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The supply chain integration - supply chain sustainability relationship in the UK and Ghana pharmaceutical industry: A stakeholder and contingency perspective

Abstract
In this research, the objective is to develop and test a model which provides understanding into the supply chain integration (SCI)-supply chain sustainability (SCS) relationship. The paper also explores how the SCI-SCS relationship is mediated by customer satisfaction and moderated by external uncertainty (EU) through the lenses of stakeholder and contingency theory by considering the pharmaceutical industry in Ghana and the UK. Empirical survey data were gathered from 231 pharmaceutical firms in Ghana and UK. We used structural equation modelling, multi-group analysis, and hierarchical regression to analyse the SCI-SCS relationship. We argue that through SCI, the economic, social and environmental performances can be simultaneously improved. However, the SCI-SCS relationship differs among the UK and Ghana context. Testing for mediation found that by increasing levels of customer satisfaction through customer integration (UK) and internal integration (Ghana), pharmaceutical companies can improve their SCS performances. However, testing moderation showed that the mediating effect is affected in both high and low EU. Drawing on stakeholder and contingency theory, our study is among the first to understand the influence of customer satisfaction and EU on the SCI-SCS relationship from a developing country (Ghana) and developed country (UK) perspective. Practitioners are provided with guidance on how to effectively/efficiently operationalise SCI to achieve SCS.

Keywords Supply chain integration, Supply chain sustainability, External uncertainty, Customer satisfaction, Pharmaceuticals.

Paper Research paper

1. Introduction

Over the years, many have recognised and regarded the significant role SCI plays in improving performance (Zhao et al., 2020). Many have supported the assertion that the adoption and/or increase in SCI improves performance (Danese et al., 2020: Munir et al., 2020). The CDP Global Supply Chain Report (2019) for instance revealed that for firms that collaborated with their suppliers, over 50% of these suppliers had their sustainability performance enhanced. Such collaboration enables companies to strategize their activities/output in meeting the exact demands of customers, especially as 73% of customers were ready to avoid existing suppliers based on their sustainability performance (CDP Global Supply Chain Report, 2019). Thus, there is high stakeholder (especially customers) demand for not only economically competitive products but products that are environmentally friendly (Ma et al., 2021) and produced under ethical conditions (Liu et al., 2021: Wolf, 2011). Besides, as firms are now operating in a more global and highly unpredictable external environment (EU) (Danese et al., 2020: Fynes et al., 2004: Yang et al., 2021), integrating activities of internal functions (II) and with suppliers (SI) and customers (CI) have been mentioned as an effective/efficient way to manage these complexities (Wiengarten et al., 2019). Hence, this makes the study of SCI to improve performance, meet customer demands whilst managing the impact of EU extremely important. Especially for industries that produce and globally supply essential products like

that of the pharmaceutical industry. Our focus is on the pharmaceutical industry because this industry is noted to be exposed to *high levels of EU and supply chain complexities* mostly in the form of a high cost of operations, complex regulations, complex supply chains, and long research duration (Yadav and Smith, 2012). These unique features make the study of sustainability in the pharmaceutical industry imperative especially to improve upon measures such as on-time medicine delivery, reduction in medicine unavailability/shortages (Yadav and Smith, 2012), and effective and efficient usage of the industry's heavy reliance on natural, and human resources (CDP Global Supply Chain Report, 2019).

In SCI literature, although research has shown a positive SCI-performance effect (Schoenherr and Swink, 2012: Wiengarten et al., 2019), the majority of the studies (Yu et al., 2019) focused on the economic performance only. Hence, sparse studies exist showing/testing the simultaneous effect SCI has on the three dimensions of SCS (Ahi and Searcy, 2013: Liu et al., 2020). It is equally crucial to consider the social and environmental dimensions due to high: (1) stakeholder pressure for companies to consider employee health and safety, and the life of the external community (2) demand for companies to account for their effective/efficient use of resources (Gimenez et al., 2012: Ma et al., 2021) (3) demand for companies to achieve truly sustainable supply chains by improving the economic performance, with no negative impact on environmental/social performance within/across the chain (Pagell and Shevchenko, 2014). Another shortcoming is that less research has been done to understand the contextual factors, which influence the SCI-performance relationship (Danese et al., 2013: Sousa and Vous, 2008). This is evident through the issue of inconsistent SCI-performance relationship results (Wiengarten et al., 2019). The literature argues that the missing link/factor which can explain (to some extent) the inconsistent direct SCI-performance results is customer satisfaction (Yu et al., 2013). However, this gap is less explored (Yu et al., 2013: Wiengarten et al., 2019). The literature also identifies EU (Wong et al., 2011) as a major factor, *inter alia*, which we argue, can explain essentially the disparity between previous results. Appendix A, TableA1 visualises and raises the importance of the raised gap.

Empirical data were obtained from 231 pharmaceutical companies in Ghana and the UK. Aside from Ghana and the UK capturing the diverse types of customers, and levels of EU exposed to pharmaceutical companies in developing and developed countries respectively (Yadav and Smith, 2012), the pharmaceutical industry in both countries are particularly vulnerable to increases in complexity, cost, regulations, and uncertainty which makes it vital in studying the influence of EU on the SCI-customer satisfaction-SCS relationship. Moreover, both countries also house leading pharmaceutical companies that contribute significantly to the global economy (Ellis, 2019: Sulaiman and Boachie-Danquah, 2017). Drawing from the stakeholder theory (Friedman and Miles, 2002), we took a more inclusive approach in studying the SCI-SCS relationship by considering the key stakeholders (manufacturers, wholesalers, distributors, and retailers) in the pharmaceutical supply chain. We further integrated contingency theory (Donaldson, 2001) to explain the (1) mediating effect of customer satisfaction on SCI-SCS, and (2) the moderating role of EU on the indirect effect of SCI on SCS through customer satisfaction. As customers form part of the environment of focal firms (Flynn et al., 2010) this approach enabled an understanding of how satisfying customers through SCI may lead to achieving SCS. Whilst further understanding in which condition (low and high EU in developed and developing countries) the mediating mechanism is effective.

The contribution of the paper lies in providing understanding into the SCI-SCS relationship and how this relationship is mediated by customer satisfaction and moderated by EU from a developing and developed country perspective. In the rest of the paper; Section 2 details the model and hypothesis formulation: Section 3 details the sample/data, questionnaire design and preliminary analysis: Section 4 presents the results, and section 5

discusses the research findings. The last section details the research implications, limitations and opportunities for future work.

2. Theoretical model and hypotheses

2.1 Supply chain integration

The literature defines SCI as encompassing the coordination and interlinking of business processes that embody various communication channels and linkages within a supply network (Mangan et al., 2011). Flynn et al., (2010, p. 59) further defined "SCI as the degree to which a manufacturer strategically collaborates with its supply chain partners and collaboratively manages intra and inter organisation processes". From the given different perspectives that SCI have been defined, it can be seen that the most effective and efficient way to implement SCI is from a strategic perspective which further feeds into the operational activities of firms. Hence both the strategic and operational aspects of a firm must be considered to provide optimum value to customers at the lowest possible cost (Flynn et al., 2010). Hence, there is need to inculcate all stakeholders within/across the supply chain to effectively/efficiently operationalise SCI for improved performance. Despite this importance, most SCI studies do not consider all players in the chain (Boon-itt and Wong, 2010: Yu et al., 2019) and do not explore how this consideration affects the effective and efficient operationalisation of SCI to impact on SCS (Ahi and Searcy, 2013: Wolf, 2011). We address this gap in this study by drawing upon the stakeholder theory (justified in section 2.3).

In SCI literature, studies have viewed SCI as comprising suppliers, the focal firm, and customers (Wong et al., 2011: Weingarten et al., 2019), whilst others measured SCI in a unidimensional form (Morash et al., 1997). Some authors also viewed SCI from the internal/external perspective (Saeed et al., 2005: Pagell, 2004) only. Generally, even though SCI is considered to improve performance, each SCI dimension (II, SI, and CI) affects different performance measures uniquely (Yu et al., 2013); for example, SI and CI (Wiengarten et al., 2019) positively impact on firm performance. Whilst II has both positive (Wong et al., 2011) and negative and/or insignificant (Flynn et al., 2010) results. The aforementioned assertion shows that to holistically understand the impact of SCI on performance, it is vital to consider all the SCI dimensions. Despite the importance raised on considering all the SCI dimensions, many studies (Weingarten et al., 2019: Weingarten et al., 2014) that have contributed to the SCI literature ignored arguably the most critical SCI dimension, thus II (Flynn et al., 2010). Hence also contributing to the inconsistent positive (Huo et al., 2016) and negative/insignificant (Flynn et al., 2010: Gimenez and Ventura, 2005) SCI-performance literature results. Notwithstanding the various aforementioned SCI dimensions taken by the various authors in studying SCI-performance, large number of the literature tackled the study only from the economic perspective of performance (Ahi and Searcy, 2013: Govindan et al., 2020) (Appendix A Table A1 details this gap as well). Aside, our study taking into consideration all the SCI dimensions (II, SI, and CI), we most importantly extend the performance measures by inculcating the equally important social and environmental (discussed in the next sub-section) performances.

2.2 Supply Chain Sustainability

SCS is defined "as the management of social, environmental and economic impacts and the encouragement of good governance practices, throughout the lifecycle of goods and services" (Sisco et al., 2011, p. 5). Thus, SCS aims to positively impact on the social, economic and environmental performances (Govindan et al., 2020: Wolf, 2011). Whilst, truly sustainable supply chains further seek to achieve SCS but with no negative impact on social/environmental performance within/across the supply chain (Pagell and Shevchenko, 2014). As there are various conceptualisation of the SCS dimensions, to explicate and add to the specificity of the SCS construct, sample of items use to measure the three dimensions

have been given in Appendix B, Table B1. The significant role and demand for sustainability in supply chain management has placed enormous pressure on not only focal firms but also how supply chain partners and all other supply chain stakeholders can be integrated to operationalise strategies (e.g. SCI) that can impact their supply chain performance in a sustainable way (Yuen et al., 2019). Thus, the concept of sustainability is not centred on focal firms only but players and inter-organisational partners (Zhu et al., 2005). Although a number of factors have been mentioned as the drivers for operationalising and achieving SCS, generally the main factors are known to emancipate from internal (focal firm) and external (regulators/government, and investors, etc.) stakeholders (Zhu et al., 2005). Despite these arguments indicating the importance of considering all the SCS dimensions (Govindan et al., 2020) and stakeholders in the chain (Wolf, 2011), the majority of SCI-performance studies (Weingarten et al., 2014: Zhao et al., 2015) focus on economic performance, and the focal firm only. In this study, we broaden and validate the SCI-performance relationship by considering the social, economic and environmental performances. We also consider all main players in the pharmaceutical chain (discussed in the next sub-section) Appendix A, Table A1 details the raised gap and shows how this paper contributes to the SCI, SCS literature).

2.3 Stakeholder theory

The stakeholder theory is defined as the combination of a firm fulfilling its business goals toward its stakeholders whilst maintaining the morals and values in managing the organisation (Friedman and Miles, 2002). This suggests that to positively impact on SCS has to do with the involvement of all the key stakeholders in the chain (Wolf, 2011). Thus, the combined contribution of all the stakeholders in strategic and/or operational decisions/activities are essential to positively impact the SCS of the focal firms and that of suppliers, customers and other key stakeholders across the supply chain. Drawing from this argument we first integrated the stakeholder theory in studying the SCI-SCS relationship. We applied the stakeholder theory in studying the SCI-SCS relationship by collecting data from the key pharmaceutical stakeholders (manufacturers, wholesalers, distributors, and retailers) in studying how the pharmaceutical players may apply SCI to improve their economic dimension and that of supply chain stakeholders whilst maintaining ethical and environmentally friendly processes and products throughout the supply chain.

2.3.1 Internal integration and Supply Chain Sustainability

Internal integration generally embodies the interlinkage and alignment between the various departments within an organisation (Mangan et al., 2011). Thus, II seeks to collaborate activities among product/service development, and right through to the point where these products/services are delivered to the end consumer purposely to fulfil consumer demands in a cost competitive way (Morash, 2001). II is regarded as a fundamental dimension (Yu et al., 2013) which does not only improve financial, and operational (quality, flexibility, cost, flexibility) (Wong et al., 2011) performance, but also influences the effect integrating with external players has on performance (Yu et al., 2013). II eliminates barriers among departments (Flynn et al., 2010) which enables quick flow of adequate information, and effective/efficient collaboration of internal activities which leads to higher forms of responsiveness. Thus, through a strongly integrated internal base, firms will be able to generate the necessary resources/capabilities to produce and deliver products in a timely manner, and effectively adjust/alter internal activities to respond quickly to market demands. Although the SCI literature shows inconsistency in the SCI-performance relationship, nevertheless literature (Flynn et al., 2010) also shows that for a company that gains *stronger* collaboration among internal departments, higher performance may be achieved (Liu et al., 2018). Hence, we posit that:

H1a: Higher levels of Internal integration will positively impact the economic performance.

Also, through the involvement of all internal stakeholders and maintaining an integrated internal system among functions, II facilitates internal transparency which helps to tackle the social interest of workers and improves workers' motivation and skills (Gold et al., 2013). Thus the internal transparency developed through a strongly integrated internal system, allows that the needed rights and protection of workers are identified and protected. Through II, firms can also collectively develop practical and effective/efficient social programmes/activities that will not only impact the social performance of the firm, but further impact their economic performance as well (Gimenez et al., 2012). Although, the implementation/operationalisation of social initiatives through II requires some form of cost, some identified such initiatives/programmes/activities to be positively related to the social performance of the firms (Gimenez et al., 2012). Thus, through *stronger* collaboration among internal departments, higher performance may be achieved (Liu et al., 2018). Hence, we posit that;

H1b: Higher levels of Internal integration will positively impact the social performance.

Moreover, as II eliminates barriers among departments (Flynn et al., 2010), this facilitates improved and environmentally friendly processes/products through joint development, efficient resource utilisation and waste reduction. Thus, through a stronger collaboration of activities among internal functions, materials/resources can be efficiently utilised whilst reducing the occurrences of mistakes in production processes. Hence maintaining a stronger II does not only improve the quality of products and processes, but also reduces generated waste from production processes/activities. Although engagement in environmentally friendly activities may demand high monetary investment (e.g. training of employees on environmental processes and practices, technology investment, etc.) (Ma et al., 2021), strongly involving all internal stakeholders will enable leverage the performance of companies especially as customers are willing to pay more for environmentally friendly products (Homburg et al., 2005). Hence we posit that

H1c: Higher levels of Internal integration will positively impact the environmental performance.

2.3.2 External integration (Supplier integration and Customer integration) and SCS

Supplier Integration has to do with how a focal collaborates at a strategic and operational level with their core suppliers in order to achieve coordinated inter-organizational activities that assist in meeting the needs of consumers (Zhao et al., 2011). Researchers have shown enormous support for the positive impact on operational (Jitpaiboon et al., 2013) and financial (Yu et al., 2013) performance through SI. Thus, through strong SI, suppliers can understand the specific needs of the companies as there is high level of transparency and sharing of adequate information in a timely manner. Through this, firms and their suppliers can ensure quality, and quick transaction and delivery (Flynn et al., 2010) of products and services. Although the majority of studies have identified a positive relationship between SI and performance, some also identified negative and insignificant results (Flynn et al., 2010). Whilst the mixed findings draw attention to the possible presence of contextual factors, other researchers further argue that the improvement in performance is more likely to be achieved through *stronger* integrations with supply chain members (Cao and Liu et al., 2018: Vanpoucke et al., 2014: Vereecke and Muylle, 2006), in this case the suppliers. Based on this assertion, we posit that:

H1d: Higher levels of Supplier integration will positively impact the economic performance.

Others also argue that conflict of interest can be resolved through SI (Wong et al., 2011) which improves social relationships between involved partners. Thus through maintaining a strong collaboration with suppliers, firms can consistently identify the specific social needs of suppliers and meet these needs through engaged processes, and generated products. Through the gaining of this knowledge, firms in collaboration with their suppliers are also able to tailor their engaged corporate social responsibility (CSR) activities to the exact needs/demands of suppliers, customers and the wider community. SI also creates the needed platform for firms to consistently assess the activities of suppliers which improves the social performance of the suppliers and focal firm (Sancha et al., 2016). Thus, through SI focal firms are able to *consistently* monitor the activities of suppliers to ensure that ethical standards (e.g. health and safety) are always followed and met. Hence, a *stronger* SI will not only enable supply chain players to improve their economic performance (Vereecke and Muylle, 2006), but also their social performance within and across the supply chain.

H1e: Higher levels of Supplier integration will positively impact the social performance.

Through SI companies can engage in adequate distribution of information and collaborative development with suppliers which reduces mistakes/waste (Flynn et al., 2010) in operational activities within and across the chain. Establishing a strong collaborative system with suppliers ensures that, firms get the needed platform to also monitor the environmental performance and certification of suppliers (Gimenez et al., 2012) on a consistent basis. This is essential as the certifications certifies that the activities/products of these suppliers are environmentally friendly according to regulatory standards. The certificates cover areas such as the type of materials (e.g. recyclable, degradable materials), and energy (e.g. renewable energy) used for operational activities, and the adoption of effective/efficient standards in operationalising and enforcing environmentally friendly management systems. Example is the ISO 14000 certification (Zhu et al., 2013). Through SI, firms can also render the needed support in the form of training suppliers (Sancha et al., 2016) to engage in environmentally friendly activities. Such trainings could also be in the form of consistently devising/implementing new and efficient programmes/ways of minimizing waste generated from operational activities (Gimenez et al., 2012). Based on these arguments, we posit that;

H1f: Higher levels of Supplier integration will positively impact the environmental performance

Customer integration has to do with how a focal company collaborates at the strategic and operational level with core *customers* in the chain to achieve coordinated activities that assist in meeting the needs of consumers (Zhao et al., 2011). CI is known to promote coordination among the involved partners, whilst enabling the generation of core competencies (Flynn et al., 2010). The focal company and its customers can distribute adequate/accurate demand information (Yuen et al., 2019), which increases speed (reduces design time), improves quality (reduces defects) (Wong et al., 2011), flexibility (quick access to demand) (Shou et al., 2018), cost (increase in productivity due to speed and reduction in product redundancy) (Wong et al., 2011), and responsiveness (Azevedo et al., 2011). Although some identified an insignificant CI-economic performance relationship (Flynn et al., 2010), the majority of studies in the literature shows a positive relationship. Nevertheless, performance is more likely to be achieved through *stronger* integrations with supply chain members (Cao and Liu et al., 2018: Vereecke and Muylle, 2006), in this case with customers. Hence we posit that:

H1g: Higher levels of Customer integration will positively impact the economic performance

Also, the sharing of adequate and timely information among focal firms and customers enables focal firms to properly understand and pursue the social interest of customers (Flynn et al., 2010). This is essential especially as customers are not demanding for only economically competitive products, but also require firms to engage in ethical processes and activities in producing and delivering ordered products (Wolf, 2011). Example of such ethical requirements are; ensuring the working conditions of workers are acceptable, whilst the rights and social interest of customers are observed and protected (Paulraj, 2011). Understanding such ethical demands and consistently communicating it with customers (operationalised through stronger integration with customers) will increase the probabilities of impacting the social performance of the firm and it supply chain. Hence, we posit that:

H1h: Higher levels of Customer integration will positively impact the social performance

Additionally, having firms engage in stronger collaboration with customers, such partners are able to jointly share capacity (Liu et al., 2020) and better understand the needs/demands of customer, which helps to reduce waste (Wong et al., 2011) and increase the efficient utilisation of resources throughout the chain. Thus through CI, partners can engage in environmental programmes that will enable improve the environmental performance of the firm and it supply chain (Gimenez et al., 2012: Ma et al., 2021). Through CI, firms can also gain the needed platform to educate and monitor the actions of customers to ensure that their actions are environmentally friendly. Example could be how customers dispose unwanted products. Although most SCI research shows that SCI leads to improved performance, whilst some showed a negative relationship (Flynn et al., 2010), other researchers further argue that the improvement in performance is more likely to be achieved through *stronger* integrations with supply chain members (Cao and Liu et al., 2018: Vanpoucke et al., 2014: Vereecke and Muylle, 2006). Hence, we posit that:

H1i: Higher levels of Customer integration will positively impact the environmental performance

2.4 The contingency approach

There was an assertion that the application of best practices in different areas leads to an increase in performance (Voss, 1995). However, the acceptance of the aforementioned argument became questionable over time, as some studies started recording no significant relationship between the best practices and performance (an example is Dow et al. 1999; Powell 1995). Based on these inconsistencies, some scholars started to argue that the adopted practices are contingent on the context in which they were applied (Sousa and Voss, 2002), which underpins the contingency theory. The contingency theory argues about the existence of fit that includes a company's both internal structure and its external environment (Donaldson, 2001). As a firm's arrangement is context/external environment- dependent, there is no one fits all method (Flynn et al., 2010; Scott and Cole, 2000). Drawing on contingency theory, the environment in which the pharmaceutical companies in the UK and Ghana operate in, as well as their customers, are different and hence the processes and structure of the companies will also differ in both cases. Therefore, different levels of SCI and different dimensions of SCI may be prioritised in both the UK and Ghana context or in cases where the companies are exposed to either low or high EU. This also supports the rationale for considering EU in this study. Moreover, as consumers form part of the focal firms' environment (Flynn et al., 2010), it can be said that the demands, requirements, actions, and behaviour of consumers will also shape the processes and structure of the organisations. Hence stressing on the importance to consider customer satisfaction. We applied the contingency theory by considering pharmaceutical companies in Ghana (developing country) and the UK (developed country) and explored how customer satisfaction mediates the SCI-

SCS relationship similarly or differently in the two context. We further applied the contingency theory by exploring how the different levels of EU in these two contexts moderate the mediating effect of customer satisfaction on the SCI-SCS relationship. Both countries capture the different levels of EU, which makes it important in studying the influence of EU on the mediating effect of customer satisfaction on the SCI-SCS relationship.

2.4.1 SCI–SCS relationship: customer satisfaction as a mediator

Supply Chain Integration is identified in the literature as influencing customer satisfaction positively (Homburg and Stock, 2004). Thus, sharing of accurate customer information among internal functions (Yu et al., 2013) and with suppliers improves product development and quality which enables understanding and tailoring products/services to meet specific customer necessities (Heikkila, 2002: Reichheld, 2003). Some have supported this claim, by arguing that the *SCI- customer service* relationship is positive (Zhu et al., 2017), whilst some have also further identified a positive relationship between *customer satisfaction*-performance (Dotson and Allenby, 2010: Yu et al., 2013). In this case customer satisfaction serves as a causal result of SCI whilst also serving as an antecedent for performance. Hence, clearly unveiling customer satisfaction as a potential mediator for the SCI-performance relationship. To support the latter argument, which is the identified positive relationship between *customer satisfaction*-performance, firms known to satisfy their customers through offered products and/or services turn out having loyal customers (Bolton and Drew, 1991) who are also willing to buy offered products/services at superior rates (Homburg et al., 2005). Such firms are also known to have higher levels of financial cash flows (Mittal et al., 2005). However, for these firms to stay relevant/competitive, *consistently* meeting the demands of satisfied customers through strong integration among internal functions, suppliers and customers, *further* propels/creates the needed platform for such firms to be stronger. Stronger in terms of their consistent flexibility and responsiveness to market/major customer demands for competitive advantage. Hence we posit that:

H2a: Higher levels of Customer satisfaction will mediate the relationship between customer integration and (1) economic performance

H2b: Higher levels of Customer satisfaction will mediate the relationship between internal integration and (1) economic performance

H2c: Higher levels of Customer satisfaction will mediate the relationship between supplier integration and (1) economic performance

Also, customers are now increasingly demanding for not only economically competitive products, but also finished products that are ethical, produced under ethical conditions and are also environmentally friendly (Gimenez et al., 2012: Ma et al., 2021: Wolf, 2011). Through stronger/higher levels of integration among internal functions, and external stakeholders (suppliers and customers), supply chains can develop an inclusive and strong capabilities. These capabilities will equip/enable the supply chain players to collaboratively engage in ethical and environmentally friendly processes and programmes, and produce sustainable products (Gimenez et al., 2012: Wolf, 2011). Such strong collaborations within and across the supply chain will also enable strict and consistent monitoring of each players activities and processes to ensure that laid down ethical (Sancha et al., 2016) and environmental (Gimenez et al., 2012) rules, regulations, and or procedures are observed and engaged throughout the entire supply chain. Hence, further translating into the type of products that are produced and offered as well as the after services rendered to customers. This will not only increase customer satisfaction (Yu et al., 2013), but further impact the social (e.g. increase in society health and safety) and environmental (e.g. reduction in waste, thus for

both forward and backward activities throughout the chain) performance of the supply chain players. Hence we posit that:

H2a: Higher levels of Customer satisfaction will mediate the relationship between customer integration and (2) social (3) environmental performance
H2b: Higher levels of Customer satisfaction will mediate the relationship between internal integration and (2) social environmental (3) environmental performance
H2c: Higher levels of Customer satisfaction will mediate the relationship between supplier integration and (2) social environmental (3) environmental performance

2.4.2 SCI – Customer satisfaction – SCS relationship: external uncertainty as a moderator
EU generally describes to what degree a firm's external environment is characterised by unexpected change (Fynes et al., 2004). However, the contingency approach denotes a fit between internal business structures (strategic and operational) and its external environment (Donaldson, 2001). Literature argues that integration across internal department functions, with customers and suppliers leads to improvement in economic (Flynn et al., 2010), social, and environmental performance (Gimenez et al., 2012: Wolf, 2011). However, ensuring that customers are *consistently* satisfied plays an essential role in this process. Thus, as customers are demanding for economically viable, socially responsible, and environmentally friendly products, firms are under pressure to *consistently* satisfy the needs of customers, out of which their sustainability performance can be further impacted. In carrying out this activity, the extent to which firms integrate their activities among internal functions and supply chain partners are influenced by the level of EU (Danese et al., 2013: Slater and Narver, 1994: Wong, 2013) exposed to firms from their operating environment.

From an economic performance perspective, Ragatz et al., (2002) empirically indicated through their survey on high-technology companies, where it was noticed that some aspects of collaborating with suppliers are prone to high technology uncertainty, this resulted in significant economic performance. In addition, Wong et al., (2011) demonstrated that in high EU, integration with customers and it influence on delivery and flexibility is increased. Especially as these performance measures are time-based or are performed/measured in relation to time, hence are susceptible to external factors. Based on these findings, it can also be argued that under a highly uncertain environment where the needs of customers are highly uncertain, firms are more likely to engage in stronger/higher levels of CI in order to be proactive in satisfying customers. Thus, some have argued that in highly uncertain environments, stronger customer collaboration is required to enable capture adequate/accurate/timely information (Boon-itt and Wong, 2011: Wong et al., 2011) that feeds and drives the whole supply chain functioning. In such highly uncertain environments, the need for firms to continuously meet the demands of the satisfied customers purposely to remain competitive will also increase which will influence the operational activities of the firm and its partners. Hence, influencing economic performance. Nevertheless, such firms operating in high EU with high changes in customer demands will also engage in stronger levels of II (Boon-itt and Wong, 2011: Flynn et al., 2010). Thus through II, firms can generate and maintain a highly integrated internal system needed to produce products that are of acceptable quality and cost (Wong et al., 2011) to satisfy customers. For firms to *consistently* meet the demands and after services of the satisfied customers, gaining such integrated internal system will push/enable firms to be *more* flexible with their operations and responsive to market demands.

However, in a low uncertain environment where the needs/demands of customers are steadier and changes less (Boon-itt and Wong, 2011), firms are more likely to focus on

strengthening their collaboration with suppliers and among internal functions. Thus when firms are operating in environments where the predictions of customer demands is high, such firms are likely to focus on ensuring supplies are received in the right quantity on time, cost and quality, in order to meet the predicted needs/demands of customers. Moreover, for firms to effectively transform received supplies through internal operations in a cost competitive way whilst satisfying the standards of customers, a stronger collaboration among internal functional will be needed (Flynn et al., 2010). Consequently, for firms to *consistently* meet the demands and after services of the satisfied customers to gain competitive edge, gaining such strong collaborative relationship with customers, and among internal functions will push/enable firms to be *more* flexible with their operations and responsive to market demands. Based on the raised arguments, we posit that:

H3a: External uncertainty enhances the indirect effect of customer integration on (1) economic performance through customer satisfaction.
H3b: External uncertainty enhances the indirect effect of supplier integration on (1) economic performance through customer satisfaction.
H3c: External uncertainty enhances the indirect effect of internal integration on (1) economic performance through customer satisfaction

As firms are under increasing pressure to produce products that are ethical and environmentally friendly (Gimenez et al., 2012: Ma et al., 2021), firms are more likely to experience this pressure in different/higher forms when operating in high EU. Hence, in high EU, firms will need stronger collaboration with customers to meet their changing needs in a socially and environmentally friendly way. Thus through stronger CI, timely/adequate customer information can be gathered, whilst ensuring joint planning and sharing of capacities among partners (Yu et al., 2013). Hence, enabling the use of less resources and generating less waste in the chain. In such highly collaborative environment, partners can also monitor each other's operations/activities to ensure that ethical codes of conducts are observed (Sancha et al., 2016). Based on the raised arguments, one can argue that in such highly uncertain environment firms will not only be able to satisfy their customers through offered products but also will further improve upon their social and environmental performance.

However, in a low EU where changes in customer demands are less uncertain (Boon-itt and Wong, 2011), firms are more likely to focus on their activities with suppliers and their internal operations. Thus in such low EU, stronger SI is needed to ensure that not only are sourced products received at the right cost, quantity and quality (Wong et al., 2011), but also having suppliers behave in an ethical (Sancha et al., 2016) and environmentally friendly manner (Wolf, 2011). Hence ensuring that not only will customers be satisfied by offering them ethical and environmentally friendly products, but also will further impact the social and environmental performance of the firm and it supply chain members. Involving all internal stakeholders through stronger II will also enable produce products to meet the needs and after services of customers whilst also engaging in socially responsible initiatives, generating less waste from operations, and using the right channels in disposing generated waste (Gimenez et al., 2012). Based on these arguments, we posit that;

H3a: External uncertainty enhances the indirect effect of customer integration on (2) social performance (3) environmental performance through customer satisfaction.
H3b: External uncertainty enhances the indirect effect of supplier integration on (2) social performance (3) environmental performance through customer satisfaction.

H3c: External uncertainty enhances the indirect effect of internal integration on (2) social performance (3) environmental performance through customer satisfaction

Figure 1 displays the conceptual framework used in this study.

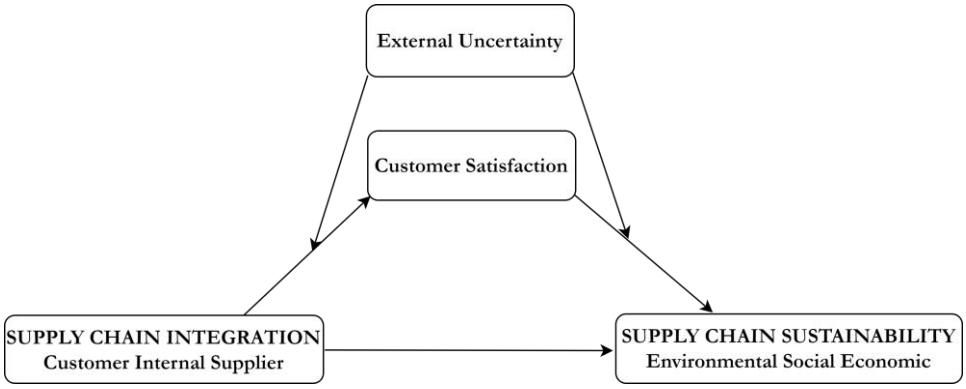

Figure 1 *- Conceptual Framework*

3. Research Methodology

3.1 Survey data collection

Survey data from pharmaceutical (manufacturers/wholesalers/distributors/retailers) companies in Ghana and the UK were collected (Table 1) from February 2019-August 2019 to test our hypotheses. The survey method was adopted as it enabled access to a large number of pharmaceutical participants from a wide geographical area both in Ghana and the UK, out of which generalization was made. Also, the survey method has been widely used in previous studies of SCI and SCS (Danese et al., 2013: Liu et al., 2020: Wiengarten et al., 2019). Hence, the adoption of the survey method enabled comparison to these studies and contributing to the SCI and SCS literature.

Aside from Ghana and UK respectively capturing the developing and developed country perspective for supply chain activities, both countries have leading pharmaceutical companies that significantly contribute to the global economy, and collectively capture the different levels of EU exposed to pharmaceutical companies globally (Shah, 2004: Yadav and Smith, 2012). Most of the pharmaceutical companies operating in the UK have the same/similar operations in Europe. Hence, the UK companies were contacted from both their UK and European site. Also, most of the pharmaceutical companies in these two contexts have their supply chains spanning different countries globally.

A list of the UK companies was retrieved from the, Association of British Pharmaceutical Industry (ABPI), the European Federation of Pharmaceutical Industries and Association (EFPIA) virtual platforms, and National Health Service (NHS) – UK. Whilst for Ghana it was from the Pharmaceutical Manufacturers Association of Ghana (PMAG) and the Pharmaceutical Society of Ghana, through which a database was created. Simple random and convenience sampling were used due to the restrictive nature of the pharmaceutical industry. For each company, we identified a respondent who is at the managerial level, likely to have in-depth knowledge about SCI (Flynn et al., 2010) and SCS. Selected companies were contacted via phone and email after which a generated link was sent for the companies to complete the online survey (Rossi et al., 2013). Noticing how reluctant some of the companies are in replying to our initial emails, we adopted a face-to-face approach were printed questionnaires were given out and collected in a few weeks. The questionnaire was administered to a total of 895 pharmaceutical companies in Ghana and the UK. Out of which 280 completed responses were gained. 49 responses were deleted due to missing data. The remaining 231 usable responses were used representing 31.3% response rate. A summary of

the respondents are detailed in Table 1. As the pharmaceutical industry is highly regulated and restrictive (especially in the UK context), it was difficult to control the response rate, hence accounting for the sample size difference for the UK and Ghana.

Table 1: *Demographics*

		Frequency	%	Mean	Std. Deviation
Level of job title/position	Top-level management	49	21.2	2.15	0.867
	Middle-level management	122	52.8		
	Low-level management	37	16.0		
	Other	23	10.0		
Annual turnover	Less than £25m	168	72.7	1.27	0.446
	More than £25m	63	27.3		
Firm Ownership	Public owned	14	6.1	1.94	0.249
	Private owned	216	93.5		
	State-owned	1	0.4		
Company classification	UK	89	38.5	1.61	0.488
	Ghana	142	61.5		
Company type	Raw material supplier only	2	0.9	7.18	2.220
	Manufacturing only	2	0.9		
	Manufacturing and Distribution	26	11.3		
	Manufacturing, Distribution and Retail	14	6.1		
	Wholesale only	6	2.6		
	Wholesale and Distribution	6	2.6		
	Wholesale, Distribution and Retail	58	25.1		
	Distribution only	7	3.0		
	Retail only	110	47.6		

3.2 Questionnaire design and measure

All the constructs (Table 2) were adopted from literature. Thus, SI, CI and II (Flynn et al., 2010: Narasimhan and Kim, 2002), EU (Chang et al., 2002: Ragatz et al., 2002: Wong et al., 2009), customer satisfaction (Zhang et al., 2003), economic (Flynn et al., 2010), social (Bansal, 2005: Paulraj, 2011), and environmental performance (Bansal, 2005: Paulraj, 2011: Zhu et al., 2010). As there are various conceptualisation of the SCS dimensions, to explicate and add to the specificity of the SCS construct, sample of items use to measure the three dimensions have been given in Appendix B, Table B1. A seven-point (1 - 7) Likert scale was used to measure all the constructs. We also controlled for annual turnover and company type in our analysis, as the extent of a company's involvement in SCI to achieve SCS might differ based on firms' financial standing and position (e.g. supplier, manufacturer, retailer, etc.) in the supply chain.

For pre-test, three academics, two industry experts, one international and one national pharmaceutical association were invited to review and validate the scales. Feedback was used to improve the confidentiality and wording of a few items.

3.3 Non-response bias and common method bias

This study compared early and late responses (Armstrong and Overton, 1977) using company classification and annual turnover. The comparison showed insignificant difference ($p<0.01$). Hence non-response bias is less likely to be present in our study.

As a single respondent was used for each company, we assessed common method bias (CMB). This study used the Harman's single factor as it is mostly used for single-method

Table 2: *EFA and CFA results: Reliability and Validity*

Construct (Reliability and Validity)	EFA Loading	CFA loading (t-values)
Independent Variable ($\chi2$= 94.991 df=29 $\chi2$/df= 3.276 IFI=0.963 TLI=0.942 CFI=0.963 RMSEA=0.080 SRMR= 0.041) (KMO Measure of Sampling Adequacy = 0.929, Bartlett's Test of Sphericity = $\chi2$= 2952.327 df= 105 p< 0.001)		
Supply chain Integration		
Supplier Integration *a*=0.876, CR=0.882, AVE=0.713		
Share information to our major suppliers through information technologies	0.549	0.804(15.291)
Have a high degree of strategic partnership with suppliers	0.947	0.826(15.964)
Have a high degree of joint planning to obtain rapid response ordering process (inbound) with suppliers	0.844	0.901(-)
Internal Integration *a*=0.921, CR=0.914, AVE=0.726		
Have a high level of responsiveness within our plant to meet other department's needs	0.653	0.823(-)
Have an integrated system across functional areas under plant control	0.836	0.912(18.560)
Within our plant, we emphasize on information flows among purchasing, inventory management, sales, and distribution departments	0.965	0.849(14.007)
Within our plant, we emphasize on physical flows among production, packing, warehousing, and transportation departments	0.891	0.822(13.418)
Customer Integration *a*=0.852, CR=0.826, AVE=0.614		
Have a high degree of joint planning and forecasting with major customers to anticipate demand visibility	0.551	0.881(-)
Our customers provide information to us in the procurement and production processes	0.965	0.765(11.430)
Our customers are involved in our product development processes	0.815	0.653(9.523)
Moderator and Mediator ($\chi2$= 346.947 df=156 $\chi2$/df= 2.294 IFI=0.978 TLI=0.963 CFI=0.978 RMSEA= 0.075 SRMR= 0.054) (KMO Measure of Sampling Adequacy = 0.809, Bartlett's Test of Sphericity = $\chi2$= 990.945 df= 28 p< 0.001)		
External Uncertainty *a*=0.839, CR=0.838, AVE=0.512		
Our suppliers performance is unpredictable	0.676	0.737(8.431)
Our plant uses core production technologies that often change	0.677	0.763(8.657)
Process technologies employed in plants are complex	0.703	0.651(7.995)
Core product technologies often change	0.903	0.784(9.244)
Regulations often change	0.594	0.635(-)
Customer Satisfaction *a*=0.919, CR=0.922, AVE=0.797		
Our after-sales service satisfaction levels increased	0.762	0.849(17.223)
Our customers stated expectations are exceeded	0.995	0.957(20.599)
Customer standards are always met by our plant	0.864	0.868(-)
Dependent Variable (Goodness of fit indices: $\chi2$= 50.371 df=22 $\chi2$/df= 2.290 IFI=0.981 TLI=0.968 CFI=0.981 RMSEA=0.075 SRMR= 0.029) (KMO Measure of Sampling Adequacy = .908, Bartlett's Test of Sphericity = $\chi2$= 1688.871 df= 45 p<0.001)		
Supply chain sustainability		
Economic Dimension *a*=0.819, CR=0.834, AVE=0.628		
Our company can quickly modify products to meet our major customer's requirements.	0.708	0.691(11.075)
Our company can quickly respond to changes in market demand.	0.773	0.855(-)
Our company has an outstanding on-time delivery record to our major customer.	0.859	0.822(13.541)
Social Dimension *a*=0.912, CR=0.898, AVE=0.747		
Improvement in community health and safety	0.915	0.815(15.211)
Reduction in environmental impacts and risks to general public	0.904	0.842(16.093)
Improved awareness and protection of the claims and rights of people in community served	0.678	0.903(-)
Environmental Dimension *a*=0.886, CR=0.871, AVE=0.694		
Reduction of waste water	0.820	0.800(13.554)
Decrease in frequency for environmental accidents	0.643	0.862(-)
Decrease in improper solid/liquid wastes disposal	0.941	0.848(14.805)

research (Podsakoff et al., 2003). The extracted single-factor explains less than 43% of the total variance. We subjected the Harman's single factor to a confirmatory factor analysis (CFA) which generated an unacceptable model: $\chi2$/df = 6.2, IFI = 0.718 TLI = 0.702, CFI = 0.717, RMSEA = 0.123, SRMR = 0.417. We further tested two measurement models. The first has traits only whilst the second has a common latent variable introduced (Yu et al., 2019). The results showed no significant difference (regression weights) among the models,

indicating unlikeliness of CMB issues in this study (Paulraj et al., 2008). All items fell within the kurtosis (-3.0 to 3.0) and skewness (-0.8 to 0.8) threshold indicating adequate symmetry in the data (Pallant, 2010).

3.4 Reliability and validity

We tested for unidimensionality, reliability, and validity for all constructs (Tables 2 and 3). Firstly, exploratory factor analysis (EFA) using maximum likelihood with Promax rotation (Chen and Paulraj, 2004) was conducted with final items loading more than 0.50 (Hair et al., 2010) (Table 2). The extracted factors matched the factors known from literature, supporting unidimensionality and convergent validity. We used the combination of the eigenvalue (> 0.1), scree plot, the total proportion of variance explained and the literature as the criteria in extracting the factors from the EFA. All the constructs also reported an acceptable Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy whilst Bartlett's test of sphericity results (detailed in Table 2) rejects the null hypothesis that the correlation matrix is proportional to an identity matrix. Secondly, the CFA loadings were above 0.5 with t-values above 2 (Hair et al., 2010), showing convergent validity. For unidimensionality, the overall fit of the measurement models were acceptable ($\chi2/df$ = 1 - 3, IFI > 0.90, TLI > 0.90, CFI > 0.90, RMSEA < 0.80, SRMR < 0.10) (Hu and Bentler, 1999). Thirdly, for multicollinearity, all the items were below 10 (variance inflation factor) (Bryne, 2013). We generated Cronbach's alpha (> 0.8), composite reliability (CR > 0.8), and average variance extracted (AVE > 0.5) (Table 2). Indicating adequate reliability and convergent validity (Hair et al., 2010). Fourthly, the square roots of the AVE are greater than the correlation among any pair of the constructs (Table 3). Indicating adequate discriminant validity (Fornell and Larcker, 1981).

To ensure comparison among the UK and Ghana groups, configural, metric and scalar invariance were tested. The obtained configural invariance values were**:** *grouped using UK and Ghana* **(**$\chi2$ = 80.802 df = 44 $\chi2/df$ = 1.836 IFI = 0.975 TLI = 0.959 CFI = 0.975 SRMR = 0.041 RMSEA = 0.060)**,** *ungrouped* **(**$\chi2$ = 50.371 df = 57 $\chi2/df$ = 2.290 IFI = 0.981 TLI = 0.968 CFI = 0.981 SRMR = 0.029 RMSEA = 0.075). Both *grouped* and *ungrouped* models have a good fit, hence enabling a comparison of the UK and Ghana data. For metric invariance, the following values were obtained: unconstrained model $\chi2$ = 80.802 df = 44, fully constrained model $\chi2$ = 91.094 df = 53, difference $\chi2$ = 10.292 df = 9, p = 0.327. We obtaining a p-value of the chi-square difference test as insignificant indicates that both groups are invariant. Hence, comparison can be made among the UK and Ghana groups. For scaler invariance ($\chi2$ = 24.067, df = 18, p = 0.153), an insignificant p-value was obtained which shows that the scaler invariance is good.

Table 3*: Correlations*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OPER_PERF(1)	**0.793**							
SOC_PERF(2)	0.694	**0.864**						
ENV_PERF(3)	0.758	0.820***	**0.833**					
SI(4)	0.703***	0.555***	0.514***	**0.845**				
II(5)	0.716***	0.605***	0.518***	0.792***	**0.852**			
CI(6)	0.710***	0.594***	0.430***	0.688***	0.761***	**0.784**		
EU(7)	0.435***	0.318***	0.243**	0.250**	0.288***	0.463***	**0.715**	
CUS_SAT(8)	0.561	0.511	0.556	0.296	0.330	0.379	0.325	**0.893**

Note: Value on the diagonal is the square root of AVE ***p< 0.001 **p< 0.010

4. Results

4.1 SCI-SCS relationship

To test hypothesis 1, we analysed the effect of SCI on SCS using the combined UK and Ghana data, as well as the UK and Ghana data in their separate forms. For the combined data PLS-SEM (SmartPLS 3) (Table 4) was used to explore the path relationships. PLS-SEM was used especially as less developed theoretical relationships are been analysed. For example the relationship between the various dimensions of SCI on social performance. Whilst to compare the UK and Ghana data, hierarchical regression was performed (Table 5) using SPSS version 24. Hierarchical regression, aside been widely used in SCI papers (Flynn et al., 2010: Wiengarten et al., 2019), is appropriate for the study as it does not only enable comparing the results among the two groups, but most importantly it enables the analysis to take into *consideration the systematic impact of the various dimensions of SCI on SCS which has strong theoretical implications. This is very vital especially as less developed theoretical path relationships are been analysed in a developing (Ghana) and developed (UK) country context.*

Table 4: *Impact of SCI on SCS*

Structural Paths	**β**	**t-statistics**	**Results**
CI -> ECON_PERF	0.301***	5.747	H1g: Supported
CI -> ENV_PERF	0.014	0.179	H1i: Not Supported
CI -> SOC_PERF	0.144†	1.831	H1h: Supported
II -> ECON_PERF	0.287***	4.161	H1a: Supported
II -> ENV_PERF	0.364***	3.979	H1c: Supported
II -> SOC_PERF	0.425***	5.765	H1b: Supported
SI -> ECON_PERF	0.271***	4.232	H1d: Supported
SI -> ENV_PERF	0.231*	2.316	H1f: Supported
SI -> SOC_PERF	0.161*	2.275	H1e: Supported
Control Variables	**β**	**t-statistics**	
AN_TRN -> ECON_PERF	-0.030	0.539	
AN_TRN ->ENV_PERF	-0.078	1.287	
AN_TRN ->SOC_PERF	0.024	0.529	
COMP_TYP ->ECON_PERF	0.141*	2.420	
COMP_TYP ->ENV_PERF	0.095	1.610	
COMP_TYP ->SOC_PERF	0.089	1.605	
R-square	**β**	**t-statistics**	
ECON_PERF	0.524***	11.993	
ENV_PERF	0.275***	5.203	
SOC_PERF	0.425***	10.148	
Q^2	**β**		
ECON_PERF	0.381		
ENV_PERF	0.207		
SOC_PERF	0.317		

***p< 0.001 **p< 0.010 *p< 0.050 †p< 0.100

From Table 4, acceptable and significant R^2 values were generated for the SCS (economic = 0.524 $p < 0.001$, environmental = 0.275 $p < 0.001$, social = 0.425 $p < 0.001$) dimensions (Chin, 1998). Hence supporting the predictive power of the SCS dimensions. We assessed the model capability to predict using Stone-Geiser's Q^2. The values generated for the SCS

dimensions were greater than 0, hence showing predictive relevance (Henseler et al., 2015). The results from Table 4 indicates that the SI-economic, environmental, and social performance association is positively significant, supporting H1d - H1f. II have a positive and significant effect on the economic, social, and environmental performances, hence supporting H1a - H1c. Except for environmental performance, the CI- and all the supply chain sustainability dimensions are positive and significant. Hence supporting H1g, H1h and not H1i.

To further test how the results for the impact of SCI on SCS (Table 4) *differ across the Ghana and UK setting (taking into consideration the systematic impact of the various dimensions of SCI on SCS)*, hierarchical regression was performed (Table 5) using SPSS version 24. For the main direct effect for both the UK and Ghana, Table 5 shows II having a positive association with economic performance supporting hypothesis H1a. For both contexts, adding SI and CI changed R^2 significantly, whilst both dimensions shows a positive association with economic performance, hence supporting hypothesis H1d and H1g respectively. However for the UK, the II- economic performance relationship became insignificant. In both contexts, II shows a positive association with environmental performance, supporting hypothesis H1c. Adding SI and CI changed R^2 significantly. However for Ghana, both SI and CI do not show a significant association with environmental performance, however vice versa in the UK

Table 5: *Direct Impact of SCI on SCS*

Predictors		**ECON_PERF**			**ENV__PERF**			**SOC_PERF**	
(GHANA)	**Step 1**	**Step 2**	**Step 3**	**Step 1**	**Step 2**	**Step 3**	**Step 1**	**Step 2**	**Step 3**
Control variables									
COMP_TYP	-.010	.017	.044	.039	.061†	.063†	-.003	.019	.029
AN_TRN	.922***	.211	.037	.410*	-.144	-.154	.819***	.203	.152
Main terms									
II		.490***	.268***		.383***	.352***		.425***	.342***
SI			.159*			.107			.144*
CI			.183*			-.059			-.015
R^2	.122	.534	.589	.032	.352	.360	.117	.497	.512
R^2 change		.412	.055		.320	.008		.380	.015
F	9.664***	52.712***	38.967***	2.285†	24.995***	15.295***	9.207***	45.469***	28.581***
F change		121.984***	9.085***		68.088***	.874		104.307***	2.131
(UK)									
Control variables									
COMP_TYP	.048	.113*	.064	-.015	.028†	.000	.026	.084	.054
AN_TRN	.367	-.231	-.302	.302	-.094	-.116	.481	-.050	-.097
Main terms									
II		.510***	.072		.339***	.021		.453***	.195
SI			.333***			.277*			.191†
CI			.307***			.187†			.186†
R^2	.011	.360	.522	.019	.186	.281	.023	.307	.365
R^2 change		.349	.162		.168	.095		.284	.058
F	.494	15.941***	18.159***	.813	6.485***	6.487***	1.011	12.571***	9.558***
F change		46.314***	14.110***		17.517***	5.467***		34.892***	3.798*

Significance Indicators: † $p < 0.100$ * $p < 0.050$ ** $p < 0.010$ *** $p < 0.001$

context. Hence the UK results supports hypothesis H1f and H1i respectively whilst that of Ghana do not. Also in the UK context only, the II- environmental performance relationship

became insignificant after adding SI and CI. In both UK and Ghana context, II shows a positive association with social performance, supporting hypothesis H1b. Adding SI and CI changed R^2 significantly. Both SI and CI shows a significant positive association with social performance for the UK setting (supporting hypothesis H1e and H1h respectively), but only SI- social performance in the Ghana context (supporting hypothesis H1e). Also in the UK context only, adding SI and CI to the model changed the II- social performance relationship to be insignificant.

4.2 Mediation of customer satisfaction on the SCI-SCS relationship

Multigroup analysis was performed using SmartPLS 3. A bootstrap (Bias-Corrected and Accelerated) with 5000 resamples was used. Table 6 indicates that for the UK, customer satisfaction fully mediates the CI- environmental, and social dimension, but at the same time it partially mediates CI-economic performance. For Ghana, customer satisfaction was identified to partially mediate II- and all dimensions of SCS. Hence the results support hypotheses H2a1 – H2b3. On the contrary, in both contexts, none of the relationships between supplier integration and the dimensions of SCS are mediated by customer satisfaction. Hence H2c1 – H2c3 are not supported. The CI-customer satisfaction-SCS, and SI-customer satisfaction-economic performance mediated relationships are statistically different between the UK and Ghana context. Although there is no statistical difference between the UK and Ghana, the results shows that customer satisfaction partially mediates II-social, and economic performance.

4.3 Conditional indirect effect of SCI on SCS through customer satisfaction moderated by EU

We tested the conditional indirect effect of SCI on SCS through customer satisfaction when the condition of EU is high and low. Based on our conceptual framework which shows the moderated mediation effect, we developed moderated mediation models using Hayes (2013) PROCESS version 3.4 (SPSS version 24) Model 58, which captures the moderated mediation relationships in the conceptual framework (Figure 1, in section 2.4.2). A bootstrap (Bias-Corrected) on 5000 resamples (for both UK and Ghana) was used to estimate the 95% confidence interval (95%CI) values. PROCESS has been widely used (Li et al., 2020: Sârbescu et al., 2017), and has gained significant relevance especially for analysing complex models that contain both mediator(s) and moderator(s). A conditional indirect effect exist when the confidence interval do not contain the value 0.

For Ghana (Table 7) the result indicates that the conditional indirect effects of II on SCS through customer satisfaction are significant when the condition of EU is both high (Economic 95%CI = 0.001, 0.113; Social 95%CI = 0.002, 0.078; Environmental 95%CI = 0.005, 0.100) and low (Social 95%CI = 0.034, 0.211; Environmental 95%CI = 0.075, 0.297), except when II-customer satisfaction-economic performance mediated relationship is exposed to low EU (95%CI = 0.000, 0.152). Indicating that EU enhances the indirect effect of II on SCS through customer satisfaction, hence supporting hypothesis H3c1, H3c2, and H3c3. The indirect effect of CI on social (95%CI = 0.003, 0.080) and environmental (95%CI = 0.007, 0.103) through customer satisfaction is significant only in the context of high EU, hence supporting hypothesis H3a2 and H3a3. Whilst that of SI on all (Economic 95%CI = 0.018, 0.171; Social 95%CI = 0.019, 0.217; Environmental 95%CI = 0.024, 0.268) the dimensions of SCS through customer satisfaction is significant only in the context of low EU, supporting hypothesis H3b1, H3b2, and H3b3. For the UK results (Table 7) the conditional indirect effect of CI on all (Economic 95%CI = 0.048, 0.253; Social 95%CI = 0.026, 0.268; Environmental 95%CI = 0.058, 0.303) the three dimensions of SCS through customer satisfaction is significant when the condition of EU is high. Hence supporting hypothesis H3a1, H3a2, and H3a3.

Table 6: *Mediation of Customer satisfaction on the SCI-SCS relationship*

	Ghana					UK					Difference	
Paths	**Direct**	**Indirect**	**Lower**	**Upper**	**Results**	**Direct**	**Indirect**	**Lower**	**Upper**	**Results**	**diff (Ghana - UK)**	**Hypothesis**
CI -> CUS_SAT -> ENV_PERF	-0.037	-0.009	-0.079	0.062	None	0.022	0.143*	0.055	0.266	**Full**	-0.152*	H2a3: **supported**
CI -> CUS_SAT -> SOC_PERF	0.070	-0.006	-0.059	0.040	None	0.075	0.146*	0.052	0.281	**Full**	-0.152*	H2a2: **supported**
CI -> CUS_SAT -> ECON_PERF	0.238***	-0.004	-0.043	0.024	None	0.229*	0.134*	0.062	0.244	**Partial**	-0.138**	H2a1: **supported**
II -> CUS_SAT -> ENV_PERF	0.382***	0.151*	0.068	0.263	**Partial**	0.051	0.013	-0.067	0.099	None	0.138†	H2b3: **supported**
II -> CUS_SAT -> SOC_PERF	0.427***	0.101*	0.041	0.194	**Partial**	0.322*	0.013	-0.078	0.096	None	0.088	H2b2: **supported**
II -> CUS_SAT -> ECON_PERF	0.353***	0.067†	0.018	0.147	**Partial**	0.118	0.012	-0.062	0.092	None	0.055	H2b1: **supported**
SI -> CUS_SAT -> ENV_PERF	0.143	0.010	-0.069	0.087	None	0.307*	0.046	-0.032	0.123	None	-0.036	H2c3: not supported
SI -> CUS_SAT -> SOC_PERF	0.123	0.007	-0.046	0.063	None	0.121	0.047	-0.032	0.137	None	-0.041	H2c2: not supported
SI -> CUS_SAT -> ECON_PERF	0.1922**	0.004	-0.029	0.045	None	0.308**	0.043	-0.026	0.127	None	-0.039	H2c1: not supported

significance Indicators: † $p < 0.100$ * $p < 0.050$ ** $p < 0.010$ *** $p < 0.001$ Partial: both direct and indirect effect are significant

Table 7: *Conditional indirect effect of SCI on SCS through CUS_SAT moderated by EU*

Ghana		Economic Performance				Social Performance				Environmental Performance			
Independent Variable	Condition of EU	Conditional indirect effect through CUS_SAT				Conditional indirect effect through CUS_SAT				Conditional indirect effect through CUS_SAT			
				95% CI				95% CI				95% CI	
		Indirect effect	SE	Lower	High	Indirect effect	SE	Lower	High	Indirect effect	SE	Lower	High
Customer Integration	Low	0.080	0.050	-0.020	0.181	0.096	0.062	-0.023	0.222	0.119	0.078	-0.026	0.280
	High	0.038	0.026	-0.001	0.097	0.032	0.020	0.003	0.080	0.051	0.024	0.007	0.103
Supplier Integration	Low	0.091	0.040	0.018	0.171	0.113	0.050	0.019	0.217	0.145	0.062	0.024	0.268
	High	0.041	0.032	-0.007	0.115	0.030	0.022	-0.008	0.078	0.045	0.028	-0.010	0.101
Internal Integration	Low	0.073	0.039	0.000	0.152	0.114	0.045	0.034	0.211	0.171	0.057	0.075	0.297
	High	0.045	0.029	0.001	0.113	0.032	0.020	0.002	0.078	0.051	0.024	0.005	0.100
UK		Economic Performance				Social Performance				Environmental Performance			
Independent Variable	Condition of EU	Conditional indirect effect through CUS_SAT				Conditional indirect effect through CUS_SAT				Conditional indirect effect through CUS_SAT			
				95% CI				95% CI				95% CI	
		Indirect effect	SE	Lower	High	Indirect effect	SE	Lower	High	Indirect effect	SE	Lower	High
Customer Integration	Low	0.033	0.038	-0.030	0.122	0.037	0.042	-0.030	0.135	0.031	0.039	-0.028	0.123
	High	0.142	0.051	0.048	0.253	0.133	0.062	0.026	0.268	0.171	0.063	0.058	0.303
Supplier Integration	Low	0.038	0.037	-0.010	0.131	0.043	0.043	-0.013	0.149	0.033	0.040	-0.021	0.134
	High	0.046	0.069	-0.095	0.176	0.041	0.062	-0.090	0.159	0.046	0.068	-0.102	0.176
Internal Integration	Low	0.019	0.029	-0.030	0.086	0.020	0.031	-0.034	0.089	0.016	0.027	-0.034	0.079
	High	0.042	0.116	-0.206	0.233	0.035	0.096	-0.183	0.208	0.041	0.109	-0.195	0.244

CUS_SAT= Customer Satisfaction

4.4 Post-hoc Analysis

4.4.1Moderating effect of external uncertainty on the SCI-SCS relationship

To gain further insight, we used SmartPLS 3 to perform multigroup analysis (Bias-Corrected and Accelerated) with 5000 resamples (Table 8). The results showed that in high EU, the relationship between CI and all the dimensions of SCS is stronger for the UK as compared to Ghana. In high EU, the II-economic, II-social, and SI-economic relationships are significant for Ghana only. However, in low EU, the CI-economic is significant for the UK only whilst that of II-social is significant for Ghana only. Also in low EU, the II-economic, and II-environmental is stronger for Ghana, whilst SI-economic, and SI-environmental is stronger for the UK.

Table 8*: Moderating role of external uncertainty on SCI – SCS relationship*

High EU	**Path relationship**	**Ghana(*β*)**	**UK(*β*)**	**Difference**	**Results**
	CI -> ECON_PERF	0.221*	0.555***	-0.333†	Stronger for UK
	CI -> ENV_PERF	0.130	0.527**	-0.397†	Stronger for UK
	CI -> SOC_PERF	0.284*	0.778***	-0.493†	Stronger for UK
	II -> ECON_PERF	0.434***	0.234	0.200	Significant for Ghana
	II -> ENV_PERF	0.272	0.011	0.261	Same
	II -> SOC_PERF	0.367*	-0.066	0.433	Significant for Ghana
	SI -> ECON_PERF	0.211*	0.008	0.203	Significant for Ghana
	SI -> ENV_PERF	0.045	-0.146	0.191	Same
	SI -> SOC_PERF	0.055	-0.087	0.141	Same
Low EU	**Path relationship**	**Ghana(*β*)**	**UK(*β*)**	**Difference**	**Results**
	CI -> ECON_PERF	0.195	0.342*	-0.146	Significant for UK
	CI -> ENV_PERF	-0.184	-0.034	-0.15	Same
	CI -> SOC_PERF	-0.118	-0.036	-0.083	Same
	II -> ECON_PERF	0.409*	-0.083	0.493***	Stronger for Ghana
	II -> ENV_PERF	0.657**	-0.108	0.765***	Stronger for Ghana
	II -> SOC_PERF	0.644***	0.459	0.185	Significant for Ghana
	SI -> ECON_PERF	0.206	0.51***	-0.304***	Stronger for UK
	SI -> ENV_PERF	0.159	0.541**	-0.382†	Stronger for UK
	SI -> SOC_PERF	0.149†	0.274†	-0.125	Same

*** p < 0.001 ** p < 0.010 * p < 0.050 † p < 0.100

5. Discussion

In this research, the objective is to develop and test a model which provides understanding into the SCI-SCS relationship and how this relationship is mediated by customer satisfaction and moderated by EU. The study has a fourfold contribution to SCI literature.

5.1 Supply Chain Integration – Supply Chain Sustainability relationship

This paper argues that through SCI, all three dimensions of SCS can be positively impacted simultaneously, and not only in isolation/parts. This argument is in contrast to the literature (Ahi and Searcy, 2013: Govindan et al., 2020: Liu et al., 2020) as literature has only demonstrated how SCI directly affect either the economic, social, or environmental dimensions, but not the aforementioned three dimensions collectively. Thus, no research has demonstrated the direct and simultaneous effect SCI has on all three *(social, economic, environmental)* dimensions of SCS considering the pharmaceutical industry in a developed and developing country context.

Although this paper argues that all the SCI dimensions collectively impact all the dimensions of SCS simultaneously, this is not the case when the impact of the external integration dimensions of SCI are analysed separately. Thus, for economic (Wiengarten et al., 2019: Yuen et al., 2019), environmental (Azevedo et al., 2011), and social (Azevedo et al., 2011) performance, supplier integration was known to have a direct effect on these dimensions, but this was not the case for customer integration. This research, in support of literature (Zhu et al., 2016) shows that when suppliers behave badly, this does reflect in the social performance of the focal firm and it supply chain. In support of literature, customer integration on the other hand also shows a significant direct association with the social dimension (Govindan et al., 2020: Yuen et al., 2019), indicating that the activities and behaviour of customers also impacts on the social performance of focal firm and the entire supply chain. Our results, also implies that the effectiveness of suppliers affects economic and environmental performance, but only for suppliers supplying environmentally friendly quality products. We also argue that customer integration directly impacts all the SCS dimensions except for environmental performance. This may imply that environmental performance is mainly influenced by the processes adopted by suppliers, and the processes and output generated by firms. Especially as some argue that environmental issues are mostly noticed upstream the supply chain (Kannan, 2021). Although the external integration-SCS relationship results are in support of existing literature (Wiengarten et al., 2019), *the insignificance may imply that there may be contextual factors that affect this direct effect*.

We argue that internal integration has a greater significance and simultaneously impacts all three dimensions of SCS. Hence, serving as the most critical SCI dimension. In support of literature, internal integration positively impacts the social, environmental (Han and Huo, 2020: Yuen et al., 2019) and economic (Durach and Wiengarten, 2020: Wiengarten et al., 2019) dimensions of SCS. Whilst also identified as the main foundation (Flynn et al., 2010) upon which SCI thrives.

In both Ghana and the UK contexts, we argue that internal integration plays a vital role in achieving SCS. We further argue that in addition to internal integration, in the UK, supplier and customer integration are equally critical whilst in Ghana, only supplier integration. These results may be attributed to customers in Ghana playing less part in the product design/functioning of supply chains whilst in the UK, both customers and suppliers play a critical role. Also, this can be a result of having the maturity level of UK's supply chain been higher than that of Ghana (developing country) (Childerhouse et al., 2011). Thus, in terms of best practices, the UK is noted to have practically adopted to a higher extent. In contrast to Ghana, this study argues that in the UK *the effect of "supplier and customer integration" and "internal integration" are mutually exclusive*. Meaning, internal integration loses significance when external integration is introduced. This may imply that in a developed country context like that of the UK, internal integration only serves as the foundation to effectively operationalise external integration. Also, this could mean that after a strongly integrated internal base is created, the main stakeholders that drive the focal company's SCS are the suppliers/customers. However, in the context of Ghana, a consistently stronger and integrated internal base is needed to keep the impact on the three dimensions of SCS positive and significant. For example, in the Ghana context, it was noted that, external integration has no significant association with the environmental dimension. We may also attribute this to the reason that the supply chain in Ghana (developing country) is at the early stages and has not matured (the oldest pharmaceutical company in Ghana is less than 35years compared to UK been over 60years) to the point where best SCI practices are adopted. Hence, such supply chains are less likely to affect strategic collaborative activities to reap the full benefits of such practices (Liu et al., 2018).

Based on the discussed findings so far, we argue that to achieve more impactful yet truly sustainable supply chains in both context all the three SCI dimensions must be collectively

considered as the (1) SCI dimensions have a different impact on various performance measures (2) dimensions of external integration when considered together, strengthens the impact of SCI on SCS. Hence, companies should strengthen more their internal integration and operationalise the dimensions of external integration collectively (3) effectiveness/efficiency of external integration thrive on internal integration.

5.2 Customer satisfaction and the SCI-SCS relationship

We argue that customer satisfaction is a key missing factor mediating the SCI-SCS relationship. In support of literature, this argument further accounts for the inconsistent SCI-performance results (Wiengarten, 2019) in literature. In the UK only, this study argues that firms can only impact positively their environmental and social dimension by collaborating with customers to purposely satisfy their needs through offered products and after services. However, the same firms can influence their economic dimension *directly* through the collaboration of activities with their customers or *indirectly* by collaborating with customers with the objective of satisfying their needs through offered products and after-services. The aforementioned argument (in support of literature) implies that environmental and social (Wolf, 2011) performances are more sensitive and heavily influenced by the direct actions/requirements of customers in the UK, which are *further* inculcated into operational activities. Hence supporting the partial mediation for the customer integration and economic performance relationship. From our findings, we also argue that in the Ghana context only, the pharmaceutical players can improve their (1) SCS *directly* by collaborating activities among internal functions (2) SCS *indirectly* by collaborating activities among internal functions with the objective of meeting the needs (products and after service) of customers. In support of literature, the aforementioned argument indicates that through the adoption of collaborating activities among internal functions, the Ghana pharmaceutical companies can simultaneously (1) remove departmental barriers (Flynn et al. 2010) to improve upon their social, environmental, economic (Wong et al., 2011) performances directly, and (2) also satisfy customers through the offering of the right products/services which further leads to achieving SCS. These results support our initial assertion that *internal integration serves as the main foundation for operationalising SCI and maintaining consistent impact on SCS in the Ghana context.* All the raised arguments for the UK and Ghana contexts support our argument that in the UK (developed country), customers are more involved in the product design/functioning of supply chains which impact on the economic performance of firms. In support of the literature, such customers are also more concerned about the ethical conditions under which products are produced and how these products are also environmentally friendly (Wolf, 2011). These factors influence the kind of products and services companies in the UK offer to meet consumer demands (Yu et al., 2013) which further impacts their supply chain's social and environmental performance. However, for the Ghana (developing country) setting, this study argues that although the customers demand for ethical and environmentally friendly products, they are *more* concerned with the prices and efficacy of the purchased products. Hence, the companies in Ghana mainly focus on strengthening the effectiveness and efficiency of their internal activities to meet these demands, which further influences the social and environmental performance of their supply chain.

However, the UK and Ghana findings generally indicate that customer satisfaction is an important factor for operationalising the collaboration of activities and flow of information among internal functions, and with customers (*as activities in the middle and down the chain are more sensitive/direct to customers*) and achieving SCS. In other words, the position of the players (manufacturers and distributors (we may classify as middle positioned), and retailers (downstream)) may influence how such players are able to impact SCS while satisfying their customers at the same time. The results could also mean that for pharmaceutical players to

satisfy their customers and impact SCS, focus needs to be placed on strengthening internal and customer integration more than integration with suppliers.

5.3 Conditional indirect effect of SCI on SCS through Customer Satisfaction

We argue that the effect of SCI on SCS through customer satisfaction is contingent on the level of EU. *From the Ghana context*, we argue that in the presence of both low and high EU customer satisfaction carries the effect of internal integration on economic and environmental performance. This implies that in Ghana, when pharmaceutical companies are exposed to either low or high EU, the activities of the internal functions are to maintain high levels of collaboration to ensure that ethical processes, environmentally friendly processes and products are produced (Wolf, 2011). Hence, not only leading to satisfying customers through the offerings of ethical and environmentally friendly products, but also further impacting the social and environmental performance of the firm and it supply chain. We further argue that, the effect of internal integration on economic performance through customer satisfaction is only significant in the context of high EU. This (in support of literature) may indicate that, when firms are exposed to high EU where activities/demands are highly unpredictable (Wong et al., 2011), the importance to consistently meet the needs of satisfied customers pushes firms to strongly integrate internal activities to gain high levels of flexibility and responsiveness to changing market demands. This is essential for firms to gain consistent relevance and competitive edge in their operating market.

We further argue that, it is only in a highly uncertain environment that the effect of customer integration on social and environmental performance through customer satisfaction is significant. This (in support of literature) implies that in the Ghana context where customers play less role in the supply chain activities (Donkor, 2020) but may demand for ethical and environmentally friendly products, there is a need for stronger integration with customers when these demands are highly unpredictable. Thus (in support of literature), in highly uncertain environments where deep scanning of the market is needed (Yu et al. 2011) coupled with high customer pressure for socially and environmentally friendly products (Wolf, 2011), effective and efficient collaboration with customers is needed to gain adequate information on demands to mitigate/manage unpredictability (Wong et al., 2011). Hence, through the gained adequate information firms are able to satisfy their customers through offering ethical and environmentally friendly products and after services which further impacts the firms supply chain performance (in this case social and environmental performance) whilst mitigating/managing the high unpredictability exposed to them.

We argue that it is only in a low uncertain environment that the effect of supplier integration on economic, social and environmental performance through customer satisfaction is significant. This also implies that, in low uncertain environments, the lower level of demand unpredictability from customers might not pose too many challenges. Hence, the main focus will be on strengthening collaboration with suppliers. This is to ensure that there is consistency in getting the right number of products from suppliers to meet predicted/forecasted customer demands which further impacts the firm and it supply chain sustainability performance.

From the UK perspective, we argue that customer satisfaction significantly transfers the impact of strongly integrating with customers on economic, social, and environmental performance when firms are operating in a highly uncertain environment and not in a low uncertain environment. This (in support of literature) indicates that, in highly uncertain environment where customer demands, processes and activities within the supply chain are highly unpredictable (Wong et al., 2011), there is greater need for stronger collaboration between firms and customers (Boon-itt and Wong, 2011). Engaging in such collaboration enables firms gather adequate customer information to satisfy the demands of customers. However, for the firms to ensure consistency in meeting the demands of their satisfied

customers, such firms through their strong integration with these customers, gather adequate *on time* information which enables them to be more flexible and responsive in meeting onward demands. Also, as these customers are in for socially and environmentally friendly products, firms are able to inculcate ethical/favourable/fair social practices into their processes and make use of environmentally friendly materials whilst generating less waste in the chain. Hence, they do not only satisfy customers through offered products and after services, but also further impact their social and environmental performance within and across the supply chain.

We further argue that, customer satisfaction do not carry the impact of integrating with suppliers and among internal functions on supply chain sustainability either in both high and low external environments. In support of literature, this implies that in the UK where customers are highly involved in supply chain activities –e.g. product development, firms turn to focus more on strengthening their collaboration with downstream players (customers) rather than upstream players to impact their supply chain sustainability performance through customer satisfaction (Donkor, 2020).

5.4 SCI-SCS relationship in uncertain environments

We also argue that in highly uncertain environments, the direct customer integration – supply chain sustainability relationship is stronger for the UK. This supports our previous assertion that in the UK, customers play a more critical role in the functioning of the entire supply chain than customers in Ghana. Thus (in support of literature), in highly uncertain environments where profound scanning of the market is imperative (Yu et al. 2011) coupled with high customer pressure for ethical and environmentally friendly products, effective and efficient collaboration with customers is needed to gain adequate information on demands to mitigate/manage unpredictability (Wong et al., 2011). We further argue that in the same highly uncertain environment, the direct impact of integrating activities among internal functions on economic and social performance, and integrating activities with suppliers on economic performance are significant for Ghana only. This also supports our previous argument that, in the Ghana context where customers play less role in supply chain activities (Donkor, 2020), in this case coupled with high unpredictability of demands/activities in the chain, companies turn to focus more on their internal activities and that with suppliers. Hence, stronger internal integration and supplier integration becomes imperative.

We argue that in a low uncertain environment, the impact of customer integration on economic performance is significant for the UK only. Also supporting the argument that customers in the UK play critical role- e.g. product development and delivery options, in supply chain activities. Hence, the need for firms to engage in stronger collaboration with customers. We also argue that when companies are operating in a low EU, the impact internal integration has on economic and environmental is stronger for Ghana, whilst the internal integration-social performance is significant for Ghana only. However, that between supplier integration and economic and social performance is significant and stronger for the UK only. This also implies that, in low uncertain environments, the lower level of demand unpredictability from customers might not pose too many challenges. Hence, to directly impact SCS in such cases, in the UK setting the main focus will be on strengthening collaboration with suppliers and customers to ensure that there is consistency in getting the right number of products from suppliers to meet predicted/forecasted demands and environmental needs of customers and supply chain stakeholders. However in the Ghana setting, focus is placed on strengthening collaboration among internal functions to ensure that there is consistency in transforming/adding value to supplies internally to meet predicted/forecasted demands and also the social and environmental needs of customers and supply chain stakeholders. Hence, our results show that in highly uncertain environments, collaboration with customers (UK), activities of internal functions and with

suppliers (Ghana) play a major role. Whilst in low uncertain environments integration with customers and suppliers (UK), and among internal functions (Ghana) are more imperative.

5.4 Theoretical contributions

The theoretical contribution of our study lies in combining the stakeholder and contingency theories as theoretical lenses to build and test the model that provides understanding into the SCI and SCS relationship and how this relationship is mediated by customer satisfaction and moderated by EU. Firstly, in contrast to most SCI research (Danese et al., 2013: Liu et al., 2020: Yeung et al., 2013: Yuen et al., 2019), we contribute to the stakeholder theory by considering the key stakeholders (manufacturers, wholesalers, distributors, retailers) within/across the pharmaceutical supply chain in studying the SCI-SCS relationship. Hence our study provides more representative and collective results for the study of the SCI-SCS relationship.

Secondly, in contrast to literature (Danese et al., 2013: Liu et al., 2020: Yuen et al., 2019), drawing upon contingency theory, we demonstrate the mediating effect of customer satisfaction on the SCI-SCS relationship by capturing data from two distinct contexts. We operationalised the aforementioned contribution by considering companies from two distinct geographies (Ghana-developing country and UK-developed country. In contrast to literature (Yu et al., 2013), our findings inform theory by not only establishing the direct effect of SCI on SCS but also by demonstrating how the SCI-SCS relationship is mediated by customer satisfaction in a developing and developed country context. Unlike existing research (Flynn et al., 2010: Wong et al., 2011), we further extended contingency theory usage in studying the SCI-performance relationship by considering the conditional indirect effect of SCI on SCS through customer satisfaction moderated by EU in both the UK and Ghana context. To the best of our knowledge, no studies has tested this effect. Thus no studies has considered how this indirect effect differs across different external uncertainties in a developed and developing country context. In contrast to literature (Wong et al., 2011), we also tested the moderating effect of EU on the direct SCI-SCS relationship in a developing and developed country context.

Lastly, we examine and validate a more holistic taxonomy of (1) SCI by considering supplier, customer, and internal integration (2) Performance measures in the SCI literature by considering economic, social and environmental performance. Unlike existing literature, many SCI research (Danese and Romano, 2011: Weingarten et al., 2014) ignored arguably the most critical SCI dimension, thus internal integration, in studying the SCI-performance relationship. Although our study expands the taxonomy of SCI, it also affirms the conceptualisation that internal integration is the most critical SCI dimension which serves as the basis upon which external integration functions (Yu et al., 2020). Moreover, many scholars (Vanpoucke et al., 2017: Yu et al., 2013) have studied performance metrics for SCI from mostly the economic dimension only whilst ignoring the social and environmental performances. Hence our study also expands on the taxonomy of SCS. In general, our study gives a more comprehensive finding and a holistic conclusion on the impact of SCI on SCS.

5.5 Managerial implications

5.5.1 Guidelines on how pharmaceutical companies can improve SCS

For practitioners in both developed and developing countries to achieve SCS through SCI, practitioners are informed to first operationalise and strengthen the integration of activities and flow of information among internal functions before investing in external integration. Our results reveal that external integration thrives on internal integration. Hence, supporting actions of practitioners first investing to achieve an integrated system across internal functions before moving on to invest in integrating with suppliers and customers. However, practitioners are advised to operationalise supplier and customer integration (external

integration) collectively to maintain (especially UK context) and strengthen (especially Ghana context) the effect SCI has on SCS.

5.5.2 Satisfying customers: guidelines on how pharmaceutical companies can improve SCS

Practitioners in developed countries should invest more in customer integration whilst practitioners in developing countries should invest more in internal integration as these lead to customer satisfaction which further impacts SCS. Thus, for UK, we noticed that strengthening the involvement of customers in product and development processes, and through an adequate, timely and transparent flow of information with customers leads to customer satisfaction, mostly in the form of meeting customer needs and after-sale services. These outcomes are known to impact SCS. However, in the context of Ghana, strengthening joint planning, maintaining high levels of economic and strategic collaboration, and adequate and timely flow of information among internal functions leads to meeting customer needs and after-sale services, which further impact SCS.

5.5.3 Satisfying customers in EU: guidelines on how pharmaceutical companies can improve SCS

Practitioners in both developed and developing countries are informed to invest more in strengthening the collaboration of strategic/operational activities and the flow of information with customers when operating in high uncertain environments to impact SCS through customer satisfaction. Thus, in highly uncertain environments, the high unpredictability of events/activities is mostly noticed for customer demands. Hence practitioners need to invest more in strengthening the integration of activities with customers to alleviate the negative effect high unpredictability has on firm activities.

On the other hand, practitioners in developing countries should invest more in strengthening the collaboration of activities and the flow of information among internal functions and with suppliers to impact SCS through customer satisfaction when operating in low uncertain environments. Although in low uncertain environments the unpredictability of events/activities is slightly low, this low unpredictability is more noticed for internal activities and activities with suppliers. Also, as the timing and number of demands from end customers are less variable, there is a high need for focal firms to ensure that the *requested* products reach customers on the time. Hence, supporting the reason why practitioners in developing countries operating in low uncertain environments should focus and invest more in strengthening the integration of activities among internal functions and with suppliers. Also, the practitioners in developing countries are to invest in integrating activities across internal functions--especially joint product and process planning, and flow of adequate and timely information, to impact SCS through customer satisfaction when exposed to high EU. Thus a strong internal base is needed to meet the highly uncertain demands of customers.

5.5.4 Uncertain environments: guidelines on how pharmaceutical companies can improve SCS

To impact SCS directly in a highly uncertain environment, practitioners in developed countries should invest more in strengthening collaboration of activities and flow of information with customers whilst those in developing countries should focus on strengthening integration of activities and flow of information among internal functions and with suppliers. However to impact SCS directly in a low uncertain environment, practitioners in developed countries should also focus on strengthening collaboration of activities with suppliers in addition to customers. Whilst those in developing countries should focus more on strengthening collaboration among internal functions.

6. Conclusion

In this research, the objective was to develop and test a model which provides understanding into the SCI-SCS relationship and how this relationship is mediated by customer satisfaction

and moderated by EU. From our findings, we offer a fourfold contribution to the SCI literature. We demonstrate that: (1) through SCI, all the three dimensions of SCS can be positively impacted simultaneously (2) the SCI-SCS relationship is mediated by customer satisfaction (3) the indirect effect of SCI on SCS through customer satisfaction is moderated by EU (4) the direct SCI-SCS relationship is moderated by EU. Contribution 2, 3 and 4 further accounts for explaining the inconsistent SCI-performance results in the SCI literature. We contribute to the stakeholder and contingency theory by using both theories as the theoretical lenses to build and test the aforementioned model. For practitioners to achieve SCS through SCI, practitioners are informed to first operationalise and strengthen their internal functions before investing in external integration. Thus, external integration thrives on internal integration. Practitioners in both developed and developing countries are also informed to invest more in customer integration to impact SCS through customer satisfaction when operating in high EU. However, practitioners in developing countries are to invest in internal and supplier integration to impact SCS through customer satisfaction when operating in low uncertain environments. Whilst also invest in customer integration to impact SCS through customer satisfaction when operating in high uncertain environments. To impact SCS directly in high EU, practitioners in developed countries are to invest more in customer integration whilst those in developing countries should focus on internal and supplier integration. However to impact SCS directly in low EU, practitioners in developed countries are informed to invest more in not only customer integration but also supplier integration. Whilst those in developing countries should focus more on internal integration.

Although our study provides interesting insights, it has limitations and prospects for further studies. We acknowledge cross-national comparison complexities especially with the data gathered. In this case, the sample size for the UK was 89 whilst that of Ghana was 142. Hence they were not the same across both contexts. Although the results from the UK and Ghana context have implications for developed and developing countries, gathering additional data from more developed and developing countries can also strengthen and further validate the generated results. Despite our findings demonstrating that SCI impacts all the SCS dimensions, future research should use a longitudinal study to test the long-term SCI-SCS relationship. Future research should also consider other industries to further validate the SCI-SCS relationship. Lastly, it will be interesting for future research to test and understand the interaction and mediating effect of the SCI dimensions on SCS.

Appendix A:

Table A1: *Literature review summarizing the perspectives SCI-performance has been widely analysed and the identified gap*

Author(s)	SCI Scope	Industry	Methodology	Moderator	Mediator	Performance	Main arguments
Boon-itt and Wong (2011)	SI, CI, II	Automotive industry (Suppliers)	Quantitative (survey)	Technological and demand uncertainty	None	Customer Delivery	CI has no direct effect on customer delivery whilst SI and II do. Technological and demand uncertainty moderates the SI-customer delivery, and II- customer delivery relationships
Chaudhuri et al., (2018)	II, EI	International Manufacturing Strategy Survey	Quantitative (survey) hierarchical regression	Supply chain risk management (SCRM)	None	Manufacturing flexibility	No significant relationship between EI-flexibility. However the II-flexibility relationship was known to be positive. SCRM moderates the EI-flexibility relationship.
Danese et al., (2013)	II, EI	Manufacturing	Quantitative (survey)	International supplier network (ISN)	None	Responsiveness	Positive relationship between EI, II, and responsiveness. ISN moderated EI-responsiveness positively but has no moderating effect on the II-responsiveness relationship.
Flynn et al., (2010)	II, SI, CI	Manufacturing	Quantitative (survey)	CI, SI	None	Operational and Business performance	II serves as the foundation for operationalising SCI. II and CI are strongly related to operational and business performance than SI. The SI-operational performance, and EI-business performance relationships are insignificant.
Frohlich and Westbrook (2001)	SI, CI	International Manufacturing Strategy Survey	Quantitative	None	None	Operational performance	Supplier and customer integration increase operational and financial performance.
Gimenez and Ventura (2005)	SI, CI, II	Manufacturing	Quantitative (survey)	None	None	Operational performance	Integration in the logistics-marketing interface does not lead to reductions in costs, stock-outs and lead-times.
He et al., (2017)	SI	Manufacturing (Mix of manufacturing plants)	Quantitative (survey)	Product Complexity; Competition Intensity	None	Operational performance	Positive relationship between SI-operational performance. The aforementioned relationship is moderated by product complexity and competition intensity
Jacobs et al., (2016)	II, EI	Manufacturing (mixed industries)	Quantitative (survey)	None	II, Employee satisfaction	EI	Employee satisfaction mediates in a partial way the internal communication-II relationship. II mediates the employee satisfaction-external integration relationship.

Koufteros et al., (2005)	II, CI, SI	Manufacturing (Mix of manufacturing companies)	Quantitative (survey)	Uncertainty, Equivocality, Platform strategy	None	Quality, Profitability, Product innovation	No direct relationship between supplier process integration and quality. Integration-performance relationship is moderated by equivocality
Schoenherr and Swink (2012)	II, SI, CI	Manufacturing, distribution and retail firms	Quantitative (survey)	II	None	Operational performance	II increases the impact of external integration delivery and flexibility, but not on quality and cost.
Vanpoucke et al., (2014)	Supplier integrative capabilities	Manufacturing	Quantitative (survey)	Market and technological dynamics	None	Operational performance	Supplier integrative capability improves cost and flexibility performance. The aforementioned relationship is strengthened by market and technological dynamics.
Vanpoucke et al., (2017)	SI, CI	International Manufacturing Strategy Survey	Quantitative (survey)	IT	Operational integration	Operational performance	Operational integration mediates the exchange of information-operational performance relationship. IT improves the impact of SI.
Vereecke and Muylle (2006)	SI, CI	International Manufacturing Strategy Survey	Quantitative (survey)	None	None	Operational performance and procurement	Weak correlation between supplier and customer collaboration and operational performance and procurement. Stronger collaborations leads to stronger performance.
Wang et al., (2018)	Internal and external green practices	High Performance Manufacturing HPM data (Mixed industries)	Quantitative (survey)	Firm size	None	Environmental performance	Internal and external green practices have a positive impact on environmental performance. Firm size moderates the aforementioned relationships.
Wang et al., (2021)	SI (in the form of supplier involvement), II (in the form of sustainable design practices)	Manufacturing	Quantitative (survey)	Supplier Involvement	None	Environmental and Economic performance	SI positively influences the relationship between sustainable design practices and economic and environmental performance.
Wiengarten et al., (2014)		Manufacturing	Quantitative (survey)	EU	None	Operational performance	Both internal and external dimensions increase operational performance.

Wiengarten et al., (2019)	SI, CI	International Manufacturing Strategy Survey	Quantitative (survey)	Delivery, cost, quality, flexibility	None	Operational and financial performance; Competitive priorities	The SCI-financial performance is contingent on company competitive priorities
Wong et al., (2011)	SI, CI, II	Manufacturing (Automotive)	Quantitative (survey)	EU	None	Operational performance	Both internal and external integration has a positive relationship with operational performance.
Yeung et al., (2013)	Supplier partnership	Manufacturing (Electronics)	Quantitative (survey)	EU, specific investment	None	Cost	There is a direct relationship between Supplier partnership-cost. The aforementioned relationship is strengthened by specific investment and not EU
Yu et al., (2013)	SI, CI, II	Manufacturing (mixed industries) (organisational learning theory)	Quantitative (survey)	None	Customer satisfaction	Financial performance	CI has no significant impact on financial performance. II serves as the foundation for operationalising EI. Customer satisfaction mediates the CI-financial performance relationship
Zhu et al., (2018)	SCI	-Young executives in China	Quantitative (survey)	None	Supply chain learning	Customer service performance; innovation performance.	Positive SCI-customer service, and SCI-Innovation performance relationship. Supply chain learning mediates the aforementioned relationships.
This paper	**SI, CI, II**	**SI, Manufacturers, retailers, distributors, suppliers**	**Quantitative (survey)**	**EU**	**Customer satisfaction**	**Environmental, Social, and Economic performance**	**We uniquely combine the mediator and moderator through a mediated moderation analysis. We analyse this from a developed and developing country perspective.**

Note: CI- customer Integration, SI- supplier integration, II- internal integration.

Appendix B

Table B1*: Dimensions of SCS and Sample Items*

Dimension of SCS	Sample items
Social Dimension	• Social investments • Employment practices • Annual Employee training time • Health, Safety and Rights • Condition of workplace and community • Ethical behavior (bribery, corruption, gender equality, and diversity) (Bansal, 2005: Sancha et al., 2016: Paulraj, 2011)
Economic Dimension	• Return on investment • Responsiveness • Profit margin • Return and growth on sales • Growth in market shares • Cost, quality, flexibility and speed • Total number of shareholders (Flynn et al., 2010: Li et al., 2020: Wong et al., 2011)
Environmental Dimension	• Waste minimization • Waste disposal • Type of energy and energy consumption • Water consumption • Use of recycled materials • State and effectiveness of transportation/distribution activities • Effectiveness of training for workers and supply chain partners in environmental issues • Effectiveness of supplier training in environmental issues • Effectiveness of supplier monitoring in environmental issues (Bansal, 2005: Li et al., 2020: Paulraj, 2011: Zhu et al., 2008: Zhu et al., 2010)

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