Effect of Supply Chain Coordination on Performance:
A Serial Mediation Model of Trust, Agility, and Collaboration

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ABSTRACT

Research on supply chain management (SCM) focuses on "what" factors of a supply chain enable firms to achieve high performance. It examines the effect of two strategically important pillars: supply chain relationships or capabilities. However, their isolated investigation leads to a limited understanding of "how" they can be combined to increase firm performance. In this study, the authors argue that beyond their direct effects, the relational and the capability-based determinants of a supply chain have a network of indirect relationships that concurrently and differentially affect firm performance. Building on the relational and resource-based views, the authors develop a serial-mediation model examining the mediating effects of trust in supply chain and collaborative advantage (i.e., relational determinants) and supply chain agility and coordinated supply chain (i.e., capability-based determinants) of SCM. Through the use of hierarchical linear regression analysis, they show that trust, agility, and collaboration act as serial mediators that carry the indirect effect of coordination to firm performance.

KEYWORDS

Collaborative Advantage, Coordinated Supply Chain, Supply Chain Agility, Supply Chain Management, Trust in Supply Chain

INTRODUCTION

Research on supply chain management (SCM) has largely focused on two distinct sets of determinants for an effective supply chain that result in improved performance (Leuschner *et al.*, 2013; Mesquita *et al.*, 2008; Whipple *et al.*, 2010). The first set includes the relational determinants that originate within the inter-firm social exchange relationships and give rise to partnership-specific advantages that elevate performance in a way that neither partner can do independently (Cousins *et al.*, 2006; Dyer and Singh, 1998; Law *et al.*, 2011). The second set includes the capability-based determinants that allow firms to use their internal strategic resources as a means to enhance key outcomes that drive performance (Barney, 2001; Hunt and Davis, 2012; Ketchen and Hult, 2007). While previous studies have largely examined the independent benefits of relational (e.g., trust and collaboration),

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and capability-based (e.g., agility and coordinated supply chain) determinants of an effective SCM, their concurrent effects were omitted from this discussion. We argue that this omission limits our understanding of the indirect influence of each and in turn the implications on how firms can capitalize on both their supply chain relationships and capabilities to leverage their performance.

In this study we offer a comprehensive model that allows the simultaneous examination of how the relationship advantages and the capabilities that are configured within a supply chain lead to a high performing firm. Integrating the relational and the resource-based views we develop and test a serial mediation model investigating the effects of trust in supply chain (TSC), collaborative advantage (CA) (i.e., relational determinants), coordinated supply chain (CSC), and supply chain agility (SCA) (i.e., capability-based determinants) on firm performance. We argue that beyond their direct effects on firm performance, TSC, CSC, and SCA have indirect effects that are transmitted through CA. We argue that this is because of the localized relationships that limits the firms' ability to open up and fully engage in collaborative relationships. Unless a firm establishes strong capabilities that secure the economic rents on its own it is unlikely that they will be willing to share the critical information or their competitive advantage with other firms although these firms are their supply chain partners. Therefore, developing capabilities that allow the firm to coordinate the supply chain will allow firms to escape the localized relationships and be able to deeply engage in trusting relationships, through which be able to quickly respond to the changes and uncertainties in the market, and turn arm's length relationships into partnerships that provide CA. This network of indirect relationships we suggest serially transmits the effects of capabilities and relationships to firm performance.

Using hierarchical linear regression analysis to test our conceptual model consisting of constructs developed and verified in the literature (Cao and Zhang, 2010; Day *et al.*, 2015; Swafford *et al.*, 2006) we found that there is a serial mediation between the relational and capability-based determinants of a supply chain. In particular, TSC, SCA, and CA mediate the effect of CSC on firm performance through serially operating mediations. The findings suggest that relational and capability-based determinants of SCM complement each other in leveraging firm performance. Neither of them can be relied on independently for a firm's enhanced performance. They operate interdependently forming a network of indirect relationships where the absence of one may result in the failure to capitalize on both supply chain relationships and capabilities. Thus, firms need to equally invest in trusting and collaborative relationships among their supply chain partners as well as strengthening their ability to establish a coordinated and agile supply chain. These findings highlight the entangled relationship of the relational facet of a supply chain with the internally driven capability facet.

LITERATURE REVIEW

An increasing body of research shows that the two strategically important determinants of an effective supply chain that translate to higher firm performance are the resources and capabilities a firm owns, and the relationships it builds with its external environment (Day *et al.*, 2015; Duong and Chong, 2020; Huang *et al.*, 2020; Yusuf *et al.*, 2014). Research on Resource Based View (RBV) predominantly argues that the superior firm performance results from those capabilities that are owned or controlled by the firm (Barney, 1991; Rumelt *et al.*, 1991). It follows that any potential relationship with the external environment would be considered competitive in nature rather than collaborative. Although it is seamlessly accurate to claim that capabilities are critical for achieving higher performance, this assumption only accounts for a partial view.

Over the past two decades increasing attention has suggested that firm performance depends also on the collaborative relationships between the focal firm and its supply chain partners (Ralston *et al.*, 2020; Zhang and Cao, 2018). Researchers argue that a firm's critical resources and capabilities increasingly extend beyond the firm's boundaries, and relationships of collaborative type allow firms to combine and utilize these resources in unique ways by enacting simultaneous interactions between the focal firm's resources and that of its partners thus contributing to the focal firm's performance (Liao *et al.*, 2017; Panahifar *et al.*, 2018).

CONCEPTUAL MODEL AND HYPOTHESES DEVELOPMENT

In this study, the relational and capability-based determinants of a supply chain are examined in an integrated model to explain their simultaneous effects. We argue that there is a network of indirect relationships between CSC, TSC, SCA, and CA that transmit the benefits accrued from the relationships and capabilities of a supply chain into firm performance.

The Direct Relationship between Coordinated Supply Chain and Firm Performance

Supply chain coordination refers to the "synchronisation of several activities of different functions from the very beginning, e.g. procurement of raw materials for the final process and distribution of finished products which may need different coordination mechanisms due to centralised or decentralised supply chain operations" (Vosooghidizaji *et al.*, 2020, p1805). The capability to coordinate the supply chain is a firm-specific resource that can provide comparative performance advantages (Day, 1994). Effective coordination within and outside a firm's boundaries serves for the purpose of satisfying customer's delivery demands in terms of timing and availability as well as decreasing the inventory and logistics costs (Simatupang *et al.*, 2002). Coordination enables firms to manage independent operations throughout the supply chain such as logistics, inventory planning, sales, and customer service.

CSC is based on the members' capability to synchronise the activities, effectively share information, align the incentives, and collectively learn (Simatupang *et al.*, 2002). Supply chain coordination makes it easier for the firm to respond to environmental changes. It provides mutual benefits for all members of the chain in terms of quality, time, and cost effectiveness. This shared benefit also increases the tendency of supply chain members to engage on collaborative relationships more openly since the firms is less under the risk of losing its core resource and knowledge base. It therefore improves the likelihood of better translating the benefits of supply chain relationships into increased performance among supply chain members and provides the firms with competitive advantage (Mandal, 2015).

Hypothesis 1: Coordinated supply chain will be positively related to firm performance.

Linking Coordinated Supply Chain to Supply Chain Agility

CSC increases the willingness of supply chain partners to rely on each other. Research suggests that when the firms engaged in supply relationships notice the partnering firms' capability to better coordinate their supply chain operations they strive to obtain synergies that enhances their likelihood to trust each other (Golicic and Mentzer, 2005; Law *et al.*, 2011). TSC enhances the responsiveness of the supply chain partners to each other's as well as customer demands. Studies provide increasing evidence that agile supply chains require high trust between the supply chain partners (Panayides and Lun, 2009; Svensson, 2001). They find that supply chain trust is positively related to SCA. Yang (2014) states that trust in the supply chain plays a critical role in the daily business life as well as bilateral relations in the supplier-buyer relationship, revealing that trust in suppliers positively affects the technical capacity of a firm and the agility of the supply chain. Along these lines we can argue that CSC enhances the SCA by allowing supply chain members to develop trust-based relationships. Therefore, we hypothesize that;

Hypothesis 2: Coordinated supply chain will be positively related to supply chain agility through trust.

Linking Trust to Collaborative Advantage

Trust in supply chain refers to the extent to which supply partners perceive each other credible and benevolent (Chen, 2019). It presents a firm's belief that its supply chain partners will act in ways that

result in positive outcomes and avoid making any moves that may harm the firm (Panahifar *et al.*, 2018). It is regarded as the suppliers' willingness to take risks and to rely on the exchange partners (Kwon and Suh, 2005; Mayer *et al.*, 1995). It is critical in supply chain relationships as it provides the social bonding for collaboration. It drives open communication, and faster and more reliable information sharing between supply chain partners. Trust also increases the willingness to take risks that facilitate the supply chain members to engage in collaborative relationships (Fawcett *et al.*, 2012). Research also suggests that trust improves supply chain responsiveness (Chen, 2019). It primarily mitigates the risks and increases the extent to which supply chain partners are responsive to the market, speeding up the product development cycle (Panayides and Lun, 2009). Trust is considered the driver of agility and flexibility by enhancing the ability and willingness of the supply partners to adapt to the changing environment (Chen, 2019). Further research provides evidence that SCA increases the tendency of supply chain partners to engage in collaborative relationships (Gligor *et al.*, 2015; Yusuf *et al.*, 2014). It increases the flexibility of suppliers in the face of uncertainty enhancing their connectivity, contingency planning, and information sharing (Al Humdan *et al.*, 2020; Dubey *et al.*, 2021). When firms jointly plan their supply chain operations and better align their goals and focus on improving responsiveness, they are more able and willing to engage in collaborative social exchange. Along these lines we suggest that SCA mediates the relationship between trust and CA.

Hypothesis 3: Trust in supply chain will be positively related to collaborative advantage through supply chain agility.

Linking Coordinated Supply Chain to Collaborative Advantage

CSC is an important facet of firm capabilities that enables supply chain partners to develop closer relationships that are collaborative in nature. CSC allows firms to develop a holistic supply management strategy and clearly articulate it among supply chain partners (Singh, 2014). It allows the partners to be more informed and prepared about their roles and responsibilities. It also increases the accountability of each partner that lowers the risks and in turn partnership limiting barriers for other supply chain members (Day *et al.*, 2015). Indeed, studies showed that the capability of firms to build CSCs is manifested as CA that results from the supply chain relationships. Coordinative efforts distinguish the collaborative exchange relationships from more traditional arm's length supply chain relationships. CSC enables integrated decision making as well as the joint product design, development, and modification activities. It follows that coordination establishes a strong basis for closer collaborative relationships (Gu *et al.*, 2017). As argued above, considering the positive effect of CSC positively on trust and SCA, and the positive effect of SCA on CA, we suggest that CSC will have an indirect effect on CA through the serially mediating role of TSC and SCA.

Hypothesis 4: Coordinated supply chain will be positively related to collaborative advantage through trust and supply chain agility.

Linking Supply Chain Agility to Firm Performance

SCA is referred to as the complex capability that is focal to a firm's competitive strategy particularly in uncertain settings (Gligor *et al.*, 2015). The ability of a company to face uncertainty and turn it into a competitive advantage is one of the most important success factors in today's global market. It enables firms to cope with unexpected difficulties, survive the unique threats of the business environment, and transform changes into an advantage as an opportunity (Gligor *et al.*, 2015; Mandal, 2015; Swafford *et al.*, 2006). Further, CA leverages the strategic benefits gained over competition through supply chain collaborative relationships (Cao and Zhang, 2010; Dyer, 2000). Cao and Zhang (2010) show that supply chain CA directly improves firm performance. By collaborating members of a supply chain can work as if they were part of the same firm, thus increasing the joint performance

of the participating firms. Through supply chain collaboration firms can gain strategic benefits over competitors through synergistic partnering. Engaging in collaborative relationships allows firms to diminish their transaction costs arising due to the hazards of opportunism (Daugherty *et al.*, 2006). The collaborating partners not only share the gains but also the risks jointly. Given that SCA has a positive influence on CA and that CA has a positive effect on firm performance we suggest that SCA will indirectly influence firm performance through the mediating role of CA.

Hypothesis 5: Supply chain agility will be positively related to firm performance through collaborative advantage.

Linking Trust to Firm Performance

Trust is an important determinant of positive performance in supply chain relationships. In Panayides and Lun's (2009) study, where the effect of trust on innovation and supply chain performance is investigated TSC is found to affect SCM performance positively. In addition, trust is considered to be a relational prerequisite for establishing collaborative relationships that when combined with the capability of timely response to the changing market, it translates into high performance in the supply chain (Panayides and Lun, 2009). Kwon and Suh (2004) found that the trust within supply chain relationships increases willingness of supply chain partners to invest more in building a high performing supply chain. More specifically studies show that TSC is the most important social lubricant that increases the relational capital of firms, decreases conflicts, and opportunism. Zhang and Huo (2013) show that trust increases supply chain integration that contributes to firms' improved performance outcomes. However, building trust that is critical for a differential firm performance is not an easy task. Studies show that the relationship between trust and firm performance is indirectly carried through collaborative efforts (Lambert *et al.*, 2004; Simatupang and Sridharan, 2005). Along these lines we suggest that trust will have an indirect effect on firm performance through the serially mediating roles of SCA and CA.

Hypothesis 6: Trust in supply chain will be positively related to firm performance through supply chain agility and in turn collaborative advantage.

A Serial Mediation Model of Coordinated Supply and Firm Performance

We referred to research on SCM to argue the network of indirect relationships between CSC, TSC, SCA, and CA, as well as their effect on firm performance, with one exception -the indirect effect of CSC on firm performance. The above discussed arguments regarding the indirect effects suggest how the effect of CSC is transmitted to firm performance through a network of indirect relationships between the relational and capability-based factors. Here we argue that CSC will have a positive effect on firm performance through the serially mediating roles of TSC, SCA and CA (Figure 1). Therefore:

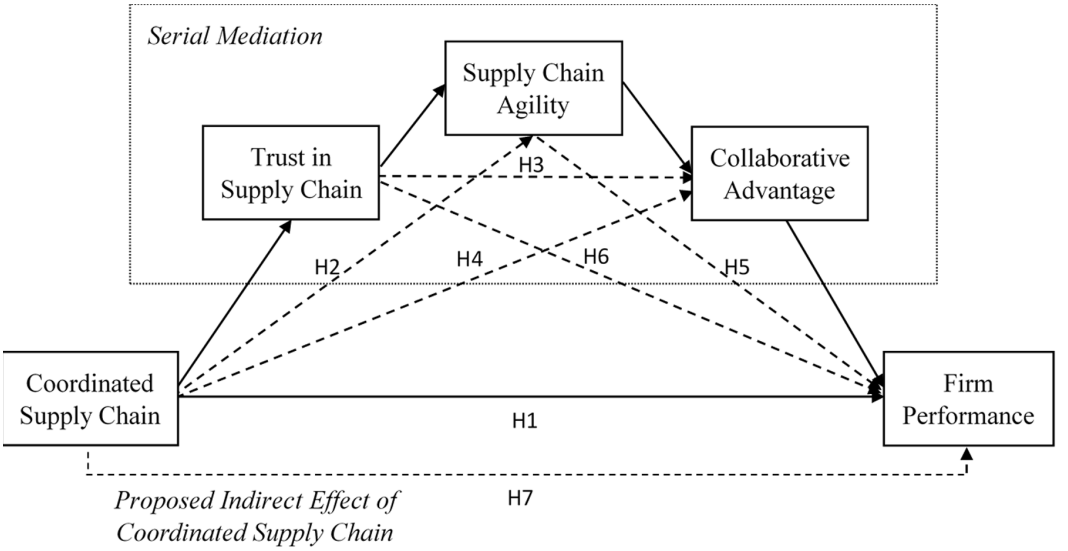
Hypothesis 7: Coordinated supply chain will be positively related to firm performance through the serially mediating effects of trust, supply chain agility and collaborative advantage.

DATA AND METHODS

Sample and Measures

In collecting the data, we employed a web-based survey methodology. The unit of analysis was the firm, and the respondents were senior managers with knowledge of supply-chain processes, and direct involvement in operational decision-making (Gligor *et al.*, 2015).

Figure 1. Serially Mediating Network of Indirect Relationships between Coordinated Supply and Firm Performance



The initial sample consisted of 200 firms that operated under International Standards Organization and European quality standards in the industrial area of Turkey, near Istanbul. These firms were selected to guarantee the presence of SCM practices as well as familiarity with the issues addressed in the surveys. The surveys were e-mailed to the general manager or managing director of each firm to ensure respondents' in-depth knowledge of the firms' SCM practices overall, and its relationships and capabilities. Of the 200 firms contacted, 117 agreed to participate in the survey study. Among these firms, we were able to gather usable data from 98 (83% response rate). Here, non-response bias was examined using the method suggested by Armstrong and Overton (1977). The adopted method tests for significant differences between early (i.e., those responses received before first follow-up letter) and late respondents (i.e., those received after first follow-up letter) by considering the late respondents a surrogate for non-respondents. Concurrently, the first 20 surveys received were compared to the last 20 received and the t-test using randomly selected measures was conducted, resulting in no significant difference between the two sets of responses.

In order to measure CSC, the scale developed by Day et al., (2015) was used. In order to measure trust in the supply chain, the trust scale developed by Doney and Cannon (1997) was used. To measure SCA the scale developed by (Swafford *et al.*, 2006) was adopted. In order to measure CA, the scale developed by (Cao and Zhang, 2010) was used. For firm performance, Akgün et al.'s (2007) scale, which was adapted from (Ellinger *et al.*, 2002) was used (Akgün *et al.*, 2007).

Construct Validity and Reliability

After data collection, measures were subject to a data purification process to assess their unidimensionality, validity and reliability (Fornell and Larcker, 1981). First, exploratory factor analysis (EFA) was conducted. Then a confirmatory factor analysis (CFA) was performed on the remaining 27 items (Anderson and Gerbing, 1988). CFA results indicated that the model was an adequate fit. Table 1 presents the results of the CFA.

To assess the reliability of each measurement scale, we calculated Cronbach's alpha coefficients, average variance extracted (AVE), and AMOS-based composite reliabilities presented in Table 2. The composite reliabilities exceed the threshold levels of .70 suggested by (Fornell and Larcker, 1981), and AVEs are above .50 as suggested by Malhotra *et al.*, (2006) indicating an adequate convergent

Table 1. Confirmatory Factor Analysis Results

Variables	Items	Standardized Factor Loadings
Trust in Supply Chain	TSC0720	0.846
	TSC0619	0.759
	TSC0114	0.530
Supply Chain Agility	SCA0428	0.779
	SCA0731	0.639
	SCA0630	0.572
	SCA0327	0.566
Coordinated Supply Chain	CSC0236	0.810
	CSC0135	0.765
	CSC0337	0.675
Offering Flexibility	OFX0354	0.759
	OFX0253	0.748
	OFX0455	0.740
	OFX0152	0.626
Business Synergy	BSN0156	0.806
	BSN0257	0.674
	INV0265	0.686
Innovation	INV0467	0.645
	INV0366	0.560
Size	SZE0269	0.788
	SZE0370	0.742
	SZE0168	0.670
	SZE0471	0.622
Sales	SLS1178	0.807
	SLS1077	0.800
	SLS0976	0.531
	SLS0673	0.512
$\chi 2$ (286) = 395.51		
$\chi 2$/df = 1.38		
CFI = .90, IFI = .91, RMSEA = .06		

p<0.01 for all items

validity. the AVE of SCA and CA are slightly lower than 0.50, the strong Cronbach's alpha coefficients indicates a strong reliability. Further, the squared root of average variance extracted (AVE) for each construct was greater than the latent factor correlations between pairs of constructs, providing support for discriminant validity (Fornell and Larcker, 1981).

Table 2. Construct Descriptive, Correlation and Reliability

Variables	1	2	3	4	5
1. Trust in Supply Chain	(.726)				
2. Supply Chain Agility	.515*	(.645)			
3. Coordinated Supply	.595*	.532*	(.748)		
4. Collaborative Advantage	.613*	.674*	.415*	(.583)	
5. Firm Performance	.621*	.552*	.472*	.73*	(.845)
Composite reliability	.765	.737	.791	.340	.833
AVEs	.765	.416	.559	.340	.714
Cronbach α	.725	.727	.790	.791	.842

*p < 0.01
Note: Diagonals show the square root of AVEs.

Hypotheses Testing and Results

To test our hypotheses, we first performed structural equations modeling (SEM) using AMOS 21.0, whereby we assessed the overall fit of our serial mediation model. This method was used to clarify direct and indirect relationships between variables in the conceptual model (Hair *et al.*, 2006, 2017). SEM also allowed us to eliminate measurement errors. Table 3 shows the results of our hypotheses tests. Our findings demonstrate that the conceptual model adequately fits the data, yielding a significant chi-square ($\chi 2(304) = 454.499$) and a chi-square per degree of freedom $\chi 2/df = 1.495$ below the 5-threshold value, indicating a reasonable fit. The goodness of fit index is above .90, also indicating a strong fit of the model with the data (CFI = .87, IFI = .87, and RMSEA = .07).

Table 3. Hypotheses Tests: Indirect effects of CSC on Firm Performance

Effects	Point Estimate	SE	Lower	Upper
Total Indirect Effects	.362	.084	.209	.539
CSC → TSC → FP	.129	.073	-.018	.275
CSC → SCA → FP	.007	.049	-.091	.112
CSC → CA → FP	-.056	.065	-.188	.068
CSC → TSC → SCA → FP	.003	.024	-.045	.056
CSC → TSC → CA → FP	.130	.045	.062	.239
CSC → SCA → CA → FP	.098	.046	.021	.200
CSC → TSC → SCA → CA → FP	.051	.027	.004	.111

Next we employed the procedure suggested by (Hayes, 2017) using the PROCESS macro as a plugin in SPSS 21.0 and choosing the Model 6 template which tests for the Serial-Multiple Mediation. Hayes (2017) suggests that the statistical significance of the indirect mediating effects of variables upon the bootstrap method is evaluated based on whether the point estimate of the mediating variable is zero within a 95% bias corrected and accelerated confidence interval (BCa CI). As such, a variable

with a no-point estimate within the zero-interval is considered statistically significant. This procedure involves several steps.

Step 1 involved the test of Hypothesis 1 where we regressed the independent variable CSC on the independent variable firm performance. The total effect of CSC on firm performance was significant. In addition, the direct effects were insignificant suggesting a potential indirect effect between CSC and CA through the mediating roles of TSC and SCA.

In Step 2 we checked the direct effects of the three mediators to each other. Accordingly, the direct effect between: a) TSC and SCA, b) TSC and CA, and c) SCA and CA were significant. This step also allowed the testing of Hypothesis 2, Hypothesis 3, and Hypothesis 4 where the serial-multiple mediating effects of the first two mediators (i.e., TSC, and SCA) were examined on the third mediator (i.e., CA). The significant direct effect of CSC on SCA (see Step 1-b) in the presence of TSC, suggests that there is no mediator role of TSC between CSC and SCA. Therefore Hypothesis 2 was not supported. Further, we found no support for the mediating role of SCA. Therefore Hypothesis 3 was not supported. The lack of a direct effect between CSC and CA in the presence of TSC and SCA suggests for the serial mediating roles of TSC, and SCA, thus supporting Hypothesis 4.

In Step 3 we checked the direct effects of the three mediators on the dependent variable firm performance. The direct effect of: a) TSC, and b) CA were significant however the direct effect of c) SCA was not significant. Since there is no significant direct effect of SCA on firm performance in the presence of CA we conclude that CA mediates the relationship between SCA and firm performance, supporting Hypothesis 5. On the other hand, there is a significant direct effect of TSC on firm performance showing that there are no mediating roles of SCA and CA between TSC and firm performance. Thus Hypothesis 6 was not supported.

In Step 4 CSC and all the mediating variables were simultaneously entered into the regression, examining the serial-multiple mediating roles of TSC, SCA, and CA. The results reveal that the direct effect between CSC and firm performance was not significant indicating for a serial mediation and supporting Hypothesis 7. In addition, the model explained 59% of the total variance in firm performance.

The statistical significance of the indirect effects was examined by estimating bias corrected confidence intervals (i.e., 95% CI) using bootstrap analysis (i.e., 10,000 bootstrap samples). The results are presented in Table 3. As shown, none of the three mediators alone are sufficient to mediate the effect of CSC on firm performance. When pairs of mediators are considered: a) TSC and CA, and b) SCA and collaborative supply chain serially mediate the relationship between CSC and firm performance. Further, when all the three mediators namely TSC, SCA, and CA are present in the model they have serial-multiple mediation roles between CSC and firm performance.

DISCUSSION AND IMPLICATIONS

Previous research on integrative frameworks of supply chain management has either focused on the operational aspects of developing supply chain capabilities such as agility, or behavioral aspects of creating supply chain relationships such as trusting and collaborative bonds. This study suggests that managers should expend effort in establishing relationships as well as capabilities rather than focusing on in either of the two. Managers' efforts to build relationships in its supply chain (e.g., trust and collaborative advantage) should be complemented with capabilities (e.g., coordination and agility) that replenish the firm with the unique resources to manage those relationships.

More specifically this study informs managers in two ways. First it shows which relational elements are essential in enabling the supply chain capabilities turn into performance outcomes. Second it shows that the four supply chain determinants are interdependent on each other and provides a roadmap as to how reorganize and relocate value-added capabilities in conjunction with relationships. Regarding the first, managers should focus on creating reliable and stronger relationships with their supply chain partners. Loosely coupled relationships inhibit firms' ability to implement their supply

chain capabilities. Most importantly this study shows managers that their firm's ability to reap the benefits of responding quickly to the changes in their environment or in their consumer expectations not only relies on the agility of their supply chain but the extent of trust between their supply partners, and the collaborative effort they achieve. Managers should invest more heavily on developing trust and collaboration within their supply chains. The second suggests that managers can only capitalize on their relational capital by building an agile supply chain. Neither trust nor agility alone can provide firms with a performance benefit. Managers should develop an integrated approach where trust and agility are developed in conjunction. Although trust and agility complement each other in achieving higher performance, managers should also seek to develop collaborative relationships. This research shows that coordination leads to collaboration. It suggests that when supply chain partners have aligned goals and interests, they will act together. However, if they believe their supply chain partner's ability to quickly respond to an emergency will impact them negatively, they will not collaborate. For managers this implies that all supply chain partners should have aligned goals for a successful collaboration. Managers should ensure that coordination is achieved through a fair and satisfactory distribution of economic incentives.

Our study is prone to several limitations. From a methodological perspective it is fair to acknowledge that the findings of this study are industry-specific (Jara-Figueroa *et al.*, 2018). Due to the sample used, the findings may be limited in terms of generalizability. Investment on capabilities and relationships with supply chain partners will vary across industries. From a theoretical perspective an alternative argument can also be raised. Research on cross-industry supply chain management would argues that supply chains are open systems where the actions of one firm influence other firms to act similarly and pass on to other to create a supply chain contagion (Li *et al.*, 2018; McFarland *et al.*, 2008). It implies that whether it is intentionally through influence techniques or not through reflexive imitation, firms in a supply chain copy each other's actions and supply chain contagion may happen. The supply chain contagion arguments render the discussion regarding whether the effects are industry-specific or cross-industry inconclusive. Along these arguments research can further examine whether the same pattern of serial mediation emerges across industries.

The findings of our study can benefit from several areas of additional research. First, a more nuanced understanding of additional relational and capability-based factors is needed. It is reasonable to suggest that there may be capabilities other than CSC and SCA, as well as aspects of relationships other than TSC and CA that can be incorporated in the supply chain that potentially improve the firm performance. Moreover, our study can also benefit from further advancements in the research on SCM that unveils potential moderators that may possibly interact with the mediators elaborated in our model. It would for instance be interesting to understand the suppressors of the indirect effect between CSC and firm performance. Could it be that possessing further capabilities suppresses the indirect effect of CSC on firm performance by leading firms to a competency trap if the firm is relatively large but enhances it if the firm is relatively small. Or could it be that investing in further relationships diminishes the indirect effect of CSC on firm performance by making the firm dependent on others if the partners are from the same industry but elevate it if the partners are from a different industry. These questions could open more avenues to understand the limitations of our current understanding of supply chains.

CONCLUSION

This study examined how firms can ensure effective SCM that translates the supply chain relationships and the firm capabilities into improved performance. Building on relational and resource-based views, we argued that supply chain capabilities and relationships complement each other in building an effective supply chain where firms achieve increased firm performance. The relational and capability-based factors namely coordinated supply chain (CSC), trust in supply chain (TSC), supply chain agility (SCA), and collaborative advantage (CA) are simultaneously examined in a serial mediation

model. The findings show that the effect of CSC on firm performance is carried by TSC, SCA, and CA. It is evident that internal capabilities and external relationships are complementary in achieving high performance. They allow supply chain partners to see the SCM as a zero-sum game where each party engages in a bilateral benefit seeking behavior for an enhanced firm performance.

Our results revealed three mediating relationships namely: (1) the serial mediating effect of TSC and SCA in the relationship between CSC and CA, (2) the mediating effect of CA between SCA and firm performance, and (3) the serial mediating effects of TSC, SCA, and CA in the relationship between CSC and firm performance. These results are consistent with past research. In particular, it is widely acknowledged that trust is the key relational mechanism that enhances the success of coordination among supply chain partners. It leverages a collaborative advantage by improving the information sharing, integration, and satisfaction among suppliers (Panahifar *et al.*, 2018). Indeed, Chen (2019) shows that trust among suppliers enhance supply chain agility by elevating close communication and consultations between suppliers. Trust is the basis of agility as it can increase the willingness of the suppliers to adjust to the changing environment faster and enables a better alignment between them. It suggests that trust operates in conjunction with agility and enhance the collaborative advantage of the supply chain by ensuring the synergy created through coordinated activities promotes sharing among the partners. Besides researchers showed that collaborative advantage may also allow firms to capitalize on their agility by establishing long-term and stable partnerships (Dubey *et al.*, 2021). Further our findings on the serial mediating effects of TSC, SCA, and CA corroborates past research findings. Panahifar *et al.*, (2018) indicate that building close relationships between supply chain partners and setting clear response strategies in the face of uncertainty can significantly increase the synchrony among supply partners resulting in an effective supply chain collaboration.

Our study contributes to the literature by suggesting that the relationship and capability facets of supply chain are complementary and investigate their indirect effects on firm performance. It allows us to understand the detailed network of serial mediation that transmit the effect of capabilities and relationships to firm performance. It also advances the research on SCM by unveiling the complementary roles of specific capabilities and relationships namely CSC, TSC, SCA, and CA. Our study is also among the first to question the role of capabilities or relationships alone by suggesting that investing in capabilities for a better coordination of the supply chain is not enough for increased performance, nor establishing trusting relationships, or agility can be the key for performance outcomes. They indeed need to be simultaneously present in supply chains and complement each other.

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