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Cross-Border Collaboration in European-Russian Supply Chains: Integrative Approach of Provision on Design, Performance and Impediments

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Abstract The primary goal of this research paper is to provide new insights in the research area of supply chain collaboration. The research aims to deliver novel evidence if supply chain collaboration has a positive effect on improvement of firm performance and what mediates and moderates such effects in the case of the contextual cross-border inter-firm (EU15-Russia) research design based on a survey questionnaire (quantitative). The empirical results showed that in a cross-border inter-firm context, as in the case of EU15-Russia, supply chain collaboration has a direct positive impact on improvement of operational performance and achieving collaborative advantages. Furthermore, these collaborative advantages have a bifurcated effect on the relationship between supply chain collaboration and improvement of firm performance. Conclusively, in market situations and environments with impediments in the form of collaborative barriers and cross-border business barriers the positive effects of supply chain collaboration are amplified and strengthened due to unfavorable environmental dissimilarities in the market which makes it more difficult and harder to obtain them.

Keywords: Supply chain collaboration, collaboration barriers, firm performance, operational performance, collaborative advantage, cross-border business barriers, mediation, interaction moderation.

1. Introduction

International trade and efficient supply chain management and operations are a valid and essential method towards firm growth, increase of sales and firm performance, and to reach higher levels of internationalization for many companies in today's globalized world. Disruptions of the status quo, changes in technology, and globalization of products and services have resulted in an increase of dynamic markets and uncertain environments. Nowadays, customers are better informed, have greater access to a wider choice of products, and have access to new products emerging at a faster pace. These developments and alterations in the current situation have significant consequences and implications on the network and design of supply chains and business operations in general, and its influence on the value chain of supplier-buyer dyads (Wuyts and Geyskens, 2005). The everlasting fierce competition in global markets, the introduction of products with shorter product life cycles (PLCs), and the heightened demands of customers have forced firms to invest in resources and to pay more attention to stronger mutually beneficial relationships and supply chains. (Deloitte, 2012). Facing and dealing with uncertain developments and dynamic environments, firms are striving to achieve greater collaboration in

supply chains to leverage the resources and knowledge of their suppliers and buyers (Fawcett and Magnan, 2004; Lejeune and Yakova, 2005). Therefore, in today's global market, firms no longer compete as independent entities but rather as integrative parts of collaborative networks, grouping entities for allowing them to seize opportunities and possibilities to which a single entity could not achieve alone (Msanjila and Afsarmanesh, 2010).

To meet the requisites and the demands of the current markets and customers, firms try to develop value-added processes that deliver innovative, high-quality, low-cost products on time, with short cycle times and greater responsiveness than ever before. In order to do so, firms are transitioning from transactional supplier relationships to more transparent and collaborative relationships designed and constructed to achieve mutually beneficial outcomes (Deloitte, 2012).

Hence, firms began to perceive that it is not enough to improve efficiencies within their organization alone. Firms are looking outside their internal organizations for opportunities to collaborate with supply chain members to ensure that the supply chain is efficient and responsive to dynamic market's needs. The future belongs to integration and collaboration of supply chains. As business increasingly relies on other firms, especially in industrial and consumer products industries, the need to effectively manage external relationships is of considerable importance. The ability to achieve effective collaboration becomes a strategic imperative in the era of information and globalization.

The debates in contemporary supply chain management (SCM) literature centers around supply chain collaboration (SCC) (Siew et al., 2012; Cao and Zhang, 2011; Christopher, 2011; de Leeuw and Fransoo, 2009) and its impact on firm performance (Stank, Keller and Daugherty, 2001). Despite the success stories (Hofman and Aronow, 2012), SCC inconsistencies have also been reported by researchers and scholars (Bragg et al., 2011). Hence, the key question of whether SCC has a specific positive impact on firm performance is still a subject of debate (Gunasekaran and Ngai, 2012).

These inconsistencies lead to the purpose and objective of this research paper to contribute to the SCC domain by testing SCC peculiarities of theoretical concepts in the existing latest academic literature by means of SCC design and its relationship and effects on operational performance and firm performance. The emphasis of this study is to research how these theories work in practice in a specific cross-border inter-firm supply chain context and how impediments in the form of collaboration barriers and cross-border business barriers moderate and mediate the effects of SCC on operational and firm performance.

2. Inception and Ascent of Supply Chain Collaboration

In today's business world, which is characterized by globalization, increased customer responsiveness, customer expectation, channel integration and advances in information and communication technologies under increasing uncertainty (Schoenherr, 2009), firms have no other option than participating in a supply chain. Thereupon, collaboration between firms plays a significant role for improving firm performance and to capitalize on sustained competitive advantage (Grant, 2012; Gunasekaran and Ngai, 2012; Hassini et al., 2012; Cao and Zhang, 2011), which then can help and improve economic and financial development (Mefford, 2011).

When talking about collaboration, a substantial amount of previous scholars and researchers cite mutuality of benefits, rewards and risk sharing together with the exchange of information as the foundation of collaboration (Stank et al., 1999; Barratt and Oliveira, 2001). Considered as an establishment for governing organizations in firms (Stein, 1982), it is believed that collaboration in supply chains could realize exceptional benefits (Mena et al., 2009).

In conclusion, it can be said that collaboration in supply chain means that different firms involve themselves in the flow of products and information from raw materials to end consumer in order to fulfill customer needs. The areas and functions in which firms can collaborate are, for instance, supply chain design (procurement, transportation and distribution); manufacturing (planning, inventory management, product design and development) and order fulfillment (including order processing, sales, customer service and demand management) (Anderson and Lee, 2001; Ellaram, 1995; Horvath, 2001).

Collaboration in business can be found in both inter-firms and intra-firms and ranges from simple partnership to complex multinational corporation. The importance of inter-firm coordination and integration are examined by most scholars and researchers as key tasks for SCM. Coordination and integration is achieved by collaboration among actors in the supply chain. In fact, Horvath (2001) argues that collaboration is a prerequisite to achieve SCM; without collaboration, there can be no SCM. There are several ways to categorize SCC (Simatupang and Sridharan, 2005). Holweg et al. (2005) classified SCC into four types based on inventory and planning coordination (Mena et al., 2009).

On the other hand, Barratt (2004) distinguishes between internal and external collaboration and whether it is vertical or horizontal. Vertical collaboration performs both internally or along the supply chain. In case of external collaboration, along the supply chain, it means working more closely with trading partners to improve each other's efficiency for collective advantages and benefits. The focus is on giving and gaining visibility into each other's processes so that each of the supply chain members can do a better job. The study in this research paper only deals with external collaboration in a vertical direction. Thus, external inter-firm vertical collaboration.

3. Supply Chain Collaboration Synopsis

As the purpose of collaboration is to optimize profitability, supply chain members need to plan, execute, and control key decisions related to defining and delivering products to the end customers. By practicing and executing SCC dimensions, firms have the opportunity to obtain and achieve collaborative advantages over its competitors. In addition, the dimensions of SCC and the achieved collaborative advantages are expected to have positive effects, consequences and outcomes on both operational performance and firm performance. The direct relationships between these constructs may be mediated through these collaborative advantages and moderated by the constructs collaboration barriers and cross-border business barriers, which are expected to have a negative direct main effect on its respective dependent performance variables.

3.1. Supply Chain Collaboration Dimensions

In SCM there are different dimensions of collaborative approaches such as information sharing, incentive alignment and decision synchronization (Holweg and Pil, 2008; Akintoye et al., 2000; Spekman et al., 1998). SCM and collaborative performance system (CPS) requires information sharing, decision synchronization, and incentive alignment to monitor and improve actual firm performance. Information sharing reports data about performance status. Decision synchronization allows supply chain members to optimize performance metrics through effective joint decision making. Incentive alignment employs performance metrics to construct benefit and cost sharing agreements. Integrated supply chain processes provide feedback about the actual benefits of collaboration based on the status of physical supply chain events.

Information sharing refers to the access to private data in supply chain members' information systems enabling monitoring of the progress of products as they pass through each process in the supply chain (Simatupang and Sridharan, 2002). This activity covers data acquisition, processing, representation, storage, and dissemination of demand conditions, inventory status and locations, order status, transparency of costs, and performance status. Visibility of key performance metrics and process of data enables the participating supply chain members to obtain the bigger picture of the situation which includes important factors for making effective decisions. Effective decisions enable supply chain members to address product flow issues more quickly, and thereby allowing more agile demand planning to take place. Several criteria, such as relevancy, accuracy, timeliness, and reliability, can be used to judge the contribution of information sharing to the integration of supply chains.

The supply chain members are interested in the utility of information sharing rather than information for its own sake. What makes information sharing valuable to supply chain members is eventually the ability to make better decisions and to take actions on the basis of greater visibility (Davenport et al, 2001). Core guidelines are that visibility should inform action, and that action becomes visible if supply chain members understand better the underlying principles that link integrated information and performance drivers. Thus, information sharing generally facilitates decision synchronization through providing relevant, timely, and accurate information required to take effective decisions about supply chain planning and execution. It enables participating supply chain members to make use of integrated information to help fulfill demand more quickly with shorter order cycle times. For example, demand and inventory visibility can be used to eliminate stock-outs by accurately replenishing fast-movers (Fisher, 1997).

In connection with supply chain performance, information sharing provides data about the progress of collaboration and performance status to supply chain performance. Supply chain managers and professional can use this data to evaluate and construct new targets and performance metrics that are relevant to new and volatile market dynamics and situations. In conjunction with incentive alignment, information sharing provides visibility about the status of incentive scores of supply chain members. It also reveals the actual link between performance measures and incentives. Finally, integration of supply chain processes provides primary useful field data about product, process, and performance status.

Decision synchronization can be defined as the extent to which supply chain members are able to orchestrate critical decisions at planning and execution levels

for optimizing supply chain profitability (Simatupang et al., 2002). The activity covers constructing joint decision making processes, including reallocating decision rights in order to synchronize supply chain planning and execution that seeks to match demand with supply. The method to assess effective decision synchronization hinge on the effects of accurate response towards fulfilling customer demand and supply chain profitability (Corbett et al., 1999). Face-to-face meetings and virtual discussion to take certain decisions are examples of possibilities to implement decision synchronization.

The significance of decision synchronization is embedded in the fact that supply chain members have different decision rights and expertise about supply chain operations. For example, a retailer may have the decision right to determine order quantity but not order delivery. In most of the situations supply chain members have conflicting criteria in making decisions resulting in solutions that are less optimal for the overall and whole supply chain (Lee et al., 1997). Supply chain members need to coordinate critical decisions that affect the way they achieve better performance. The use of joint decisions depends on the incremental sales that can be realized and the significant amounts of inventory costs that can be reduced from this joint decision making. Joint decisions may include sales and order forecasts, inventory, replenishment, order placement, order delivery, customer service level, and pricing. For example, vendor managed inventory (VMI) provides the supplier with decision rights to determine the frequency and quantity of orders that need to be delivered. This scheme enables the supplier to match supply with demand from the supply chain wide perspective and thereby improves profits for both supply chain members.

Decision synchronization provides feedback to supply chain performance concerning how performance metrics guide the supply chain members to make effective decisions. In relation to information sharing, decision synchronization aids and enhances information sharing to identify what kind of relevant data should be collected and transferred to the decision makers. In supporting incentive alignment, decision synchronization provides justification for incentive alignment to construct appropriate incentive schemes, because different supply chain members are responsible for different levels of decision making. Finally, decision synchronization helps supply chain members to carry out productive actions associated with integrated supply chain processes such as replenishment, transportation, and customer service.

Incentive alignment refers to the process of sharing costs, risks, and benefits among the participating supply chain members (Simatupang and Sridharan, 2002). This scheme motivates supply chain members to act in a consistent manner with their mutual strategic objectives, which includes making decisions that are optimal for the overall supply chain and revealing truthful private information. It covers calculating costs, risks, and benefits as well as formulating incentive schemes such as pay-for-performance and pay-for-effort. The contribution of incentive alignment can be judged based on compensation fairness and self-enforcement. Compensation fairness ensures that aligned incentives motivate supply chain members to share properly and equally the loads and benefits that result from collaborative efforts. An effective incentive scheme means that supply chain members are self-enforcing for aligning their individual decisions with the mutual objective of improving total profits. Expert systems, activity-based costing, and web-based technology can be used to trace, calculate, and display incentive scores (Kaplan and Narayanan, 2001; Simatupang and Sridharan, 2002).

The theory behind incentive alignment assumes that an individual supply chain member tends to act in a certain way based on the expectation that the act will result in mutual benefit and on the attractiveness of that benefit to individual supply chain members (Simatupang et al., 2002). An appropriate incentive scheme can be formed in a number of ways (Simatupang and Sridharan, 2002). Pay-for-effort is a scheme that links payment and effort. This assumes that rewarding effort would motivate the individual supply chain member to expand a given amount of effort which relates to a certain level of performance. Pay-for-performance is a scheme that links payment and performance. This scheme assumes that rewarding performance will motivate the individual supply chain member to achieve a particular level of performance. The supply chain members accept the importance of the potential rewards that can be obtained from collaboration although costs need to be shared. The interaction of incentive alignment with other SCC dimensions and indicators is very profound as it motivates supply chain members to align their actions to the mutual purpose of collaboration that would also enhance their individual profitability. Incentive alignment links performance scoreboards from supply chain performance to incentives. The more transparent the linkages between performance and incentives, the more effectively the given incentives are able to motivate the desired and required behavior. Information sharing is required to signal supply chain members that incentives are available, timely and proper. In conjunction with decision synchronization, incentive alignment provides incentives to motivate supply chain members to make effective decisions that reinforce the desired level of performance.

Recent research have focused on the development of SCC models that reflect the latest understanding of collaboration which includes four new dimensions in addition to the aforementioned three (Cao and Zhang, 2011; Nyaga et al., 2010; Ramanathan et al., 2011). Latest research topics on SCC dimensions have shown that the most dominant SCC dimensions consists of information sharing (Manthou et al., 2004), goal congruence (Angeles and Nath, 2001), decision synchronization (Stank et al., 2001), resource sharing (Sheu et al., 2006), and incentive alignment (Simatupang and Sridharan, 2005) among independent supply chain members. However, the study in this research paper defines SCC dimensions as the following seven intertwined components and indicators: information sharing, goal congruence, decision synchronization, incentive alignment, resources sharing, collaborative communication, and joint knowledge creation.

These seven dimensions of SCC are expected and ought to be interwoven with each other. Each of all the dimensions and components of SCC add value by reducing response time, leveraging resources and improving innovation. Besides the aforementioned initial three core SCC dimensions, contemporary research has identified the following SCC dimensions and components, namely goal congruence, resource sharing, collaborative communication and joint knowledge creation.

Goal congruence between supply chain members is the extent to which supply chain members notice their own goals and objectives are achieved and satisfied by accomplishing supply chain objectives. It can be said that it is the degree and level of goal agreement among supply chain members (Angeles and Nath, 2001). Supply chain members either feel that their objectives fully coincide with those of the supply chain, or if there is discrepancy, that their goals and objectives can be realized as a direct result of working toward the goals and objectives of the supply chain as a whole (Lejeune and Yakova, 2005).

Resource sharing indicates the process of leveraging capabilities and assets and investing in it with supply chain members. From the viewpoint of resource based view (RBV) theory, resources include physical resources, such as manufacturing equipment, facility, and technology (Harland et al., 2004). Practices of SCC models such as VMI are used to allow suppliers to assess stock level data and take the required replenishment actions (Lamming, 1996).

Collaborative communication encompasses the contact and message transmission process among supply chain members through frequency, direction, mode, and influence strategy. Tight and close inter-firm relationships are generally open, frequent, balanced, two-way and mutual, and multilevel communications (Goffin et al., 2006). On the contrary, Mohr and Nevin (1990) highlighted patterns of communication from a mechanistic perspective. Both provide evidence that collaborative communication has higher frequency, more bidirectional flows, better informal modes, and increased indirect influence. Frequency relates to the amount of contact between supply chain members. Direction concerns to the movement of communication up and down the supply chain (Mohr and Nevin, 1990; Prahinski and Benton, 2004). Mode of communication refers to method that is used to transmit information. Informal communication covers the degree and level to which communication among supply chain members is formed through a spontaneous and non-regulated way. While direct influence aims to change behavior by requesting specific actions from its supply chain members using recommendations, promises, and tends towards legal obligations, indirect influence focuses to change the supply chain members' belief and attitudes about their desires of intended behavior without explicit commanding or threats (Mohr and Nevin, 1990).

Joint knowledge creation is the extent to which supply chain members develop a better understanding of the market and exogenous factors that influence it by collaboration (Malhotra et al., 2005). According to Harland et al (2004), there are two types of knowledge creation activities: knowledge creation such as search and acquire new and relevant knowledge, and knowledge exploitation such as comprehend and apply knowledge. The capture, exchange, and absorption of knowledge among supply chain members allow innovation and enhance it to realize long-term competiveness (Harland et al., 2004). Supply chain members should not only be involved in creating and building a knowledge framework, but also be engaged in interpreting knowledge, which allows firms to create added value through developing new products, building brand image, and satisfying customers' needs (Kaufman et al., 2000). Recent research has shown that the value of SCC is not only limited towards efficiency improvements, moreover it has strategic benefits, which aids the value chain respond to competition and increasingly satisfy the needs of the customers (Sobrero and Roberts, 2001).

SCC accelerates a firm's ability and capability to capitalize swiftly on market opportunities (Uzzi, 1997). As an example, problem solving increases the velocity that products are introduced to the market by resolving and overcoming thresholds at a faster pace. Collaboration between supply chain members can eventually lead to unique sources that enhance new product ideas (Kalwani and Narayandas, 1995). Shared resources between supply chain members could result in reduction of sub-additive cost, or complementary resources, which increases super-additive value (Tanriverdi, 2006). SCC for resource sharing and replenishment will result in

significant cost reduction in supply chain processes and activities. Such sources of business synergy can lead to competitive advantage outcomes.

Furthermore, information sharing among supply chain members guarantees on-time replenishment (Cachon and Fisher, 2000). It also supports supply chain members to be involved and engaged in inventory pooling and joint replenishment activities (Ramanathan, 2012). Overall, adequate information technology is reliant on the associated benefits of supply chains such as cost reduction or sales incentives (Toktay et al., 2000). Therefore, complementary to collaborative planning activities and collaborative decision making process, the activities and execution of the embedded dimensions and components of SCC help to improve and optimize supply chain processes.

3.2. Collaborative Advantages

SCC relates to the desired synergy outcomes of SCC activities that could not have been realized by a firm individually (Vangen and Huxham, 2003). Collaboration between supply chain members has the prospect to increase the size of joint benefits and to give each of the supply chain members a share of greater gain that could not be generated by a firm alone. The value that is created by collaboration could be in the form of either cost savings and/or cost avoidance, enhanced capacity and flexibility for collective actions, better decisions making and a surge in revenue by resource synergy and innovation through the combination and interpretation of ideas. Therefore, collaborative advantage comprises the following five dimensions: process efficiency, offering flexibility, business synergy, quality and innovation.

Bagchi and Skjoett-Larsen (2005) have shown that a firm's collaboration process with other SCC partners is cost competitive among its competitors. This form of process efficiency could be information sharing, joint logistics process, joint product development process or joint decision making process. Hence, process efficiency is a rate of success and a determinant influencing factor on a firm's profit (inventory turnover and operating cost). The benefits of collaboration include cost reductions and revenue enlargements (Lee et al., 1997).

Offering flexibility points out to how a firm's supply chain correlates and adapts to changes in product or service offerings, volume, speed, features, and specifications, in reaction to environmental and business changes. Generally, it is also called customer responsiveness based on the existing literature (Kiefer and Novack, 1999; Holweg et al., 2005). Offering flexibility encompasses the ability of the collaborating firm to swiftly change process structures or to accustom information sharing process for altering the features of a product (Gosain et al., 2004). Nowadays, firms pay more and more attention to customers and an increasing amount of firms use customer input at the design stage resulting in better product acceptance (Bagchi and Skjoett-Larsen, 2005).

Furthermore, supply chain members combine complementary and related resources to obtain considerable benefits in the form of business synergy. Ansoff (1988) found that synergy can lead to a combined return of resources that is greater than the sum of individual parts. This collaborative effect results from the process of making more efficiently use of resources in the total supply chain, including physical assets such as manufacturing facilities and intangible assets such as customer knowledge, technological competence, and organizational culture (Itami and Roehl, 1987).

It is expected that firms that are able to respond and adapt quick and agile to customer demand with high quality products, innovative design and perfect after sales service supposedly build customer loyalty, increase market share and finally receive higher profits. On the other hand, Garvin (1988) mentions eight dimensions of quality, namely: performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality, which are comprehensive but measures for each are difficult to establish and to create. By reason of shorter PLCs, firms have to innovate frequently and in small increments (Handfield and Pannesi, 1995; Kessler and Chakrabarti, 1996). In order to innovate, firms work jointly with their supply chain members in introducing new processes, products or services. Firms improve their ability to engage in process and production innovation by carefully managing their relationships with suppliers and customers (Kaufman et al., 2000). Firms have the opportunity and possibility to improve absorptive capacity which could lead to fast and frequent introduction of new products by systematically joint creativity capacities, joint organization learning, knowledge sharing and joint problem solving between supply chain members.

The imperative condition for SCC is that supply chain members are capable to increase the total gain due to synergy (Simatupang and Sridharan, 2005). Supply chain members will obtain financial benefits by enhancing responsiveness (Fisher 1997). Another advantage of SCC is to achieve cost savings and reduce and terminate non-value added activities and/or duplication of efforts (Lambert et al., 2004). The cooperation between supply chain members can foster greater knowledge and result in synergetic benefits. Initially, firms will obtain operational improvements through SCC such as higher order fulfillment, lower total logistics costs and less stock-out. In the long-term horizon, SCC will be beneficial through more competitive products and shorter time-to-market that will transform into possible competitive advantages and increased profits (Stuart and McCutcheon, 1996). Hence, collaborative advantages will eventually lead to improved operational performance and firm performance which comprises on how a firm fulfills its operational and financial goals compared with other firms (Yamin et al., 1999; Barua et al,. 2004; Li et al., 2006).

Besides, Frohlich and Westbrook (2001) observed that firms who have implemented an effective SCC enjoy the largest rates of performance improvement across multiple marketplaces (market share and profitability), productivity (cost and lead-time) and non-productivity (customer service, quality and delivery) measures.

3.3. Operational and Firm Performance

SCC has been linked to enhance and boost firm performance (Simatupang and Sridharan, 2004; Squire Cousins, Lawson and Brown, 2009; McLaren et al., 2002). By working with other supply chain members, firms are expected to multiply the outcomes of the effort from working alone (Wilding, 2006). Such outcomes and results consist out of a better level of responsiveness and service level improvements from their SCC programs (Holweg et al., 2005). One more expected benefit is the reduction of supply chain costs like those that reflect with inter-firm transactions, inventory and production (McLaren et al., 2002).

Many studies have concluded that a higher degree of SCC can improve firm performance (Nyaga et al., 2010; Robson et al., 2008) especially on their logistics activities (Ha et al., 2011). Further, success of collaboration could also lead to more collaborative actions in the future (Ramanathan and Gunasekaran, 2012). Moreover,

higher levels of collaboration could lead to elimination of bullwhip effect, inventory reduction, better transport capacity utilization, and risk mitigation (Holweg et al., 2005).

Financial performance and operational performance can be measured in terms of firm performance (Chen and Paulraj, 2004). In addition, firm performance can also be viewed through the lens of service effectiveness and cost effectiveness (Richey et al., 2010). Performance can be also measured by cost, quality, delivery and flexibility (Krause et al., 2007). In general, supply chain performance measures include: order lead-time, inventory levels, time-to-market, quality, customer service, and flexibility (Bhatnagar and Sohal, 2005; Gunasekaran et al., 2001). Bagchi et al. (2005) measured performance in eight dimensions, namely: order fulfillment lead-time, order fill rate, production flexibility, total logistics costs, return processing costs, inventory days of supply/inventory turnover rate, on-time delivery, and rate of returns. Generally, logistics performance is a key determinant for maintaining relationship with the other supply chain members (Glenn Richey et al., 2010; Ellinger et al., 2006, 2000; Beamon, 1999). Hence, supply chain members gravitate to be more satisfied when their performance of logistics is improved (Gunasekaran et al., 2001).

Furthermore, according to Porter (1980), the two generic competitive strategies are cost advantage and differentiation. Cost advantage can be realized through reducing costs, while on the other hand differentiation increases profitability by providing increased levels of customization and service. By means of efficient and effective order capture, product availability, on-time delivery, information transparency and improved responsiveness, a firm can increase its level of service. Further, SCC creates elements of differentiation by means of customer value which is formed by superior service (Christopher and Peck, 2003). In addition, there is a positive relationship between high service levels and growth of sales volume and customer retention (Parasuraman et al., 1991; Mentzer et al., 1999; Ray et al., 2004). Therefore, this stipulates that SCC should be the silver bullet for reducing costs without negatively impacting customer service and improving service without exponentially increasing costs. Increase of operational performance and efficiency by means of cost savings, inventory reduction, planning accuracy and improved responsiveness could eventually lead to increase of sales and reduction of costs. Supplementary, successful SCC and firm performance can be determined in terms of market share and satisfaction of SCC (Mishra and Shah, 2009).

3.4. Collaboration Barriers

Although, according to the existing literature, SCC amongst independent firms often result in improvements and larger benefits from effectively satisfying end customers' needs, lack of awareness about the existence of barriers of collaboration burdens to grasp the benefits of it. Based on recent literature, there are several identified SCC barriers that have a negative direct effect on realizing collaborative advantages by SCC. The final list of collaborations barriers was partially adapted from the study of Ramesh, Banwet and Shankar (2009).

In most of the supplier-buyer dyads, trust is acknowledged as an essential element to bind independent firms (Agarwal and Shankar, 2003). Trust can only exist when firms believe that its supply chain member is reliable and benevolent (Heikkila, 2002). On the other hand, Chung et al. (2008) mentions that human relations like trust or long-term orientation are a tremendous important aspect in relationships.

Thus, according to Cetindamar et al. (2005), a lack of trust is the core argument behind the difficulties in establishing collaboration between firms.

In order to achieve success, when firms decide to collaborate with each other, it is important to educate and train employees about awareness of SCC and its core principles to exploit collaboration and to improve business processes to realize the advantages. A severe lack of understanding and awareness of SCC among the employees could result in significant diminishing of positive spillover effects of collaboration advantages (Ramesh, Banwet and Shankar, 2009).

Besides trust, commitment to collaboration and to relationship is also considered to be an important aspect as an enduring ambition and longing to maintain a fruitful relationship (Moorman et al., 1992). Morgan and Hunt (1994) concluded that commitment was the core component to successful long-term relationships.

The inability of vision and understanding of the supply chain is also a barrier to effective collaboration. As mentioned in the Introduction chapter, supply chains are getting more sophisticated which results in limited view and understanding of the entire and complete supply chain. Individual firms focus on their own functional areas and fail to recognize how collaboration with others, both inside and outside the firm, will improve overall performance (Mentzer et al., 2000). The inter-firm comfort levels of collaboration could increase as managers begin to understand the importance of integrated business processes and commit to working for the betterment of the whole supply chain.

The depth of collaboration also dependents on the supply chain members' technological capabilities. According to Kwan (1999), in cases that supply chain members are incapable to exchange information electronically due to low IT resources it hinders and forms barriers and thresholds to implement and optimize collaboration.

Information sharing is determined as a core requisite for collaboration. Multiple studies (Bowersox et al., 2003; Cannon and Perreault, 1999) pointed out that successful supplier-buyer relationships are connected with high level of information sharing. Low level and inadequate information sharing could lead to low level of trust and commitment that harms the efforts of collaboration.

For a long-term relationship focus between supplier-buyer, risk and reward sharing is an important factor. According to Spekman et al. (1998), firms collaborate to share risks and benefits in order to create competitive advantage. In addition, Kaufman et al. (2000) and Kotabe et al. (2003) emphasized that it is essential that channel participants in a supply chain share risks and rewards.

The lack and inconsistency of appropriate performance metrics and measurement systems results in the barrier for supply chain alignment between supply chain members (Fawcett and Magnan, 2001). This could lead to conflicts, because firms are focusing on improving their key performance indicators (KPI) and metrics rather than the performance metrics of the whole supply chain performance.

In conclusion, lack of awareness about the existence of barriers of collaboration hinders to realize the benefits of collaboration. Therefore, it is important to know and identify the barriers of collaboration so that the collaborative decision makers can focus on how to overcome and manage these collaboration barriers in order to obtain higher benefits out of SCC.

3.5. Cross-Border Business Barriers

Cross-border barriers can be defined as the attitudinal, structural, operational and other constraints that hinder a firm's ability to initiate, develop or sustain inter-

national operations (Koksal and Kettaneh 2011). Therefore, in the context of this paper, which covers cross-border SCC, it is important to achieve a better understanding of such barriers since these barriers waste resources of firms and threaten the efficiency, effectiveness and profitability of a firm's operations.

The cross-border business barriers that were the most suitable and appropriate for the study in this research paper were used and included, which are partially derived adapted from current literature, such as Leonidou (2011). This careful selection of cross-border business barriers, based on their relevance in context of the study in this research paper, are depicted in the table below.

Table 1: Frequent indicated cross-border business barriers

Cross-border business barrier	Authors
Strong international competition	Leonidou (2000); Da Silva et al. (2001); Ortega (2003); Ahmed et al. (2004); Altintas et al. (2007); Koksal et al. (2011); Mpinganjira (2011)
High business risk	Leonidou (2000); Kneller et al. (2011)
Different customer culture	Leonidou (2000); Altintas et al. (2007)
Unfamiliar foreign business practice	Leonidou (2000); Altintas et al. (2007)
High tariff and non-tariff barriers	Leonidou (2000); Ahmed et al. (2004); Altintas et al. (2007); Koksal et al. (2011)
Unfavorable foreign exchange rates	Leonidou (2000); Da Silva et al. (2001); Kneller et al. (2011)
Lack of government assistance	Leonidou (2000); Ahmed et al. (2004); Altintas et al. (2011)
Restrictive rules and regulation	Leonidou (2000); Mpinganjira (2011)
Transportation difficulties	Leonidou (2000); Mpinganjira (2011); Kneller et al. (2011); Koksal et al. (2011)
Bureaucratic requirements	Leonidou (2000); Altintas et al. (2007); Mpinganjira (2011)
Limited information about foreign markets	Leonidou (2000); Mpinganjira (2011); Koksal et al. (2011)

Source: Partially adapted from Leonidou (2011)

4. Hypothesis Development

From the theoretical background and the literature review, it has become apparent that there are several prominent dimensions in SCC that are pivotal in the integrative and integral process. By practicing and executing SCC dimensions, firms have the opportunity to obtain and achieve collaborative advantages over its competitors. In addition, the dimensions of SCC, and the achieved collaborative advantages, are expected to have positive consequences and outcomes on both operational performance and firm performance. The direct relationships between these constructs may be mediated through these collaborative advantages and moderated by the constructs collaboration barriers and cross-border business barriers, which are expected to have a negative direct main effect on its respective dependent performance variables.

The developed conceptual SCC framework suggests that supply chain members need to embrace SCC dimensions and to conduct and perform the dimensions of SCC properly. If a firm accomplishes to do so, the properly executed SCC dimensions will lead to efficient and effective collaborative planning activities, collaborative decision making processes and collaborative advantages, which in its turn will have a positive direct and indirect impact on firm performance and operational performance.

Based on the results of the literature review, several relevant latent constructs were identified and defined, namely: supply chain collaboration dimensions (SCCD), collaborative advantage (CA), operational performance (OP), firm performance (FP), cross-border business barriers (CBBB) and collaboration barriers (CB). Furthermore, each of the latent construct consists out of several pivotal and key variables and items. The latent construct SCCD has 7 variables, CA has 5 variables, OP has 5 variables, FP has 4 variables, and CBBB and CB have 9 variables. The identification of the latent constructs were converged to the following formulated hypotheses per latent construct.

Supply chain collaboration dimensions (SCCD):

H1a: Supply chain collaboration dimensions have a significant positive direct effect on operational performance

H1b: Supply chain collaboration dimensions positively impacts collaborative advantage at a significant level.

H1c: Supply chain collaboration dimensions have a positive significant direct impact on firm performance.

Collaborative advantage (CA):

H2a: Collaborative advantage has a positive direct significant impact on operational performance.

H2b: Collaborative advantage has a direct positive significant influence on firm performance.

H2c: Collaborative advantage positively mediates the positive relationship between supply chain collaboration dimensions and operational performance.

H2d: Collaborative advantage positively mediates the positive relationship between supply chain collaboration dimensions and firm performance.

Operational performance (OP):

H3: Operational performance has a direct positive significant impact on firm performance.

Collaboration barriers (CB):

H4a: Collaboration barriers positively moderate the positive effect and relationship between supply chain collaboration dimensions and operational performance.

H4b: Collaboration barriers positively moderate the positive effect and relationship between supply chain collaboration dimensions and collaborative advantage.

H4c: Collaboration barriers positively moderate the positive effect and relationship between supply chain collaboration dimensions and firm performance.

Cross-border business barriers (CBBB):

H5a: Cross-border business barriers positively moderate the positive effect and relationship between collaborative advantage and operational performance.

H5b: Cross-border business barriers positively moderates the positive effect and relationship between collaborative advantage and firm performance.

The identified theoretical latent constructs were conceptualized to study the effects and relationships. The conceptual SCC hypotheses framework that was conducted for the study in this research paper, including the relationships between the different constructs, mediation and interaction moderations, is visualized in Figure 1.

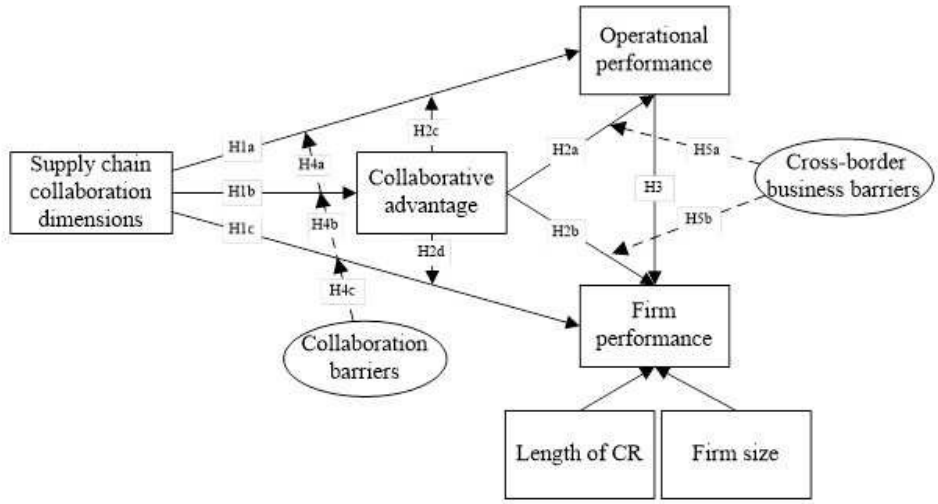


Fig. 1: Conceptual supply chain collaboration hypotheses framework
Source: partially adapted from Ramanathan and Gunasekaran (2012); Zhang and Cao (2011)

5. Research Approach and Design

The study in this research paper is considered to be explanatory and deductive, concerning the latent constructs in the conceptual SCC framework. According to Hussey et al. (1997), deductive research is a study in which a conceptual framework and theoretical structure is developed and then tested by empirical observation. For this reason, the deductive method is referred to as moving from the general theoretical concepts and theories of SCC in the existing literature to the particular usefulness in practice for supply chain managers, professionals and practitioners.

In this study the conceptual SCC framework was examined by means of a web-based survey questionnaire. Analyses were performed after collecting and compiling all the data. The literature on SCC inception, design, advantages, operational performance and firm performance, as well as on impediments and barriers, was reviewed first in order to formulate the hypotheses for this study.

5.1. Scope and Delimitations

The geographical scope was constrained to the initial 15 member states, which are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom. The core argument and main reason to constraint the EU to its initial 15 member states, which nowadays comprises 28 member states, is that the integration of the initial EU15 member states is more mature and profound, and the economy and financial

institutions are more interwoven and intertwined with each other than in comparison with the New Member States (NMS) of the Eastern enlargement. Furthermore, a study of European Association of Comparative Economic Studies (EACES 2013) enumerated that the largest bilateral trade flows still take place between neighboring sovereign countries and geographical areas: between Japan and China, the EU15 and Russia, the US and Mexico. Hence, for the EU15, Russia is a more important market than, for instance, China.

Strictly speaking, this development and situation is strengthened by the same study of EACES (2013) in figures by stating that the EU15 exports recorded their biggest increase in medium-high technology (MHT) sectors to Russia (machinery, motor vehicles and chemicals) and in high-technology (HT) goods to Russia (electronics and pharmaceuticals). In addition, there is also an increase observed in exports of capital goods to Russia, which received in 2008 almost one-third of the EU15 exports, and has thus overtaken China as its most important market. Russia was also the largest market for consumption goods, absorbing half the EU15 exports in 2008.

From a practical point of view, whereas the European Union (EU) facilitated economic and trade integration that makes the flow of goods and collaboration across national borders simple and smooth, the importance of cross-border context is still high in many parts of the world. Such as the eye-catching case of the EU and Russia, where the national and cultural differences in many aspects and elements are quite substantial. While Russia seems to offer low-cost production opportunities and possibilities for international manufacturers, the study of Hilmola et al. (2008) showed how difficult it is to achieve cost efficiency in Russian operations in comparison to similar operations in more mature markets. Furthermore, western markets are starting to get saturated and European firms are starting to look for new growth opportunities in emerging economies. Countries that used to be targeted for low cost sourcing are now changing into attractive end markets due to their increase in GDP and disposable income. Russia is one of those markets. However, besides the fact that the market is booming, its business environment shows differences in comparison with the European ones and poses specific challenges. This complicates the supply chain because it not only needs to be globally managed but also adapted to local conditions. Therefore, export and supply chain operations of semi-finished and final goods from the EU to Russia are likely to maintain and increase, accentuating the importance of cross-border context in terms of SCM. Conclusively, European firms perceive difficulties in the ease of doing business in Russia in areas of customs regulation, bureaucracy, uncertainty and logistics and transport (Finnish-Russian Chamber of Commerce, 2004).

In conclusion, Russia is a key factor for the EU15 performance in the aforementioned markets, which can be explained by the geographic proximity and the nature of the Russian import demand (capital goods, MHT and HT products). The trends in the EU15 export intensities to the large emerging economies show that Europe has by far outperformed the other suppliers in the Russian market. In the other large emerging markets, the positions of the EU15 tend to converge with the world average.

5.2. Data Collection and Research Methodology

In contemporary SCM research, little attention has been paid to the comprehensive, integrative and integral approach of SCC and its impact through the con-

struct collaborative advantage on operational performance and firm performance. The construct SCC dimensions forms the cornerstone and backbone for the operational business processes of collaborative planning activities and collaborative decision making processes, and its impact on the mediation construct collaborative advantage, which impacts the dependent constructs operational performance and firm performance. Therefore, as mentioned throughout this research paper the high-level and abstract objective is to analyze and to discover the impact of SCC dimensions on firm performance and operational performance.

Historically, in most of the prior studies in the field of SCM, survey questionnaires have been the most popular research method (Mentzer and Kahn, 1995; Kotzab et al., 2005; Sachan and Datta, 2005; Burgess et al., 2006; Giunipero et al., 2008; Chicksand et al., 2012). Furthermore, the logic of researchin this study is deductive. Deductive research pursues a conscious direction from a general law to a specific case (Alvesson and Skoldberg, 1994; Andreewsky and Bourcier, 2000; Danermark, 2001; Kirkeby, 1990; Taylor et al., 2002). Thus, deductive research scans theory, derives logical conclusions from this theory and presents them in the form of hypotheses. These hypotheses are tested in an empirical setting and presents general conclusions based on the corroboration or falsification of the self-generated hypotheses (Arlbjorn and Halldorsson, 2002; Kirkeby, 1990; Wigblad, 2003).

The subject of study in this research paper is SCC in the contextual cross-border inter-firm design in a supplier (EU15) - buyer (Russian firm) dyad, whereas the EU15 supplier is the focal firm. Therefore, the object of study is the focal European firms of the EU15 member states. The unit of analysis is a sample of EU15 firms which was primarily extracted from the Amadeus database.

The tool applied for collecting primary data was a web-based survey questionnaire. The sample respondents were expected to have experience in doing business in Russia. For each construct and their indicators and items, a Likert (1932) type method of summated five-point scale was used to assess and review its perceived level and degree of perception on several propositions. This Likert scale was apt, because it provides an interval. This is the most powerful scale for statistical analysis (Hair et al., 2010). The potential sample respondents were collected by means of database Amadeus of Bureau van Dijk. To improve response rate, four waves of emails were sent once a week. Out of the 72 respondents, 66 were considered as useable for data analysis.

6. Data Analysis of Depth and Scope of Collaboration

The scope of collaboration encompasses the number of business processes and activities that are collaborating, and the depth of collaboration measures the integration of processes that are collaborating. Therefore, the web-based survey questionnaire included multiple different business processes and departmental variables measuring the scope and depth of collaboration. Furthermore, the web-based survey questionnaire also included multiple indicators of the independent constructs operational performance and firm performance to measure the perceived improvements as a result of collaboration. The respondents were asked to estimate the level of collaboration and involvement of their Russian buyer in several organizational areas of SCC.

Pearson correlation coefficients of the collaboration areas and firm performance and operational performance were calculated to make some preliminary conclusions

about the effects and relationship between these dependent variables (firm performance and operational performance) and independent variables (collaboration areas). The results of the Pearson correlation coefficients are shown in table 2.

Table 2: Pearson correlation of collaboration areas, operational and firm performance

Dependent / independent	**Production**	**Inventory management**	**Distribution**	**R&D**	**Procurement**	**Supply chain design**	**Product development**
Sales growth	.082	.177	.316**	.018	-.005	.123	.070
Market share	.183	.209	.149	.138	.074	.035	.157
ROI	.134	.289*	.218	.129	.091	.137	.085
On-time delivery	-.037	.276*	.507**	.211	.024	.296*	.268*
Order fulfillment lead time	.047	.312*	.471**	.329**	.022	.291*	.276*
Total logistics cost	.024	.293*	.193	.222	.109	.315*	.137
Inventory turns	.089	.346**	.133	.211	.109	.129	.254*
Stock-outs	.110	.451**	.157	.178	.117	.204	.239

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

As illustrated in table 2, statically significant correlations were measured in several collaboration areas, namely: inventory management, distribution, R&D, supply chain design and product development. All of the statistically significant correlations were positive. Collaboration in distribution led to strong significant correlation with strong change in operational performance on-time delivery (.507**) and moderate significant correlation with order fulfillment lead-time (.471**) and sales growth (.316**). Further, collaboration in inventory management resulted in weak significant correlation with ROI (.219*), on-time delivery (.276*), and total logistics costs (.293*), moderate significant correlation with order fulfillment lead-time (.312*) and inventory turns (.346**) and stock-outs (.451**). Collaboration in the area of inventory management showed the most relationships and significant effects with dependent variables. Also, collaboration in R&D showed a moderate significant correlation with order fulfillment (.329**). In addition, collaboration in supply chain design led to moderate significant correlation with total logistics cost (.315*) and weak significant correlation with on-time delivery (.296*) and order fulfillment lead-time (.291*). Last but not least, collaboration in the area of product development showed weak significant correlation with on-time delivery (.268*), order fulfillment rate (.276*) and inventory turns (.254*). Absolutely no significant correlations were found in the collaboration areas production and procurement. Interestingly, also no significant correlation was found in the dependent firm performance variable market share growth.

By computing the composite variables through summing the collaboration area variables and firm performance and operational performance variables, correlation

was analyzed between these two composited variables. Interestingly, the sum of collaboration areas had a significant moderate correlation with the sum of firm performance and operational performance (.345**). Hence, it can be concluded that there is indeed a moderate correlation between the scope and depth of collaboration with firm performance and operational performance.

However, to get a better detailed understanding of the effect of the parameters and elements of SCC to operational performance, and operational performance to firm performance, multiple regression analyses were performed. Based on prior conducted researches and studies, the cut-off and threshold value for the adjusted R square was set on .10 (Bagchi et al., 2005). In addition, there were a numerous number of significant strong correlations among the independent variables of collaboration areas. This could lead to multicollinearity, which is an undesirable situation where the correlations among the independent variables are strong. Therefore, the indicators of collaboration areas, operational performance and firm performance were tested for multicollinearity by means of variation inflation factor (VIF). For this study, VIF between 5 and 10 indicates high correlation that may be problematic. And if the VIF is above 10, the regression parameter estimates and coefficients are poorly estimated due to multicollinearity. The VIF values of the collaboration areas were in the range of 1.204 to 1.981, therefore, the variables were not subject to multicollinearity. In the case of operational performance indicators, the VIF values were in the range of 1.500 to 5.776. Only some variables of operational performance had a VIF value higher than 5 which might have caused some minor multicollinearity, but none of them were above 10, so these were negligible, therefore, no adjustments were made. The results of multiple regressions of collaboration areas as independent variables and operational performance indicators as dependent variables are presented in table 3.

Table 3: Multiple regressions of collaboration areas and operational performance

Operational performance variables	**Collaboration area variables**	**Regression parameter estimate (Beta)**	**Adjusted R square**
On-time delivery	Distribution**	.395	.304
Order fulfillment lead time	Distribution**	.346	.295
	Procurement*	-.316	
Total logistics cost	N.A.	N.A.	.088
Inventory turns	N.A.	N.A.	.070
Stock-outs	Inventory management**	.530	.158

***. $P < 0.001$, **. $P < 0.01$, *. $P < 0.05$ and N.A.=Not Applicable

Concerning the results of the multiple regression analysis of collaboration areas on operational performance, the operational performance variable on-time delivery was significant correlated with collaboration area distribution. The same observation was made with regards to the operational performance variable order fulfillment lead-time. Looking back on the Pearson correlation results, the results were partially expected in these collaboration areas. Collaboration in distribution activities and processes, such as order deliveries in a cross-border context, improves supply

chain performance and efficiency in on-time delivery and order fulfillment lead-time. The multiple regression analysis also illustrated that collaboration in collaboration area inventory management had a significant positive correlation with stock-outs. Again, this correlation was logic and coherent with its inherent nature of activities and processes. Collaboration by means of inventory management leads to better understanding and synchronization of inventories in the pipeline between supplier and buyer. All these efforts of collaboration in inventory management therefore results in minor and/or less frequent stock-outs. An interesting and kind of unexpected result was the significant negative correlation between collaboration area procurement and order lead-time fulfillment. The explanation of the negative sign of the correlation could be that collaboration in procurement improves similar and alike processes and activities which will lead to higher demands from the purchasing and procurement department to their planning and LSP to meet service-levels of order fulfillment lead-times. Another explanation could be that due to improvement and optimization of activities within the department, the information exchange and sharing with other departments and external parties changed from the current situation which could lead to initial misunderstandings and errors.

Again, by computing the composite variables through summing the collaboration area variables and operational performance variables, a linear regression analysis was conducted between these two composited variables. The same as with the Pearson correlation analysis, the sum of collaboration areas variables had a significant parameter estimate with the sum of operational performance variables (.379***). Furthermore, the adjusted R square is higher than the cut-off value of .10, namely: .130. Therefore, it can be stated that there is indeed a positive effect between the scope and depth of collaboration with operational performance.

The results of multiple regression of firm performance as dependent variables are presented in table 4 below.

Table 4: Multiple regressions of collaboration areas and firm performance

Firm performance variables	**Collaboration area variables**	**Regression parameter estimate (Beta)**	**Adjusted R square**
Sales growth	N.A	N.A.	.035
Market share growth	N.A	N.A.	-.033
ROI	N.A	N.A.	.007

***. $P < 0.001$, **. $P < 0.01$, *. $P < 0.05$ and N.A.=Not Applicable

The second result of multiple regression analysis of collaboration areas on firm performance did not show any significant regressions between the variables of collaboration areas as independent variables and firm performance indicators as dependent variables. For all the firm performance variables the adjusted R square was lower than the cut-off value of .10. However, there were no collaboration area variables that had a p-value that was lower than .05 to any of the firm performance variables. Hence, none of the independent variables of collaboration areas had a significant regression with the dependent variables of firm performance.

However, by computing the composite variables through summing the collaboration areas variables and firm performance variables, a linear regression analysis

was conducted between these two composited variables. The composite variable collaboration area had a positive parameter estimate with the composite variable of firm performance (.220), but it was not significant. Furthermore, the adjusted R square was lower than the cut-off value of .10, namely: .033. Therefore, it can be stated that there was no significant positive effect between collaboration areas on firm performance.

Last but not least, the results of multiple regressions of operational performance as independent variable and firm performance indicators as dependent variable are presented in table 5.

Table 5: Multiple regressions of operational performance and firm performance

Firm performance variables	**Operational performance variables**	**Regression parameter estimate (Beta)**	**Adjusted R square**
Sales growth	N.A.	N.A.	.355
Market share growth	N.A.	N.A.	.247
ROI	N.A.	N.A.	.374

***. $P < 0.001$, **. $P < 0.01$, *. $P < 0.05$ and N.A.=Not Applicable

The results of multiple regression analysis of operational performance on firm performance did not show any significant regressions between the variables of operational performance as independent and firm performance indicators as dependent. However, the adjusted R square was moderate above the cut-off value of .10, while in comparison with the adjusted R square of the collaboration areas indicators on firm performance the indicators the adjusted R square was around zero.

To provide an integrative and all-embracing analysis of the scope and depth of collaboration in the context of EU15-Russian supply chains, a path diagram of the multiple regressions was conducted. The independent variables of all the different collaboration areas were combined to one latent construct, which is named: collaboration areas, whereas the latent constructs operational performance and firm performance were determined as dependent variables. The results of the multiple regression analysis and its extension to the visualized path diagram are presented in Appendix 1. Table 6 shows the results of only significant relationships between variables.

The table above and the path diagram in Appendix 1 highlight and accentuate that there was a positive significant relationship and effect between latent construct collaboration areas and latent construct operational performance (.351*). However, there was no significant positive relationship between latent construct collaboration areas and latent construct firm performance. Unexpectedly, there was a negative effect and relationship between latent construct collaboration and latent construct firm performance (-.020), but not significant. On the other hand, operational performance had a strong positive significant effect and relationship with latent construct firm performance (.576***). Furthermore, the control variables firm size (.130) and length of customer relationship (.128) had a weak positive effect on firm performance, but not significant. Moreover, the control variables contributed and explained a higher degree of variance of the latent construct firm performance,

Table 6: Regression parameter estimates of depth and scope of collaboration

Relationship	**Regression parameter estimate (Beta)**	**P-value**
Collaboration → Operational performance	**.351***	**.016**
Collaboration → Firm performance	-.020	.879
Operational performance → Firm Performance	**.576***	***
Firm size → Firm performance	.130	.242
Length of CR → Firm performance	.128	.246
Collaboration → Inventory management	.520***	***
Collaboration → Distribution	.338*	.033
Collaboration → R&D	.785***	***
Collaboration → Procurement	.560***	***
Collaboration → Supply chain design	.361*	.014
Collaboration → Product development	.803***	***
Firm performance → Sales growth	.901***	***
Firm performance → Market share growth	.922***	***
Firm performance → ROI	.825***	***
Operational performance → On-time delivery	.918***	***
Operational performance → Order fulfillment LT	.970***	***
Operational performance → Total logistics cost	.606***	***
Operational performance → Inventory turns	.567***	***
Operational performance → Stock-outs	.597***	***

***. P < 0.001, **. P < 0.01, *. P < 0.05 and N.A.=Not Applicable

thereby, increasing the reliability of other predictors on the dependent variable firm performance.

In addition, another model was constructed by compositing all variables and indicators of collaboration areas, operational performance and firm performance, the relationship and effect between collaboration and operational performance was positive and significant (.379***). Furthermore, the relationship and effect between operational performance and firm performance was also positive and significant (.654***). In this model the control variables firm size (.228) and length of customer relationship (.104) were also positive, but again not significant. The visualized structural path model of the composite observed variables is included in Appendix 2.

6.1. Concluding Remarks

Overall, the tendency shows that the scope of collaboration, by the number of business process and activities that are collaborating, was quite moderate, while the depth of collaboration, by the level and degree of integration of the process in collaboration, can be determined between low and moderate in the challenging cross-border contextual design. Hence, the depth and scope of collaboration in the

EU15-Russian supply chain setting can be defined and concluded as moderate and modest.

As reported by the Pearson correlation and regression tables, it seems that collaboration in the areas of distribution and inventory management had the most positive significant effect on primarily operational performance indicators such as on-time delivery, order fulfillment lead-time and stock-outs. Nevertheless, it must be underlined that in many collaboration areas no severe and substantial results were reported from collaboration. Conclusively, it is clear that distribution and inventory management are the collaboration areas where EU15 suppliers should collaborate with their Russian buyer. In the train of thought, supply chain design can also be considered as a viable and feasible option for collaboration to enhance and complement mainly operational performance parameters and metrics.

In addition, by compositing all variables of collaboration areas, operational performance and firm performance, the relationship and effect between collaboration and operational performance was positive and significant (.379***). Furthermore, the relationship and effect between operational performance and firm performance was also positive and significant (.654***). In this model the control variables firm size and length (.228) of customer relationship (.104) were both positive but not significant.

Additionally, an integrative structural model was conducted to measure the path coefficient and relationship between the unobserved latent constructs collaboration areas and operational performance (.351*), and collaboration areas and firm performance (-.020). Furthermore, the effect and relationship between operational performance and firm performance (.576***) was analyzed.

Hence, it can be concluded that if the latent construct collaboration goes up by one standard deviation, the latent construct operational performance goes up by a standard deviation of .351 at the 5 percent level of significance. Thus, more depth in collaboration, especially in distribution and inventory management, leads to a significant positive effect on operational performance. Following-up, if the latent construct operational performance goes up by one standard deviation, the latent construct firm performance goes up by a standard deviation of .576 at the 0.1 percent level of significance.

The control variables firm size and length of customer relationship were positive, respectively .130 and .128, but not significant. However, the control variables do explain more of the latent construct firm performance' variance and adjusted the effect of the latent construct operational performance and collaboration areas on firm performance.

7. Structural Equation Model of Supply Chain Collaboration

In consideration to test the depicted conceptual SCC hypotheses framework that is visually presented in figure 1, the two-step approach was used for assessing the structural model (Anderson and Gerbing, 1988).

The two-step approach advocates that in order to test a structural regression model, the measurement part of the model was firstly identified and consequently the structural part of the model. Hence, the suitability of the formulated conceptual model in this research paper was tested before the eventual structural path relationships in the conceptual SCC hypotheses framework were examined to test the hypotheses. Hence, first of all, a confirmatory factor analysis (CFA) was conducted

for the measurement part of the model of the indicators of the latent constructs: SCCD, CA, OP and FP, including the interaction moderation latent constructs CB and CBBB.

CFA is a multivariate statistical procedure that is used to test how well the measured predefined variables represent the above mentioned latent constructs. For the study in this research paper it was felt that the two-step approach would be the best, because the conceptual SCC hypotheses model is partially adapted from the studies of Ramanathan and Gunasekaran (2012) and Zhang and Cao (2011). The CFA evaluates a priori hypotheses and relies heavily on existing theory of previous researchers and scholars. Therefore, the number of latent constructs and indicators are partially determined in advance (Thompson, 2004).

7.1. Reliability and Validity Tests

First of all, it is preferable to determine if a measurement instrument is able to produce consistent results every time it is conducted under similar circumstances. Statistically, reliability is defined as the percentage of the inconsistency in the responses to the survey questionnaire which is the result of differences in the respondents. This implies that responses to a reliable survey questionnaire will vary, because respondents have different opinions, not because the survey questionnaire questions are confusing or ambiguous. Therefore, the predefined indicators of each of the latent constructs were tested to remove confusing indicators in order to improve reliability. In this study, one of the methods that were used to test reliability was Cronbach's alpha for each latent construct and its indicators. Furthermore, a Cronbach's alpha of all the indicators of all the latent constructs was also calculated. Generally, Cronbach's alpha of >0.7 is the cut-off and threshold value (Cooper and Schindler 2006; Malhotra and Birks 2006). The results of the reliability analyses are illustrated in table 7.

Table 7: Cronbach's alpha reliability test

Latent construct	**Number of indicators**	**Cronbach's alpha**
SCCD	7	.895
CA	5	.736
FP	4	.926
OP	5	.897
CB	9	.928
CBBB	11	.844
All indicators	49	.901

The results of the Cronbach's alpha test indicated that all the latent constructs had a Cronbach's alpha above the cut-off and threshold value of 0.7. Hence, based on the preliminary reliability test of Cronbach's alpha, all the latent constructs and its indicators were included in the CFA for further reliability and validity analysis.

However, due to the large number of indicators in the latent construct CBBB and the distinction in the nature and dimension of the barriers, a principal component with varimax rotation factor analysis was conducted. The results of the principal component analysis are included in Appendix 3. The KMO is .818 and Bartlett's Test of Sphericity was significant, therefore, the set of variables were suitable for

factor analysis. As shown in Appendix 3, there are some indicators that had a poor and low loading, and loaded in multiple factors. Therefore, the indicators with the lowest loading and that loaded in multiple factors were deleted to rerun the factor analysis. Furthermore, due to the fact that only two indicators loaded in the last factor, the number of factors was constrained to two. After deleting the indicators 'unfavorable foreign exchange rates' (.341) and 'strong international competition' (.542), the KMO increased to .836.

The results of the revised factor analysis showed that the two factors can be categorized and interpreted in indicators with an environmental dimension, and indicators with a market dimension. Hence, the revised CFA, in which the latent construct CBBB was separated in market dimension (MD) indicators and environmental dimension (ED) indicators, is included in Appendix 4.

The outcomes of the CFA analysis functioned as input to conduct composite reliability, and convergent and discriminant validity tests. If the latent constructs do not show adequate validity and reliability, the structural model will be of less good fit, thereby, unreliable. Hence, more thoroughly validity and reliability tests were conducted, such as composite reliability (CR), average variance extracted (AVE), maximum shared variance (MSV), and average shared variance (ASV) (Hair et al., 2010). The same authors established the following cut-off and threshold values that were used to measure and determine reliability and validity, which are presented in the table below.

Table 8: Reliability and validity threshold values

Reliability and validity tests	**Cut-off value**
Composite reliability	> 0.70
Convergent validity	CR > AVE
	AVE > 0.50
Discriminant validity	MSV < AVE
	ASV < AVE

Source: Hair et al. (2010)

In order to calculate the above mentioned reliability and validity tests, the correlation table and standard regression weight table of the CFA, including all the latent constructs, were used as input values. By means of an Excel macro (Gaskin, 2014), the outcomes of the CFA were used as input to calculate the reliability and validity tests. The total results of the test are illustrated in the table below.

Table 9: Reliability and validity test results of CFA

LC	**CR**	**AVE**	**MSV**	**ASV**	**ED**	**SCCD**	**CA**	**FP**	**OP**	**CB**	**MD**
ED	0.890	0.623	0.215	0.096	0.790						
SCCD	0.888	0.534	0.320	0.131	0.276	0.731					
CA	0.741	0.370	0.320	0.127	-0.138	0.566	0.609				
FP	0.928	0.763	0.429	0.172	-0.239	0.366	0.516	0.873			
OP	0.879	0.600	0.429	0.142	-0.057	0.487	0.390	0.655	0.775		
CB	0.929	0.596	0.335	0.102	0.452	0.133	-0.032	-0.234	-0.022	0.772	
MD	0.798	0.508	0.335	0.112	0.464	0.037	-0.016	-0.303	-0.173	0.579	0.713

The results in the table above demarcates that there was one element of convergent validity that did not meet the cut-off value, which is shown by the red font color. The low AVE number of CA can be explained by the low factor loadings of some of the observed variables and indicators, such as business synergy (.47), quality (.53) and innovation (.57), as shown in Appendix 4. In addition, it is noteworthy to mention that due to the relatively low sample size (n=66), the factor loadings of each indicator on the latent construct should be approximately around .60 - .65 in order to meet the requirements of the reliability and validity test (Hair et al., 2010). Nevertheless, in the spirit of the study and the low impact on model fit of only one criterion that did not meet the reliability and validity requirements, all the indicators of the latent construct CA were included despite the aforementioned low loadings of some of these indicators.

As shown in Appendix 4, besides the observed indicators and variables of the aforementioned latent construct CA, the remaining observed indicators had a loading of approximately .60 and higher to their respective latent constructs. The measurement model met almost all the cut-off and threshold values of composite reliability, convergent validity and discriminate validity. Hereinafter, the measurement model of the CFA was used to test the common method bias by means of common latent factor (CLF).

The common method bias test indicates bias in the dataset due to something external to the measures. Something external to the question may have influenced the given answers. For example, collecting data using a single (common) method, such as a web-based survey questionnaire, may introduce systematic response bias that will either inflate or deflate responses. Significant common method bias is one in which a majority of the variance can be explained by one single factor. The CLF was used to capture the common variance among all observed variables and indicators in the measurement model. The CLF was implemented in the measurement model and the standardized regression weights of the measurement model with and without the CLF were compared. The measurement model with the CLF is included in Appendix 5. According to Podsakoff et al. (2003), if the difference between the adjusted common bias standardized regression weights with CLF and the standardized regression weights without CLF is greater than 0.2 then the standardized regression weight results with the CLF should be used. The results of comparison are included in Appendix 6. As shown in Appendix 6, the difference between the standardized regression weights of CLF and without CLF was not greater than the threshold value of 0.2; therefore the measurement model without CLF was used for the next step of the structural SCC hypotheses model.

7.2. Structural Equation Model

After the first step was conducted and the amended measurement model without the CLF was approved, the next step, structural model, was done in order to test the conceptual SCC hypotheses framework by means of SEM.

SEM is a robust statistical analysis technique that is used for multivariate analysis. SEM is a set of linear equations for testing the hypothesis about the relationship between observed indicators and latent constructs (Hair et al., 2010). SEM is widely known for the following advantages. First, SEM makes assumptions, unobserved latent construct, and hypothesized relationships. Second, SEM enhances a degree of precision, since it contains clear definition of latent constructs and the functional relationship between them. Third, SEM offers a formal framework for constructing

and testing both theories and measures, and selection of sample size through the use of estimation methods. Comprehensively, the main goal of SEM is to find the extent to which a hypothesized model fits or at least adequately describes sample data.

Model fit of the measurement and structural model was tested by using a number of goodness-of-fit (GOF) indices. These GOF indices aim to measure the distance or difference between sample covariance and fitted covariance. Hair et al. (2010) recommend that in order to establish a robust and vigorous analysis more than one fit index is mandatory. Hence, the table 10 shows the GOF indices and their cut-off values that were used in this study to measure model fit. Furthermore, as a side mark, it is important to point that GOF is inversely related to sample size and the number of variables in the structural model.

Table 10: GOF indices for structural model

GOF measure	**Cut-off value**
Chi-square/degree of freedom	< 3 good; < 5 sometimes permissible
CFI	$> .95$ great; $> .90$ moderate; $> .80$ sometimes permissible
NFI	$> .90$
AGFI	$> .80$
RMSEA	$< .05$ good; .05 - .10 moderate; $> .10$ bad

Source: Hair et al. 2010

By using the measurement model of the CFA without the adjusted CLF, a hybrid structural model was constructed, which is included in Appendix 7. The hybrid structural model showed that the latent construct SCCD had a significant positive influence and effect on latent construct CA (.588***) and on the latent construct OP (.442*). The latent construct CA had significantly positive effect on the latent construct FP (.300*). Furthermore, the latent construct OP had a significant relationship and impact on FP (.524***). Considering the impediments, the moderator CB had negative direct effects and impacts on CA (-.104) and FP (-.111), and a positive direct effect on OP (.078). In case of the cross-border business barriers, ED had a negative direct effect and impact on OP (-.105) and FP (-.090), but both of them were not significant. As for MD, the direct effect and impact on OP (-.180) and FP (-.095) were all negative and not significant.

Consequently, the structural path model was conducted by comprising the unobserved latent constructs into observed variables, which then does not account for measurement error as in the hybrid model, because it is just a structural path model between the newly created imputed composite observed latent constructs. Furthermore, the control variables firm size and length of customer relationship were also included. The structural path model between the observed constructs is included in Appendix 8. The standardized regression weight results of both the hybrid structural model and the structural model are included in table 11.

The structural model, which includes the imputed composited observed variables, did not include measurement errors, as in the case with the hybrid structural model. The results of the structural path model showed that there were significant positive effects and relationships on SCCD to OP (.472***), SCCD to CA (.651***), CA to FP (.429***) and OP to FP (.579***). One surprising observation was the

Table 11: Standardized estimates between hybrid model and structural path model

Relationship	**Hybrid model**	**Structural path model**
SCCD → OP	.442*	.472***
SCCD → CA	.588***	.651***
SCCD → FP	-.022 (ns)	-.180*
CA → OP	.115 (ns)	.122 (ns)
CA → FP	.300*	.429***
OP → FP	.524***	.579***
CB → CA	-.104 (ns)	-.129 (ns)
CB → OP	.078 (ns)	.100 (ns)
CB → FP	-.111 (ns)	-.121 (ns)
ED → OP	-.105 (ns)	-.126 (ns)
ED → FP	-.090 (ns)	-.010 (ns)
MD → OP	-.180 (ns)	-.201 (ns)
MD → FP	-.095 (ns)	-.070 (ns)
Firm size → FP	N.A	.122 (ns)
Length of CR → FP	N.A	.070 (ns)

***. $P < 0.001$, **. $P < 0.01$, *. $P < 0.05$ and ns=not significant

significant negative sign of the standardized estimate of the relationship between SCCD to FP (-.180*). The most likely explanation for this significant negative sign and magnitude of the effect of SCCD on FP is that SCC dimensions and the inherent business activities and processes require resources that have to be implemented and put into place. The direct main effect and impact of implementing, establishing and executing SCC business activities is negative on firm performance, because in the structural model with the included mediation variable CA, it implies that no advantages were obtained through SCC. Thus, if a firm implements SCC dimensions and business practices, but it does not manage to obtain advantages through collaboration these resources are wasted and have a negative direct main effect on firm performance, because the wasted resources increases the total costs of operations and does not lead to an increase in profits. Therefore, increased total costs of operations increases the marginal costs of the firm' product which dampens the profits and decreases the profitability and competiveness of the firm.

As an intermezzo, the table below presents the GOF and model fit of the aforementioned conducted measurement model and structural path model to give an overview about the development of model fit from the CFA to the structural path model.

Based on the results in the above table, it can be concluded that the reliability and validity test improved model fit significantly from the CFA to the structural path model, including the imputed composite observed constructs. The CFI increased from 0.784 to 0.846, NFI from 0.531 to 0.806 and AGFI from 0.557 to 0.627, while RMSEA increased from 0.099 to 0.180 in the structural model and decreased to 0.099 in the CFA and hybrid model. On a side note and remark, it has to be mentioned that the added interaction moderation constructs CB, ED and MD had a negative impact on model fit. The reason is that these moderation constructs are exogenous variables that have a direct main effect on one or several dependent variables and does not explain for all the variance. Hence, hypothetically, the same

Table 12: Model fitting indices of SEM two-step approach

GOF measure	**Cut-off value**	**CFA**	**Hybrid model**	**Structural path model**
Chi-square/df.	< 3 G; < 5 P	1.635	1.640	3.099
CFI	> .95 G; > .90 M; > .80 P	0.784	0.782	0.846
NFI	> .90	0.531	0.592	0.806
AGFI	> .80	0.557	0.530	0.627
RMSEA	< .05 G; .05 - .10 M; > .10 B	0.099	0.099	0.180

G=Good, M=Moderate, P=Permissible and B=Bad

structural model was run without the moderation constructs to determine model fit. Almost all of the GOF measures met the cut-off and threshold values. The results were as follows: 0.985 for CFI, 0.956 for NFI, 0.854 for AGFI and RMSEA was 0.082. However, in light of the study and the formulated hypotheses, which are included in the conceptual SCC framework, no adjustments and revisions were made despite the moderate and modest model fit of the structural model, including the impediments moderation variables.

7.3. Mediation Effect of Collaborative Advantages

Due to the mediation latent construct CA in the conceptual SCC hypotheses framework, which was used to measure the chains of causation, a mediation analysis was conducted. Mediation in SEM is generally used to provide a more accurate explanation of the causal effect of the independent variable on the dependent variable. The mediator variable is in most of the cases bridging the gap in a causal chain. For instance, the latent construct SCCD had a positive main effect on OP and a negative direct effect on FP, but not in all contextual situations, as not all SCCD activities always lead to either OP or FP. Hence, some mediation variable, such as the latent construct CA explains this effect and relationship. Thus, it can be expected that collaborative advantages positively mediates the relationship between SCCD and FP and/or OP. This means that the relationship between SCCD with OP and FP is better explained through the mediation variable CA. The same structural path model was used to analyze the mediation of the latent construct CA. The results of the mediation analyses are shown in the table below.

Table 13: Mediation effect of CA on SCCD to OP and FP

Path	**Direct without CA mediator**	**Direct with CA mediator**	**Indirect effect**	**Conclusion**
SCCD → CA → OP	.559***	.472***	.079 (ns)	No mediation
SCCD → CA → FP	.125 (ns)	-.180*	.599**	Bifurcated

***. P < 0.001, **. P < 0.01, *. P < 0.05 and ns=not significant

According to the table above, the latent mediation construct CA had no mediation effect on the path from latent construct SCCD to OP. However, on the other hand, the latent construct CA had a strong bifurcated mediation effect on the latent construct FP. The results can be explained by the fact that the dimensions of SCC have a direct main effect and impact on the relationship with OP indicators. For instance, information sharing, decision synchronization and/or collaborative communicative have a direct positive significant effect on operational performance indicators such as order-fulfillment lead-time, total logistics cost and/or on-time delivery.

On the other hand, the dimensions of SCC are fully bifurcated by the mediation variable CA. This means that the direct main effect of the dimensions of SCC without the mediation variable CA was not significant (.125) on FP. However, when the mediation variable CA was included between the direct path of SCCD and FP, the direct main effect and impact of SCCD on FP was significant and negative (-.180*). On the contrary, the indirect effect of SCCD through the mediation variable CA on FP was positive and significant (.599**). Thus, it can be strongly implied that, for instance, by conducting and practicing the dimensions of SCC, collaborative advantages can be accomplished and realized. These collaborative advantages by means of indicators such as offering flexibility, process efficiency, quality and innovation can result into sustainable competitive advantages which on its turn will lead to a stronger competitive position in the marketplace in comparison with its competitors. Therefore, the firm might be able to outperform and outcompete its competitors to increase its firm performance metrics, such as market share growth and sales growth.

Conclusively, the direct main effect of SCCD on OP (.559***) without the mediation construct CA was significant and positive. However, when the mediation construct CA was added the direct main effect of SCCD on OP (.472**) was slightly dampened, because the mediator CA accounted for some of this effect and impact (.079), but not significant. Therefore, it can be concluded that the mediator CA had no mediation effect on the relation between SCCD and OP.

Furthermore, the direct main effect of SCCD on FP (.125) is positive but not significant. When the mediator CA was added the direct effect of SCCD to FP (-.180*) was negative and significant. However, through the mediator CA the indirect main effect of SCCD through CA on FP (.599**) was strongly positive and significant. This type of mediation is called bifurcation. Hence, if a firm practices SCCD and realizes CA it has a strong positive effect on FP, because it might obtain and realize sustainable competitive advantages over its competitors that increases the metrics of firm performance such as sales growth and market share growth.

7.4. Interaction Moderation Effects of Impediments

There are several identified collaboration barriers that are supposed to have a negative direct main effect on CA and a positive moderating effect on the realized CA by means of the independent variable SCCD. Therefore, an interaction moderation analysis was conducted to determine the moderating effect on the positive relationship of SCCD on CA and OP, and on the negative relationship of SCCD on FP. The interaction moderation of the impediments was conducted in several steps and consisted out of a two-way and three-way interaction moderation analyses. The two-way interaction moderation analysis was done with the independent variable SCCD and the moderating variable CB to CA, OP and FP, and the three-way moderation

analysis was done with the independent variables CA and the moderating variables MD and ED to OP and FP. The interaction moderation is further explained by plotted slopes following the procedures outlined by Dawson and Richter (2006).

Factoid, interaction moderation effects are in theory actually joint effects of two predictor variables in addition to the individual direct main effects (Hair et al., 2010). Interactions enable more precise explanation of causal effects by providing a method for explaining not only how SCCD directly affects CA, OP and FP, but also under what circumstances the effect of SCCD changes depending on the interaction moderating variable CB. Basically, the interaction regression equation specifies that the slope of the line relating SCCD to CA, OP and FP changes at different continuous interaction moderation levels of CB, or equivalently, that the slope of the line relating SCCD to CA, OP and FP changes at different levels of CB.

First of all, the two-way interaction moderation was conducted with the independent variable SCCD and the moderation variable CB to the dependent variables CA, OP and FP. The main effect variables were standardized before forming the interaction terms (Cohen et al., 2003). The table below shows the results of the first and second step that were conducted to perform the moderation analysis.

Table 14: Two-step interaction moderation of collaboration barriers

Relationship	**Model 1**	**Model 2**
Step 1: Main effects		
CB → CA	-.129 (ns)	-.175 (ns)
CB → OP	.100 (ns)	.090 (ns)
CB → FP	-.121*	-.143 (ns)
SCCD → CA	.651***	.635***
SCCD → OP	.472***	.475**
SCCD → FP	-.180*	-.170 (ns)
Step 2: Two-way interaction effects		
CB x SCCD → CA		.251**
CB x SCCD → OP		.025 (ns)
CB x SCCD → FP		.054 (ns)
Firm size → FP	.123 (ns)	.124 (ns)
Length of CR → FP	.086 (ns)	.196 (ns)

***. $P < 0.001$, **. $P < 0.01$, *. $P < 0.05$ and ns=not significant

The results of two-way interaction moderation of CB in the table above shows that in the first model the main effect of CB on FP was negative and significant (-.121*). The main and direct effect of CB on CA (-.129) was also negative, while the main effect on OP (.099) was positive, but both of them were not significant. The second model included the interaction effects of the multiplied standardized predictors CB and SCCD which showed that the interaction effect of CB and SCCD had a positive significant impact on CA (.251**). The interaction effect on OP (.025) and FP (.054) were also positive but not significant.

In addition, the results of the second model, including the interaction effects, were used to conduct plots to help to interpret and to understand the interaction moderating effect of CB on the relationship between SCCD and CA, OP and FP

better. Gaskin (2014) created an Excel worksheet to visualize and interpret two-way interaction moderation effects which was used to conduct plots.

The interaction moderation effect of CB on the relationship between SCCD and CA can be explained as follows. Although, at first glance, the results in figure 2 might seem to go against the grain, intuition and rationale, CB strengthens the positive relationship between SCCD and CA. Furthermore, it demonstrated that the relationship between SCCD and CA is always positive. The slope of high CB is steeper and stronger than the slope of low CB. This means that if CB increases, in other words, the effect of collaboration barriers are getting stronger, the effect between SCCD and CA is also getting stronger. In other words, in a scenario where there are high collaboration barriers the effects of low SCCD to high SCCD are the most severe and significant on the dependent variable CA. Exactly, the same effect occurred between SCCD and OP, but the magnitude and impact was less strong in comparison to the effect between SCCD and CA.

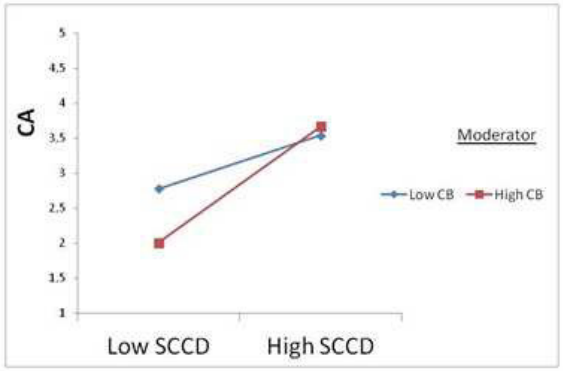


Fig. 2: CB moderation On SCCD and CA

Exactly, the same effect occurred between SCCD and OP, but the magnitude and impact was less strong in comparison to the effect between SCCD and CA.

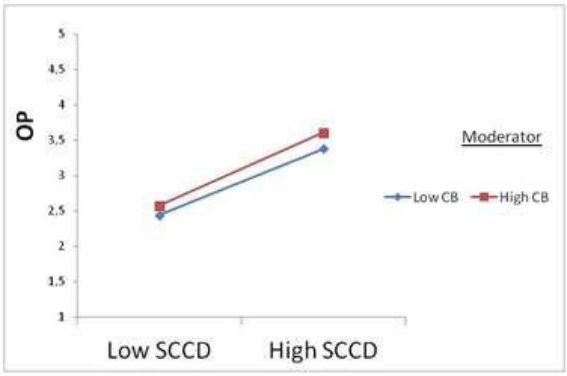


Fig. 3: CB moderation On SCCD and OP

On the other hand, CB dampens the negative effect and relationship between SCCD and FP. Hence, high CB has less impact and effect on the negative relationship between SCCD and FP. In other words, this can be explained by the fact that if a firm decides to practice SCC dimensions such as goal congruence, decision synchronization, incentive alignment and resource sharing, the elements of SCC could have a negative direct main effect and impact on a firm if it does not attain any collaborative advantages. In the scenario of high collaboration barriers, these aforementioned dimensions of SCC are hindered and affected by the collaboration barriers, which will work contradictory and lead to disincentives for a firm to conduct SCC practices. Therefore, a firm will synchronize, align and adapt less towards what is best for the overall and whole supply chain, and will focus more on its own individual goals and objectives which dampens the negative firm performance effects of the individual firm.

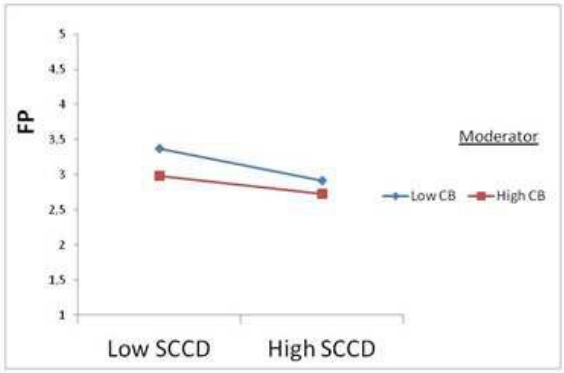


Fig. 4: CB moderation On SCCD and FP

Secondly, the three-way interaction moderation was conducted with the independent variable CA, and the moderation variables ED and MD to the dependent variables OP and FP. The same approach was used as with the two-way interaction moderation. The main effect variables were standardized before forming the interaction terms. The results of the first, second and third step are depicted in the table below.

According to the results that are depicted in the table above, the first model consisted only out of independent variable CA and moderating variables ED and MD which measured the main and direct effects on the dependent variables OP and FP. The effect and relationship between CA and FP was positive and significant (.429***). Furthermore, the effect and relationship between CA and OP was also positive but not significant (.122). The interaction moderation variables ED and MD showed weak negative direct main effects within the bandwidth of -.010 to -.201 to both OP and FP but also not significant.

For the second model the standardized multiplied two-way interaction effects were included. In comparison with the first model that only included the main effects and not the interaction effects, the positive effect in the relationship between CA and FP decreased (.395***). On the contrary, the positive effect in the relationship between OP and FP amplified (.599***). The main direct effects of ED and MD

Table 15: Three-step interaction moderation of cross-border business barriers

Relationship	Model 1	Model 2	Model 3
Step 1: Main effects			
CA → OP	.122 (ns)	.084 (ns)	.001 (ns)
CA → FP	.429***	.395***	.403***
ED → OP	-.126 (ns)	-.175 (ns)	-.220 (ns)
ED → FP	-.010 (ns)	-.037 (ns)	-.039 (ns)
MD → OP	-.201 (ns)	-.184 (ns)	-.147 (ns)
MD → FP	-.070 (ns)	.014 (ns)	.016 (ns)
OP → FP	.579***	.599***	.600***
Step 2: Two-way interaction effects			
CA x ED → OP		.254*	.314*
CA x ED → FP		-.121 (ns)	-.123*
CA x MD → OP		-.112 (ns)	-.186 (ns)
CA x MD → FP		.215*	.218*
ED x MD → OP		-.132 (ns)	-.104 (ns)
ED x MD → FP		-.025 (ns)	-.025 (ns)
Step 3: Three-way interaction effects			
CA x ED x MD → OP			.182 (ns)
CA x ED x MD → FP			.003 (ns)
Firm size → FP	.122 (ns)	.119 (ns)	.122 (ns)
Length of CR → FP	.086 (ns)	.080 (ns)	.082 (ns)

***. $P < 0.001$, **. $P < 0.01$, *. $P < 0.05$ and ns=not significant

were also negative in the second model, but not significant, except for MD on FP (.014). Intriguingly, the interaction effect of CA and ED showed a significant positive effect and impact on OP (.254*). Additionally, the interaction effect of CA and MD had a significant positive effect and impact on FP (.215*).

In the last model, the three-way interaction constructs were included to analyze and to determine the final consequences and effects of the impediments ED and MD on both OP and FP. Equally interesting, the interaction moderations of the impediments MD and ED on the relationships CA to OP and FP were also included. As shown in table 15 in the last column on the previous page, the main and direct effects of both MD and ED were negative on OP and FP, except for MD on FP (.016) which was positive, but all the these main effects and direct paths were not significant. The main and direct effect of CA on FP from model one (.429***) to model three (.403***) dampened by including the two-way and three-way interaction effect constructs. On the contrary, the effect of OP on FP amplified from .579** in the first model to .600*** in the third model. As for the three-way interactions, the interaction effects of MD, ED and CA on both OP (.182) and FP (.003) were positive, but as expected not significant. It has to be pointed out that, in general, interaction moderation variables are rarely significant. Moreover, it is equally interesting to see the moderations of OP and FP at different levels of SCCD, ED and MD.

To conclude, the two-step interaction moderation analyses of CB on the relationships between SCCD and CA, OP and FP indicated that the direct main effects of the interaction moderation construct CB had a minor negative direct effect on CA (-.175). Interaction effects of the moderator CB on the relationship between SCCD and CA (.251**), OP (.025) and FP (.054) were all positive, but only significant

for the interaction between the relationship SCCD and CA. Thus, it can be stated that the impediment construct variable CB had a negative direct main effect on the dependent variables CA and FP and a positive direct main effect on the dependent variable OP. Furthermore, only the interaction moderation of the product of the standardized variables SCCD and CB on CA was significant (.251**). Therefore, it can be concluded that the interaction moderation variable CB had a significant positive moderation impact on the relationship SCCD and CA. In other words, in the scenario of high CB, the impact and effect of low SCCD on CA is the lowest primarily due to high CB. However, in the scenario of high CB, if a firm manages to accomplish a high level of SCCD, the effect of SCCD on CA will be strengthened and a firm will obtain even higher collaborative advantages than in the case of low CB. So to speak, firms retrieve and attain more valued, unique and inimitable collaborative advantages in the scenario of high CB if a firm realizes to practice the indicators of SCCD on a high level and scale.

The three-step interaction moderation analyses of the interaction moderation variables ED and MD on the structural paths and relationships of CA to OP and CA to FP determined that the direct and main effects of ED were negative and low on OP (-.220) and on FP (-.039), but not significant. The same findings were stemmed from the interaction moderating analysis for the moderation variable MD on OP (-.147). However, the direct main effect of MD on FP (.016) was positive but also not significant. Interestingly, the three-way interaction moderators ED and MD had a positive effect and impact on the structural path and relationship from CA to OP (.182) and FP (.003). The most reasonable explanation of this finding can be given by the fact that in the case and scenario of high international and cross-border barriers, firms can realize an even higher positive effect and result on OP and FP if they manage to attain and realize high levels of CA. Nevertheless, the three-way interaction results between ED, MD and CA were statistically not significant. Thus, these three attributes combined interactively do not predict OP and FP. Even though the three-way interaction constructs were statistically not significant, it is still interesting to determine and interpret the interaction effects between ED, MD and CA on OP and FP.

The relationships and effects between the independent variable CA and the interaction moderation variables ED and MD on the dependent variables OP and FP can be better understood by visualization and plotting the results. Hence, due to these sophisticated and complicated relationships, the separate plots of the interaction moderation of ED and MD on OP and FP are included below to clarify the implications and results of the three-way interactions.

In the figure 5 the horizontal axis shows the independent variable CA and the vertical axis indicates the dependent variable OP. The figure comprises the relationship between CA and OP moderated by both the impediments ED and MD. The above plot and graph encrypts and demystifies the interaction effects of the moderation variables ED and MD on OP.

As shown in figure 5, there is almost no change of effect in the relationship between CA on OP when both ED and MD are low. This stagnated and horizontal slope can be clarified and explained by the fact that if there are low cross-border barriers by means of ED and MD the effect and relationship between CA and OP (.001) tend to be small and not significant, as shown in table 15 in the last column.

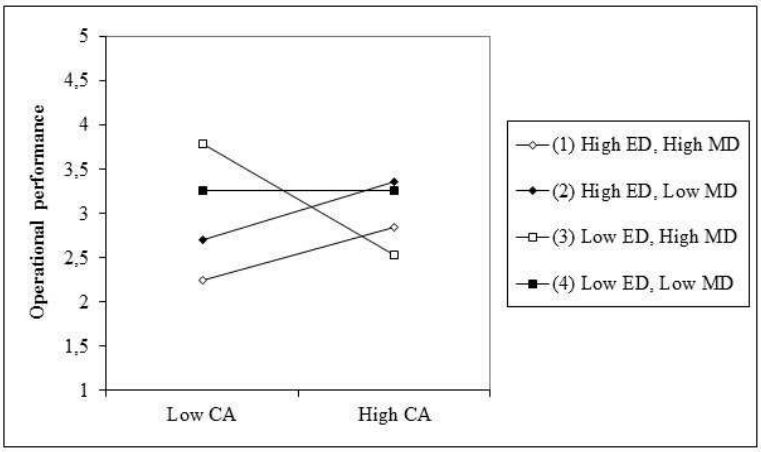


Fig. 5: Plot of regression slopes for three-way interaction on OP
Source: Author's own

The effect of CA on OP is larger in the scenario and situation when ED was high. The findings indicated that under the conditions of high ED the effect of achieved and attained CA were stronger on OP. Rationally, if a firm operates in a business environment that is affected and categorized by negative market conditions by means of high cross-border environmental barriers and impediments, such as bureaucratic requirements, transportation difficulties and restrictive rules and regulations, a firm perceives and experiences difficulties executing and practicing its business operations and activities. These environmental barriers and impediments form burdens and hurdles for the firm which leads to deoptimization and to non-value added business activities in order to get the job done. Hence, if a firm manages to realize and establish CA such as process efficiency, offering flexibility and quality by means of highly reliable and highly quality products, and innovation under the conditions of high ED and low MD barriers, these positive CA effects will be stronger on OP parameters and metrics such as on-time delivery, order fulfillment lead-time and total logistics costs.

The effect of CA on OP showed almost the same tendency and steep of slope for the market conditions when both MD and ED were high. However, there was a shift of the slope downward meaning that the overall effect of CA on OP was lower. Thus, in market conditions of both high ED and MD, the effect of CA on OP showed almost the same steep of slope, but the slope shifted downward. In general, the effects of CA on OP are lower due to high MD barriers. The most likely explanation that MD barriers decreased the effects of CA on OP is that MD indicators such as high business risk, different customer culture, unfamiliar foreign business practices and limited information about markets have a negative direct main effect on OP. If a firm experiences a business environment that is characterized by high MD indicators such as high business risk, different customer culture and limited information about markets, the firm will perceive difficulties to accurately plan demand and to determine which product types are the most suitable and demanded in the market. Therefore, the firm might be experiencing a higher probability of risk in that it will experience unexpected higher and frequent stock-outs, lower inventory

turns, fluctuations and undesired on-time deliveries and order fulfillment lead-time which will also lead to higher total logistics costs. Nonetheless, the relationship of CA on OP was positively moderated by the also high ED indicators.

In addition, the effect of CA on OP decreased when MD was high and ED low. This means that in the case of high CA the effect was lower than it was in the case of low CA. Therefore, the effect of high CA worked contradictory on OP. This finding can be explained by the fact that due to high MD indicators, such as high business risk, different customer culture and limited information about markets, a low level of CA by means of offering flexibility, process efficiency, innovation and quality, had a higher effect on OP indicators such as total logistics costs, on-time delivery, order fulfillment lead-time and inventory turns. For instance, a high level of business risk and limited information about markets, and a high level and degree of innovation by means of rapid product development and low time-to-market will lead to more transactions and operational activities in comparison with low CA. Therefore, solemnly looking at the operational performance indicators and metrics, the context in which MD is high and ED is low, the effect of CA has a negative effect and impact on OP.

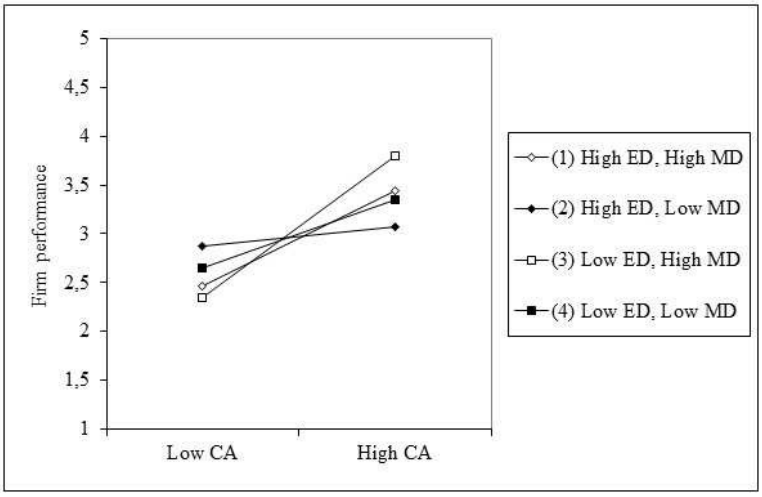


Fig. 6: Plot of regressions slopes for three-way interaction on FP
Source: Author's own

As in the case of the plot of regressions slopes for three-way interaction on FP, the horizontal axis shows the independent variable CA and the vertical axis indicates the dependent variable FP. The figure comprises the relationship between CA and FP moderated by both the impediments ED and MD.

Figure 6 illustrates and presents that the effect of CA on FP is the largest in the situation of low ED and high MD market circumstances. This can be explained through the logic and rationale of that high MD indicators, such as limited information, high business risk and different customer culture are strengthening the effect of CA such as offering flexibility, process efficiency, and especially, quality and innovation on FP. Specifically, if a firm perceives high CA through SCC the effects on

sales growth, market share growth and ROI will be bigger, because the perceived CA such as quality and innovation leads to rapid product development, low time-to-market and frequent innovations which had an even higher positive impact on FP in a business environment and market conditions with high MD barriers and obstacles. The findings tend to show that it might be more difficult and rarer to attain such collaborative advantages in these types of market circumstances and therefore the positive effects of CA on FP are even more rewarding than in other market situations.

The second largest effect of CA on FP was in the situation when both MD and ED were high. Hence, for both market situations in which MD was high the effect of CA on FP had the largest effects. This finding seems to be plausible due to the fact that CA had a bifurcated mediation effect on the path SCCD-¿CA-¿FP. Thus, the positive effects of SCCD on FP were going through the mediation effect CA. Therefore, CA had a strong positive effect on FP. Furthermore, due to high ED barriers, the effect of CA on FP was dampened and the slope was less steep than in the situation of low ED barriers.

In case of low MD and ED, the effect of CA on FP was even less strong. Despite the fact of low ED and MD barriers and impediments, the effect of CA on FP was still positive. However, since MD was low the effect is less strong, therefore, firms do not have the additional and incremental possibility and opportunity to overcome these business environment and market conditions by collaborative advantages and to achieve an even more rare, unique and inimitable sustainable competitive advantages as in a market situation with high MD impediments. Thus, probably in this market situation, CA is easier to be attained and achieved by firms; therefore, it does not substantially lead to a tremendous positive effect of CA on FP.

The effect of CA on FP was the least and marginal in a market situation with high ED and low MD. Nevertheless, the effect of CA on FP was still positive. The most likely explanation that the effect of CA on FP was the least in a market landscape in which there are relatively high ED and low MD impediments was that ED indicators such as bureaucratic requirements, restrictive rules and regulations and transportation difficulties dampens the positive effect of CA. However, in the situation of low CA, low MD and high ED, the relatively high FP can be partially explained by low MD and this same low MD dampened and limited the effect of high CA on improved FP.

To put the whole sequence and process of structural equation model of supply chain collaboration in a nutshell, the final measurement model was transformed and computed in the final structural path model. This final structural path model was used for mediation analyses of the mediation construct CA, and for the interaction moderation analyses of the interaction moderators CB, ED and MD to test the formulated hypotheses in the conceptual SCC hypotheses framework. The full SEM model results of the standardized regression weights of the structural direct paths and the mediation and interaction moderations are shown in figure 7.

The results of the structural path model showed that there were significant positive effects and relationships on SCCD to OP (.472***), SCCD to CA (.651***), CA to FP (.429***) and OP to FP (.579***). One surprising observation was the significant negative sign of the standardized estimate of the relationship between SCCD to FP (-.180*). The most likely explanation for this significant negative sign and magnitude of the effect of SCCD on FP is that SCC dimensions and the inherent

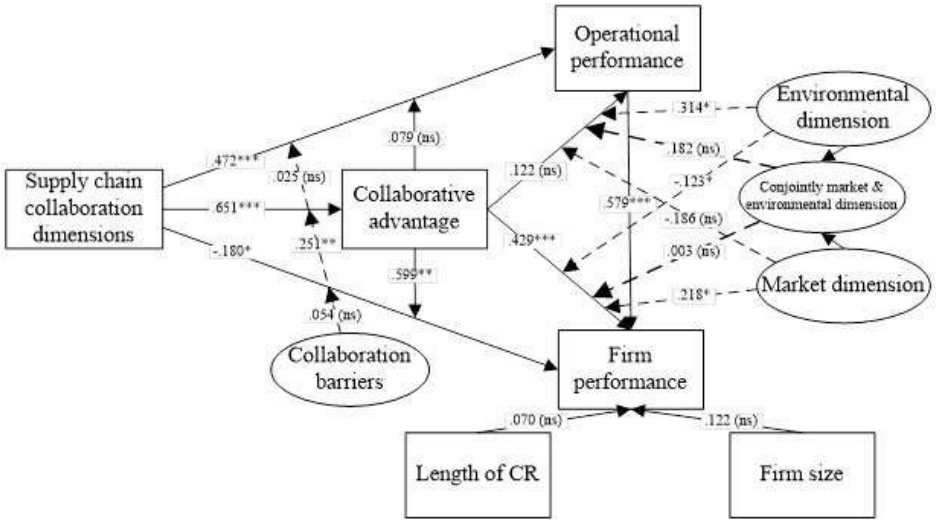


Fig. 7: SEM full model results of conceptual SCC hypotheses framework
Source: Author's own

business activities and processes require resources that have to be implemented and put into place. The direct main effect and impact of implementing, establishing and executing SCC business activities is negative on firm performance, because it implies that no advantages were obtained through SCC. The results of the SEM model test the hypotheses of structural direct paths and the mediation variable CB on the relationships SCCD to OP and SCCD to FP. Furthermore, the two-way interaction variable of the moderation variable CB, and the two-way and three-way interaction effects of the moderation variable MD and ED are also included. The results of the hypotheses testing are shown in the table 16.

Conclusively, in the contextual cross-border inter-firm collaboration in the case of EU15-Russian supply chains, the integrative and integral SEM full model results show that the different dimensions of SCC have a significant positive impact and effect on realizing and achieving collaborative advantages and improving operational performance directly. These collaborative advantages are a form and type of sustainable competitive advantage in which a firm is able to distinguish itself from its competitors to improve its uniqueness and inimitableness, thereby, increasing its competiveness. Increased competiveness of a firm leads to significant direct positive effects on improvement of firm performance, and a positive not significant effect on improvement of operational performance. Improved operational performance primarily and significantly through the different dimensions of SCC and marginally and not significantly through collaborative advantages, have a positive significant effect and impact on improvement of firm performance. The mediation variable CA had a marginal positive insignificant effect and impact on the path SCCD to OP, and a bifurcated mediation on the path SCCD to FP. All the interaction moderation impediment variables had a not significant negative direct impact on their respected dependent variables except for CB on OP. The interaction effect of CB was only significant on the path SCCD to CA. Last but not least, the three-way

Table 16: Hypotheses testing and results

	Chi-square/df.	CFI	NFI	AGFI	RMSEA
Structural model	3.099	0.846	0.806	0.627	0.180
Hypotheses	**Structural path**			**Std. est.**	**Result**
H1a	SCCD ⇒ OP			.472***	Supported
H1b	SCCD ⇒ CA			.651***	Supported
H1c	SCCD ⇒ FP			-.180*	Rejected
H2a	CA ⇒ OP			.122 (ns)	Rejected
H2b	CA⇒ FP			.429***	Supported
H2c	SCCD⇒ CA ⇒ OP			.079 (ns)	Supported
H2d	SCCD ⇒ CA⇒ FP			.599**	Supported
H3	OP ⇒ FP			.579***	Supported
H4a	SCCD ⇒ CB ⇒ OP			.025 (ns)	Supported
H4b	SCCD ⇒ CB⇒ CA			.251**	Supported
H4c	SCCD ⇒ CB ⇒ FP			.054 (ns)	Supported
H5a	CA ⇒ ED & MD ⇒ OP			.182 (ns)	Supported
H5b	CA⇒ MD ⇒ OP			-.186 (ns)	Rejected
	CA ⇒ ED ⇒ OP			.314*	Supported
H5b	CA⇒ ED & MD ⇒ FP			003 (ns)	Supported
	CA ⇒ MD⇒ FP			.218*	Supported
	CA ⇒ ED⇒ FP			-.123*	Rejected

Source: Author's own

interaction effects of MD and ED were both positive, but not significant on either OP or FP, as expected.

7.5. Concluding Remarks and Findings

The SEM full model results of structural direct paths of the developed conceptual SCC hypotheses model, which was partially adapted from Ramanathan and Gunasekaran (2012) and Zhang and Cao (2011), supported and replicated the results of prior studies of prominent and well-known scholars and researchers in the research area SCC of SCM literature that in general SCC achieves improvement and positive changes in firm performance.

The structural paths of the full SEM model showed that the dimensions of SCC by means of information sharing, decision synchronization, incentive alignment, resource sharing, collaborative communication, joint knowledge creation and goal congruence achieved positive direct changes on operational performance. The dimensions information sharing and collaborative communication were considered as pivotal and imperative pillars for SCC in the cross-border and inter-firm context.

Information sharing between supplier and buyer increases visibility of key performance metrics and process data which enables them to obtain the bigger picture of the as-is situation that takes into account important factors in making effective decisions. These effective decisions by both supplier and buyer enable them to address product flow issues and hiccups more quickly, thereby allowing more agile demand planning to take place. Complementary on information sharing, collaborative communication enhances the tight and close inter-firm relationship. Hence, as Mohr and Nevin (1990) highlighted, the patterns of collaborative communication increases the intensity and frequency, has more bidirectional flows, better informal modes, and increased indirect influence. Therefore, information sharing and collaborative communication in conjunction lead to more frequent contact points and moments and increases the accuracy and relevancy of the content. Another spillover effect of the SCC dimensions information sharing and collaborative communication is that it increases trust and commitment by means of social exchange processes. Especially, within a cross-border and international business context this snowball effect of events accumulates and will have a positive direct main effect on primarily operational performance.

Conclusively, information sharing through optimized, smooth and lean collaborative communication increases the ability to make better decisions and to take actions on the basis of greater visibility (Davenport et al. 2001). The core cornerstone and backbone of information sharing and collaborative communication provides the opportunity to link integrated information and performance drivers. Hence, information sharing and collaborative communication provide a platform to stimulate joint knowledge creation and decision synchronization by means of relevant, timely and accurate information. As decisions are incrementally more synchronized between supplier and buyer, incentive alignments come into place which employs performance metrics to construct benefit and cost sharing agreements. This new form of business environment of integrated information between supplier and buyer helps to fulfill demand more quickly with shorter order cycle times.

The results of the study in this research paper showed that the dimensions information sharing and collaborative communication are paramount for SCC, especially in a cross-border and inter-firm context. These dimensions incentivize the more deeply involved dimensions of SCC such as decision synchronization, joint knowledge creation, incentive alignment and goal congruence.

To summarize, the full SEM model results showed that SCC by means of the aforementioned seven dimensions has a positive direct effect and impact on both operational performance and collaborative advantages. The improvement of operational performance and the established and realized collaborative advantages by SCC dimensions have a positive effect and impact on firm performance which increases the profitability and competitiveness of the firm.

8. Conclusions and Implications

The research of this paper provided comprehensive understanding of the relationships and effects of SCC and its effects on both operational performance and firm performance by testing the latest theoretical concepts of SCC. The novelty and topicality of this study is the integrative and integral empirical study. Prior studies only included the direct main effects of SCC activities and dimensions on mainly firm performance KPIs. This study included collaborative advantages as a mediation variable to determine the mediation effects of SCC on operational performance and firm performance.

Due to the international business dimension of the cross-border inter-firm contextual design of the study, the impediments, collaboration barriers and cross-border business barriers, in the form of market dimension and environmental dimension, were included as interaction moderation variables. Again, these interaction moderation variables offer novel insights which have not been analyzed before. These interaction moderation variables measured the change of effect of different hypothesized direct main effects in a variety of different market environments and situations by means of low and high impediment factors. Furthermore, the direct and main effects of these interaction moderation variables were also included to conclude their impact on collaborative advantages, operational performance and firm performance.

The final results of the novel introduced mediation analysis showed and implied that the actual direct main effect of SCC has a negative impact and effect on firm performance. The most plausible and reasonable explanation for this direct main effect is that SCC requires tangible and intangible assets of the firm. If the firm does not achieve any form of collaborative advantages and/or improvements in operational performance, SCC does not add any value. Hence, these opportunity costs could have been used for different purposes. However, the relationship SCC through the mediator collaborative advantages shows positive changes and improvements on firm performance. Thus, collaborative advantages bifurcates the effect of SCC on firm performance. On the other hand, there is no mediation effect between the relationship SCC and operational performance. Hence, it can be concluded that collaborative advantage as a mediator explains the relationships and effects better than prior conducted studies on both operational performance and firm performance.

Another novel element of the study in this study was the moderator collaboration barriers and cross-border business barriers by means of market dimension and environmental dimension. The results of the full SEM model of the moderator collaboration barriers showed that collaboration barriers moderate positively the positive effect of SCC on CA. Thus, SCC has an even greater effect and impact on realizing collaborative advantages. Although, the direct main effect of collaboration barriers on collaboration advantages is negative. Therefore, it can be concluded that under the presence of collaboration barriers, SCC will experience difficulties to be conducted properly and firms are disincentified and discouraged to conduct SCC. However, if a firm manages to realize SCC, the effects on collaborative advantages will be even more profound and stronger. These stronger and more profound collaborative advantages can be interpreted as more unique and rare collaborative advantages under challenging collaboration business environments which leads to even greater improvements in firm performance.

The results of the moderators market dimension and environmental dimension showed that the positive effect of collaborative advantages on operational performance are even more profound and stronger in market situations which are categorized by environmental impediments and barriers, while on the other hand, the positive effect of collaborative advantages on firm performance dampens. As for market dimensional impediments and barriers, the positive effect of collaborative advantages on firm performance amplifies in market situations that are characterized by market impediments and barriers. In conjunction, both market dimensions and environmental dimension strengthens the positive relationship between collaborative advantage and operational performance and firm performance. The strengthening effects tend to be slightly stronger on operational performance than on firm performance due to the stronger negative direct effects of both market dimensions and environmental dimensions on operational performance.

Based on the results of the interaction moderation analyses of market dimension and environmental dimension impediments, the figure below was constructed.

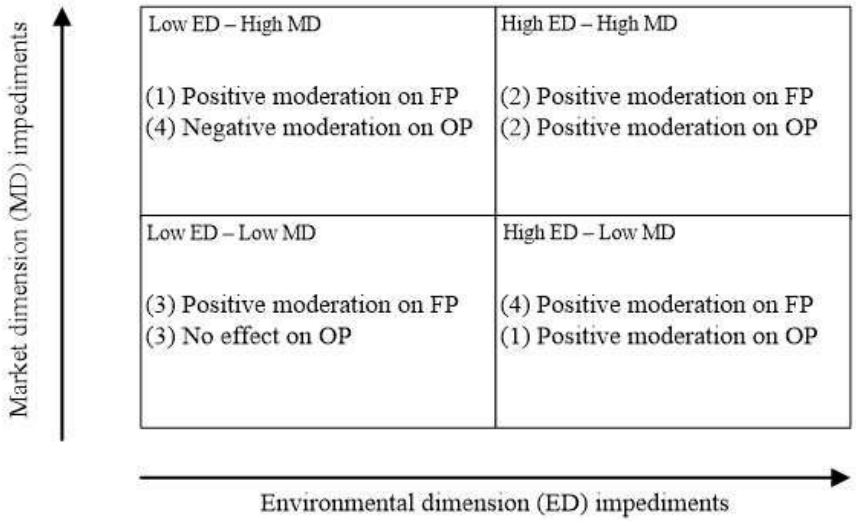


Fig. 8: Moderation changes in different market situations on OP and FP
Source: Author's own

This figure of four quadrants interact the low and high moderation effects and changes of market dimension and environmental dimension on the effects and relationship between collaborative advantages and operational performance and firm performance. The numbers within the parentheses show the rank and magnitude of the interaction moderation effect on the relationship between collaborative advantages and operational performance and firm performance. In other words, the higher the rank (1), the higher the moderation effect of collaborative advantages on operational performance or firm performance.

The figure 8 shows that in a market situation with high environmental and market impediments and barriers, the effect of collaborative advantages is positively moderated on both operational performance and firm performance.

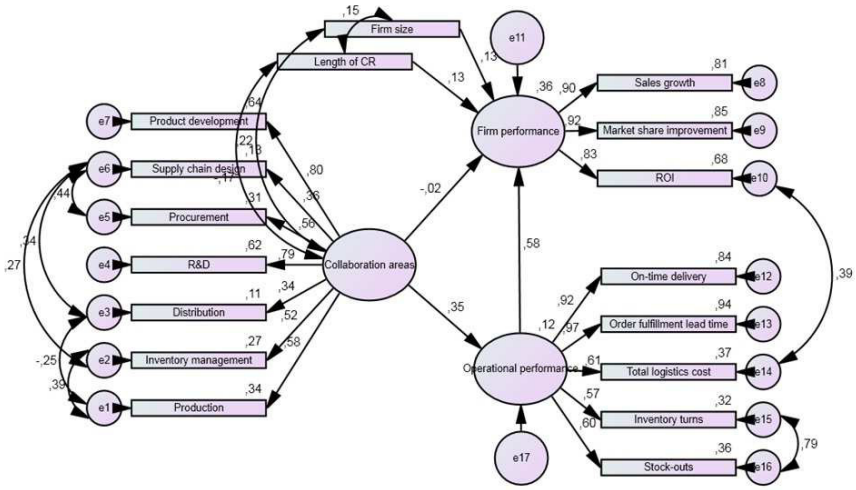
The final results showed and implied that the actual direct main effect of SCC has a negative effect on firm performance. The most plausible and reasonable explanation for this direct main effect is that SCC requires tangible and intangible assets of the firm. If the firm does not achieve any form of collaborative advantages and/or improvements in operational performance, SCC does not add any value. Hence, these opportunity costs could have been used for different purposes. However, the relationship SCC through the mediator collaborative advantages shows positive changes and improvements on firm performance. Thus, collaborative advantages bifurcates the effect of SCC on firm performance. On the other hand, there is no mediation effect between the relationship SCC and operational performance. Hence, it can be concluded that collaborative advantage as a mediator explains the relationships and effects better than prior conducted studies on both operational performance and firm performance.

In conclusion, after finalizing all the empirical and statistical analyses and formulating the conclusions and implications, the strict and precise contribution and proposition of this study on the depicted and formulated problem statement, which stated that it is unclear and ungrounded and that there is no definite and conclusive answer if SCC has a positive direct impact and effect on operational performance and on firm performance, and which mechanisms mediate and moderate such impacts and effects in the case of the contextual cross-border inter-firm (EU15-Russia) design, is as follows.

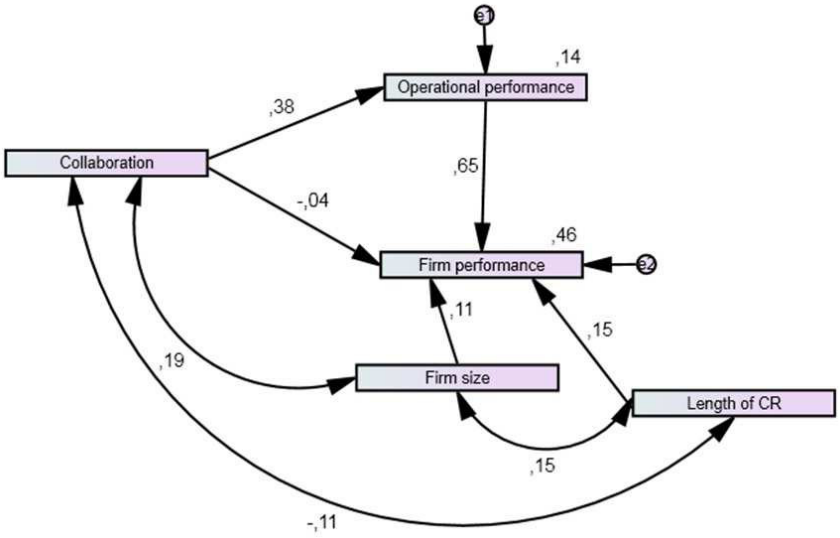
In the contextual cross-border inter-firm (EU15-Russia) design, SCC has a positive direct impact and effect on operational performance and indirectly through collaborative advantages on firm performance. The effects of SCC are bifurcated by collaborative advantages on firm performance. Furthermore, collaboration barriers and cross-border business barriers have negative direct main effects, but strengthen and amplify the effect of collaborative advantages on operational performance and firm performance.

Appendix

1. Path Diagram of Scope and Depth of Collaboration



2. Path Diagram of Scope and depth of Collaboration (Composite Observed)



3. Factor Analysis Latent Construct CBBB

Table 17: Rotated Component Matrix[a]

	Component		
	1	2	3
Restrictive rules and regulation	,890		
Bureaucratic requirements	,856		
Lack of government assistance	,840		
Transportation difficulties	,783		
High tariff and non-tariff barriers	,587	,327	
Unfamiliar foreign business practice		,871	
Different customer culture		,861	
High business risk		,621	
Limited information about markets	,402	,576	
Strong international competition			,808
Unfavorable foreign exchange rates	,348		,795

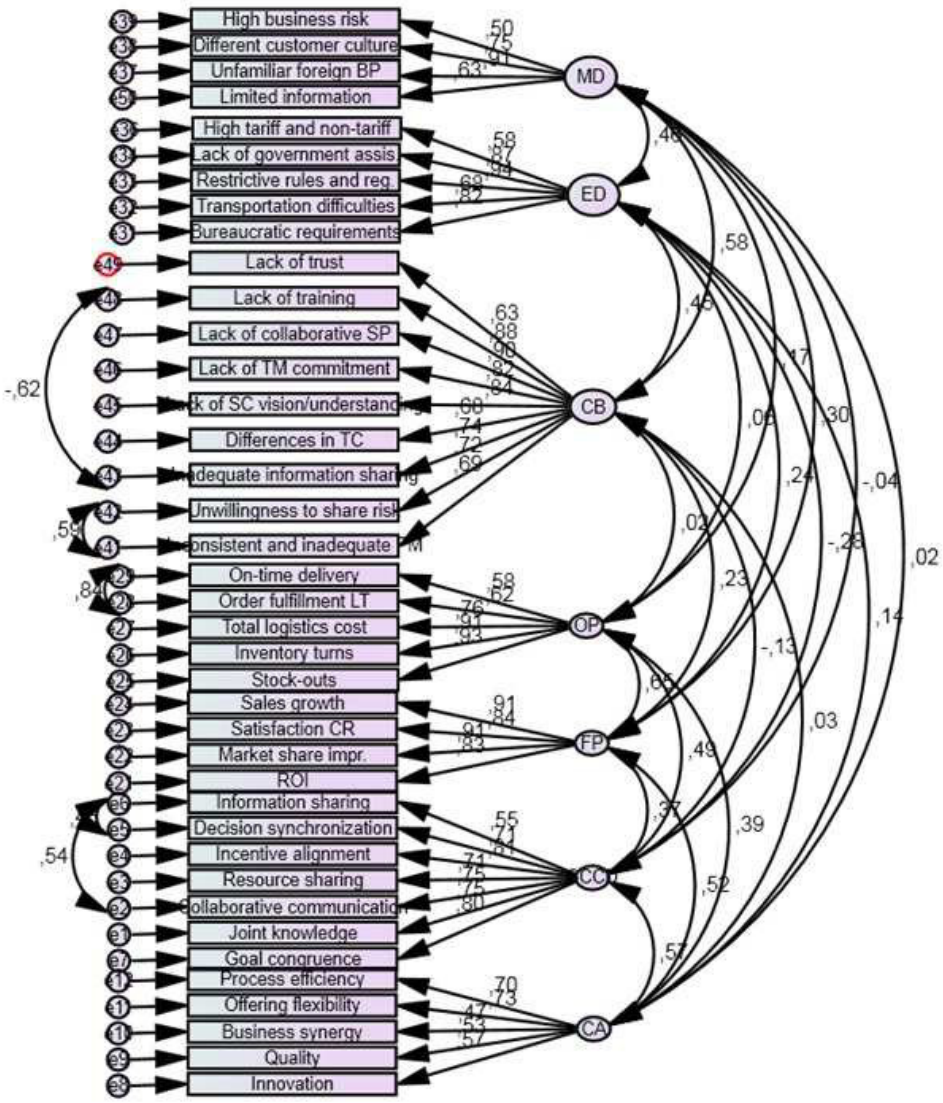
Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

Table 18: Rotated Component Matrix[a]

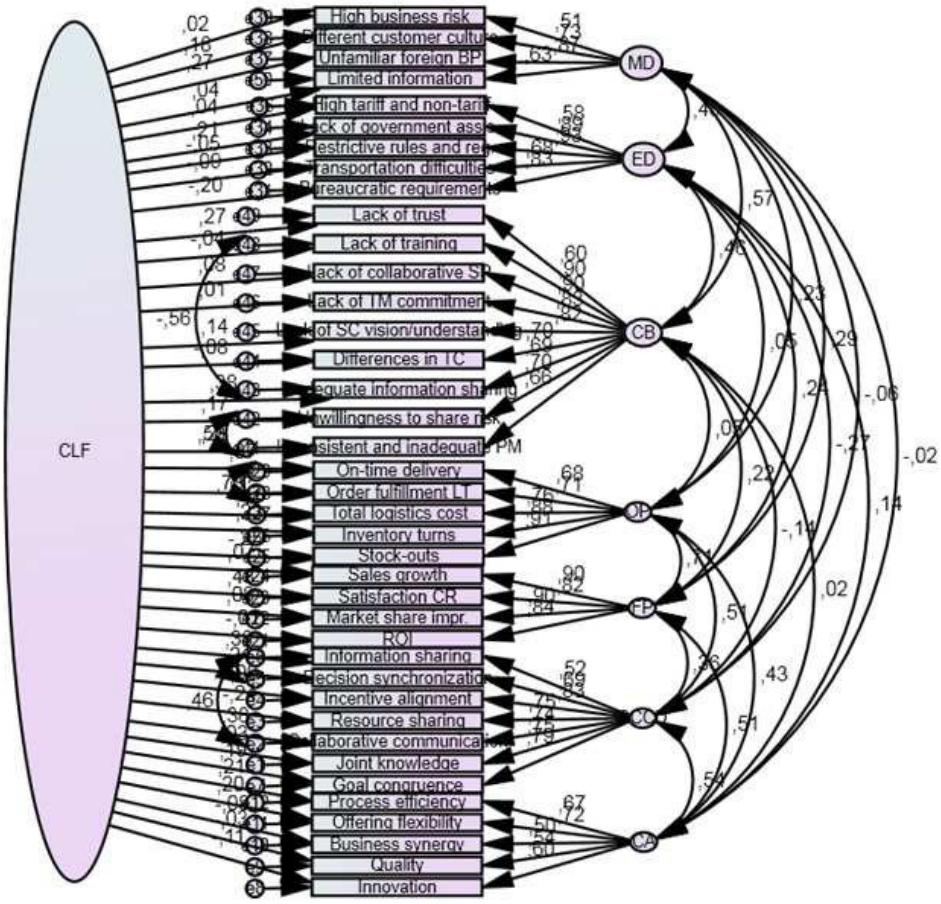
	Component	
	1	2
Restrictive rules and regulation	,904	
Bureaucratic requirements	,869	
Lack of government assistance	,845	
Transportation difficulties	,767	
High tariff and non-tariff barriers	,594	
Different customer culture		,878
Unfamiliar foreign business practice		,868
High business risk		,626
Limited information about markets		,593

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

4. Confirmatory Factor Analysis



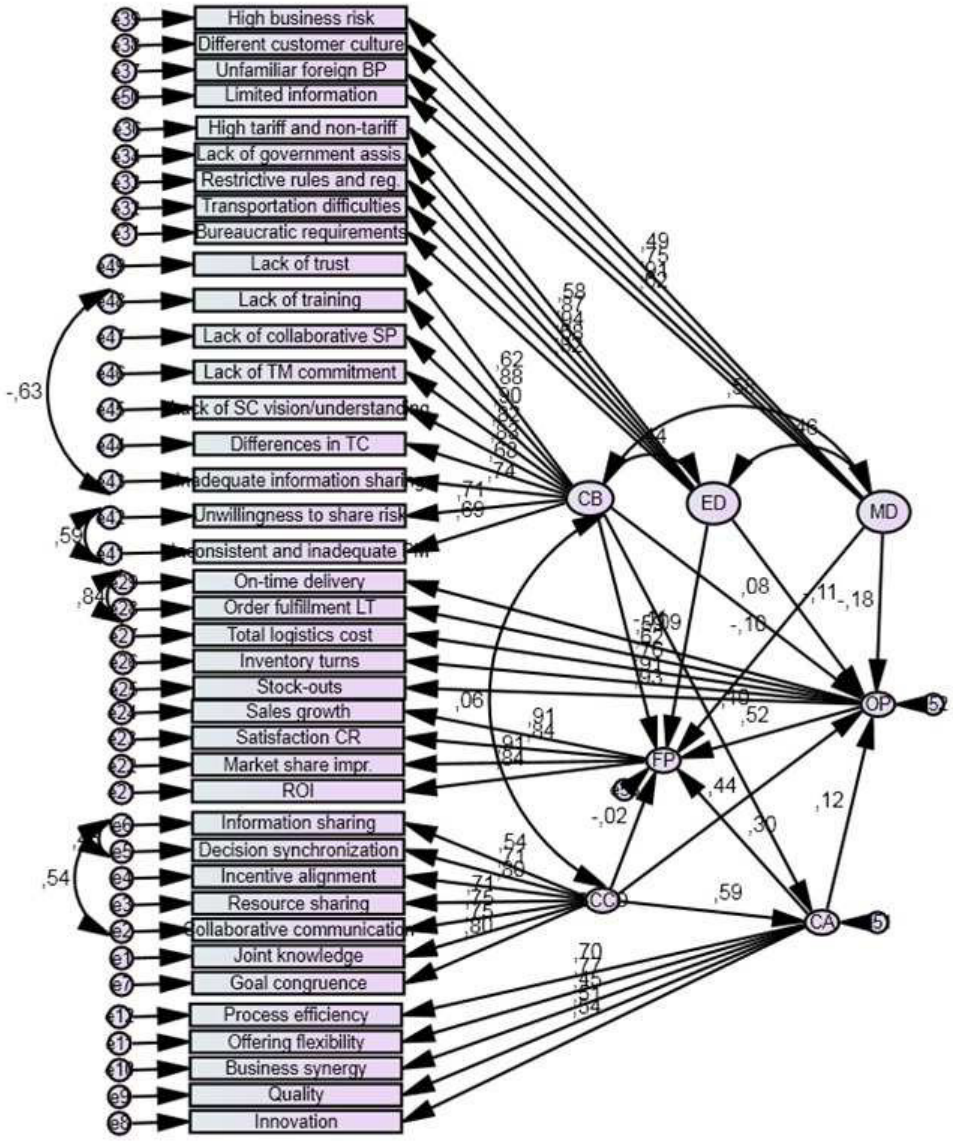
5. Common Method Bias - CFA with CLF



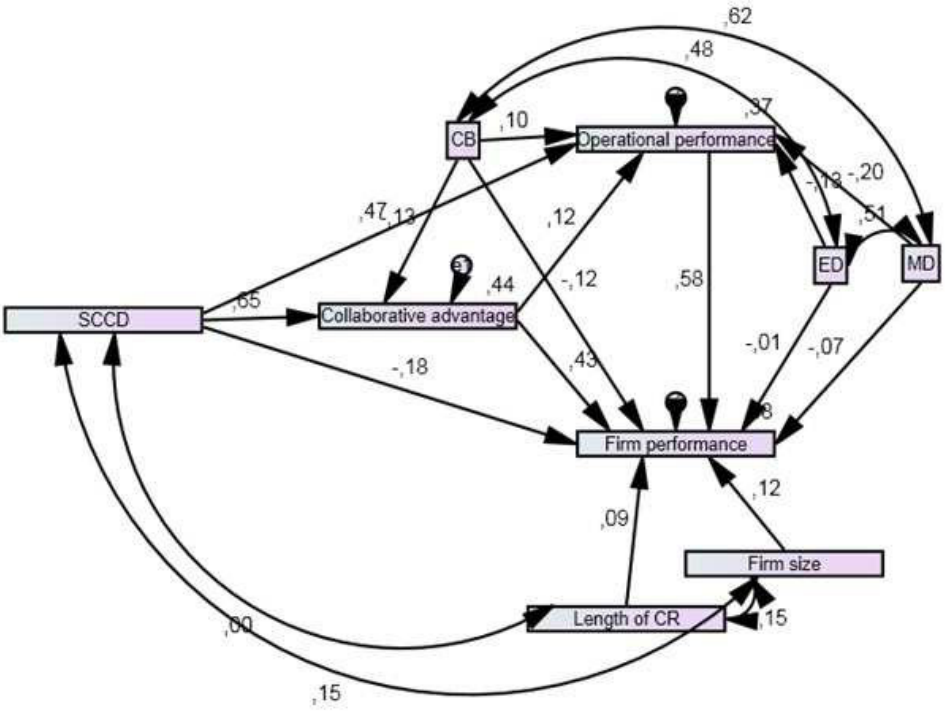
6. Comparison between CLF with and without CLF

Standardized Regression Weights				**Standardized Regression Weights:**			
With CLF				**Without CLF**			
		Estimate				Estimate	
var46	<— SCCD	0,747		var46	<— SCCD	0,755	0,008
var45	<— SCCD	0,736		var45	<— SCCD	0,754	0,018
var44	<— SCCD	0,748		var44	<— SCCD	0,707	-0,041
var43	<— SCCD	0,828		var43	<— SCCD	0,81	-0,018
var42	<— SCCD	0,688		var42	<— SCCD	0,709	0,021
var41	<— SCCD	0,521		var41	<— SCCD	0,55	0,029
var47	<— SCCD	0,795		var47	<— SCCD	0,799	0,004
var53	<— CA	0,603		var53	<— CA	0,568	-0,035
var52	<— CA	0,539		var52	<— CA	0,534	-0,005
var51	<— CA	0,498		var51	<— CA	0,467	-0,031
var50	<— CA	0,715		var50	<— CA	0,733	0,018
var49	<— CA	0,672		var49	<— CA	0,699	0,027
var81	<— FP	0,84		var81	<— FP	0,832	-0,008
var80	<— FP	0,899		var80	<— FP	0,91	0,011
var79	<— FP	0,818		var79	<— FP	0,839	0,021
var78	<— FP	0,904		var78	<— FP	0,909	0,005
var88	<— OP	0,909		var88	<— OP	0,933	0,024
var87	<— OP	0,879		var87	<— OP	0,913	0,034
var86	<— OP	0,755		var86	<— OP	0,757	0,002
var85	<— OP	0,713		var85	<— OP	0,619	-0,094
var84	<— OP	0,68		var84	<— OP	0,584	-0,096
var111	<— CB	0,663		var111	<— CB	0,693	0,03
var109	<— CB	0,693		var109	<— CB	0,736	0,043
var108	<— CB	0,7		var108	<— CB	0,682	-0,018
var107	<— CB	0,824		var107	<— CB	0,836	0,012
var106	<— CB	0,827		var106	<— CB	0,819	-0,008
var105	<— CB	0,903		var105	<— CB	0,905	0,002
var104	<— CB	0,896		var104	<— CB	0,884	-0,012
var103	<— CB	0,596		var103	<— CB	0,626	0,03
var110	<— CB	0,7		var110	<— CB	0,716	0,016
var98	<— ED	0,928		var98	<— ED	0,936	0,008
var100	<— ED	0,828		var100	<— ED	0,822	-0,006
var97	<— ED	0,892		var97	<— ED	0,872	-0,02
var99	<— ED	0,68		var99	<— ED	0,681	0,001
var95	<— ED	0,585		var95	<— ED	0,584	-0,001
var94	<— MD	0,872		var94	<— MD	0,91	0,038
var93	<— MD	0,732		var93	<— MD	0,753	0,021
var92	<— MD	0,508		var92	<— MD	0,497	-0,011
var101	<— MD	0,634		var101	<— MD	0,626	-0,008

7. Hybrid Structural Model



8. Structural Strandardized Regression Model



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