this study found robust links between leadership, citizenship, and security that add to the body of research on supply chain relationships. SCCB explained a significant amount of variance in the relationship between SCL and SCS perceptions. The security-oriented supply chain can seek workers who are interested in volunteering to be security advocates who monitor the security climate between the firms in the supply chain. Leaders can produce strategies that foster a security climate aimed at reducing risks throughout the supply chain. In difficult times, firms cannot accept below average security efforts, or it could be a costly mistake (Ali et al., 2025). There is evidence that supply chains that place a greater emphasis on security experience improved supply chain performance and report more satisfying supply chain relationships (Goffnett & Williams, 2019). Supply chain leaders need to establish the right vision and collaborative relationships to lead their firm and its affiliates and followers in developing a supply chain security climate.

5.3 Limitations and Future Research

This research explored interfirm behaviors using a cross-sectional study. A longitudinal study that looks at several sources at different points in time could minimize the risk of sampling error (Podsakoff, MacKenzie & Podsakoff, 2012). Future research should find ways to better assess the supply chain triad perspective and investigate other antecedents and outcomes as well as other potential mediators. Measuring perceptions of each supply chain member in the triad would allow for comparing the behaviors of all the partners and examining the effects of any differences. The firm that imparts the most transformational leadership qualities and ICBs could provide interesting insights into security and performance. Other leadership styles, like adaptive or servant, should be studied to improve the understanding of leadership in the supply chain (Cao, Elking & Gu, 2023). Other variables, such as agility, ambidexterity and sustainability, for example, could be studied to determine if other variables have a significant role in the relationship between SCL and SCS. Finally, future research could replicate this work in specific industries and in other countries to see if there are industry or cultural differences that influence results.

6. CONCLUSION

The results of this study contribute to literature on supply chain management by identifying pathways where supply chain leadership influences supply chain security and is supported through citizenship behaviors at the intraorganizational level and at the interorganizational level. The results highlight the examination of interorganizational processes in supply chain networks. More clarity was found regarding the importance of transformational leadership and followership in supply chains. Firms should invest in leadership training for managers and executives and make it accessible to counterparts in the supply chain to motivate more citizenship behaviors that promote a positive organizational climate that stands to minimize risk and improve performance. Firms in a supply chain should collaborate regularly to codevelop security policies and deploy joint initiatives. Leaders need to make security and

risk management a strategic priority that is emphasized through vision and actions and through policies and standards, such as ISO 28000, that impacts the supply chain.

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CONFLICTS OF INTEREST

All authors declare that they have no conflicts of interest.

DATA AVAILABILITY STATEMENTS

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