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Supply chain agility and sustainability performance: A configurational approach to sustainable supply chain management practices

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ABSTRACT

The sustainable supply chain management literature points to a positive relationship between sustainability practices and firm performance. However, firms have limited resources to apply toward competing strategies and initiatives and managers are therefore challenged with making decisions about *which* sustainability initiatives to pursue. Two potential solutions to this challenge include combining supply chain agility with sustainability practices and utilising the resource orchestration theory framework (ROT) to help supply chain managers make more informed sustainability-related decisions. The purpose of this study is to investigate the different potential combinations of firm and supply chain sustainability practices and supply chain agility which result in high firm performance. This study uses ROT and applies a configurational approach and qualitative comparative analysis methodology. The findings indicate that high sustainability performance can be reached through different paths (equifinality) entailing both high and low values of each proposed sustainability initiative and supply chain agility (asymmetry). The findings also reveal that results are dependent on how practices are combined, rather than on their single effects.

1. Introduction

The past two years have been a particularly challenging time of transition for supply chain managers due to the COVID-19 pandemic and related macro business trends. Given that many of the challenges to the global supply chain are expected to continue for the foreseeable future, identifying resources that will allow firms to gain competitive advantage is critical (Paul et al., 2021). Within this discussion, academic research suggests that sustainable supply chain management (SSCM) practices through the triple bottom line (TBL) perspective of economic, environmental and social performance, may help firms navigate the post-COVID global business environment (Ivanov, 2021). Managers also seem to recognise the value of developing SSCM. For example, organisations such as Levi Strauss, Apple and Unilever have invested in sustainability initiatives across their global supply chains, with the goal of improving TBL performance through greater transparency, integration and customer service (Escoto et al., 2022).

The supply chain literature leans toward a positive relationship between supply chain sustainability practices and positive performance outcomes (Qorri et al., 2018; Wang and Dai, 2018). However, recent discussions suggest that this relationship may be more complicated than the prevailing literature suggests, where inconsistent or missing relationships exist between sustainability practices and firm performance (Dubey et al., 2017; Wong et al., 2018; Miemczyk and Luzzini, 2018; Omar et al., 2022). Furthermore, the exact relationships and dynamics among different combinations of supply chain and firm sustainability practices and their impact on firm performance vary, as numerous pathways exist for firms to pursue, particularly when multiple supply chain partners are involved (Chen and Tian, 2022). The challenge then becomes determining which combinations are optimal (Malik et al., 2021).

Two potential solutions may help managers address these challenges. First, from a resource perspective, *agility* is a critical competitive component of successful supply chain management strategies and operations (Gligor and Holcomb, 2012; Stank et al., 2022). Supply chain agility capabilities can lead to greater supply chain efficiency, effectiveness, return on assets and overall firm performance (Gligor et al., 2015). Importantly, when integrated with sustainability practices, supply chain agility through integration, communication, trust, and responsiveness has been shown to significantly improve service levels and firm performance (Ciccullo et al., 2018). Thus, pairing sustainability practices and supply chain agility may be key to creating competitive

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advantage (Nath and Agrawal, 2020; Geyi et al., 2020; Stank et al., 2022). Second, from a theoretical perspective, resource orchestration theory (ROT) can help provide managers a solution to the problem of resource possession and allocation (Sirmon et al., 2011). At its core, ROT is a theoretical framework that assesses the performance outcomes of different combinations of resources and allow managers to make resource development and allocation decisions. With limited company resources, managers can benefit from better understanding which combination of sustainable practices and supply chain agility should be developed and implemented.

This study seeks to address the overarching concern of firm resource development. Therefore, the purpose of this study is to investigate and identify configurations of sustainability practices and supply chain agility, as resources, which may lead to superior firm sustainability performance, from TBL perspective. Specifically, it seeks to answer the question: *which configurations of salient sustainability practices (both internal firm practices and external supply chain practices) and supply chain agility impact the TBL of economic, environmental and social outcomes, leading to high firm sustainability performance?*

This study uses fuzzy set qualitative comparative analysis (fsQCA) to identify effective combinations of sustainability-related practices as strategic resources, and responds to calls in the literature for research that grapples with complex causality. Advantages of fsQCA include relationship asymmetry, causal complexity, and *equifinality*, the idea that combinations of causal attributes lead to the same outcome (Woodside, 2014; Misangyi et al., 2017). FsQCA is applied to different variables identified in the literature as having an impact on firm TBL performance.

The aim is to identify whether there is a single subset of sustainability practices and supply chain agility that can be most closely associated with performance, or if there are several different combinations that represent different paths to achieve the outcome (a high level of sustainability performance). In combination with complexity theory, fsQCA provides a deeper understanding of the relationship between variables to better predict and explain real-world business phenomena using a configurational approach (Kumar et al., 2022). Consequently, the focus is on the interplay of sustainability practices and agility is motivated by ROT and the causal complexity perspective.

The rest of this study is organized as follows: The next section provides the theoretical background of ROT and complexity theory, sustainability as firm-related practices and supply chain-related practices, and supply chain agility. This is followed by the formulation and development of three research propositions. Next, the details and results of the empirical study are presented. Finally, the implications, limitations, and future research opportunities are discussed.

2. Theoretical background

2.1. The resource orchestration theory and the causal complexity perspective

The identification, development and deployment of strategic resources to improve firm performance has long been the core of strategic management theories. Of these, the resource-based theory (RBT) and its variations are the mostly extensively used and adapted across disciplines (Hitt, 2011). Scholars have been refining RBT for years to make it more research-specific and applicable in its ability to predict and explain how businesses employ strategic resources to create competitive advantage and generate positive performance-related outcomes. Within these modifications, the study of specific configurations of resources has gained traction (Malik et al., 2021; Wiklund and Shepherd, 2003).

Among the various resource combination theories, ROT explicitly addresses the role of managers and resource combinations (Hitt, 2011; Sirmon et al., 2011; Queiroz et al., 2022). ROT explains that the way resources are developed and employed, rather than the simple possession of resources, is more relevant for creating value for the firm (Skipworth et al., 2023; Gligor et al., 2022; Sirmon et al., 2011). Moreover, complexity theory indicates that, "relationships between variables can be non-linear, with abrupt switches occurring, so the same 'cause' can, in specific circumstances, produce different effects" (Urry, 2005, p. 4). This discussion suggests that the relationship between variables and performance might not always be linear and in the same direction. Furthermore, variables can produce different results when considered in combination with other variables (Malik et al., 2021; Russo et al., 2019). Thus, ROT predicts that different, *specific* combinations of resources may help firms obtain superior performance. This study, based on ROT, theorises that sustainability practices and supply chain agility, as resources, lead to superior performance. The resulting theoretical framework (Fig. 1) is made up of the potential combinations of firm sustainability practices, supply chain sustainability practices, supply chain agility, and their impact on firm sustainability performance. The components of the framework in Fig. 1 are discussed in the following sections.

2.2. Sustainable supply chain management resources: firm and supply chain sustainability practices

Considerable supply chain management sustainability research separates internal (firm) and external (supply chain) practices from a strategic resource perspective (Pinto, 2020; Yang and Wang, 2023; Machado et al., 2023). For example, Kirchoff et al. (2016a) divide green supply chain management into internal environmental management and external partnerships with supply chain partners. Similarly, Gualandris and Kalchschmidt (2014) describe sustainable supply chain practices as internal process management and external sustainable supply management. The reason for separating sustainability practices into internal and external is because firms need to orchestrate resources internally by integrating with other functional departments and within levels of the same department, and externally with supply chain partners, outside of the four walls of the firm (Gong et al., 2018).

Firm sustainability practices are defined here as sustainability initiatives that are internal to the firm's operations and include (i) human resource management, related to employee well-being; (ii) community outreach, related to support and engagement with the communities in which firms operate; and (iii) environmental responsibility, related to green operations, processes and product design (Agan et al., 2016; Laari et al., 2016; Wang and Dai, 2018; Zhang et al., 2018). Supply chain sustainability practices are external to the focal firm. The primary areas that fall under supply chain sustainability practices include (i) social sustainability supply chains, related to human safety, welfare and labour responsibility; (ii) CSR to customers, related to cooperation with customers on sustainability issues; and (iii) environmental SSCM, related to environmental thinking in supply chain processes, product sourcing, logistics and end-of-life (Croom et al., 2018; Kirchoff et al., 2016a; Nichols et al., 2019). The six areas of sustainability practices, in general, also include collaboration with stakeholders (e.g. collaboration with customers in the development and evaluation of sustainability goals; collaboration and monitoring of suppliers on the environmental sustainability aspects of the SC) (Agan et al., 2016; Croom et al., 2018; Kirchoff et al., 2016b; Sancha et al., 2015a; Wang and Dai, 2018; Zhang et al., 2018).

Previous studies have often focused only on one dimension of sustainability. For example, much of the SSCM literature has analysed the effects of environmental practices on firm performance by identifying direct and indirect relationships between green supply chain management (GSCM) practices and environmental and financial performance (Grekova et al., 2016; Laari et al., 2016; Yildiz Çankaya et al., 2019). Other studies shed light on the use of green practices (e.g., waste and waste management practices) to meet environmental and social sustainability by analysing how the implementation of environmental practices contributes to the achievement of the SDGs (Di Vaio et al., 2022; Foo et al., 2021). SSCM studies have also analysed environmental

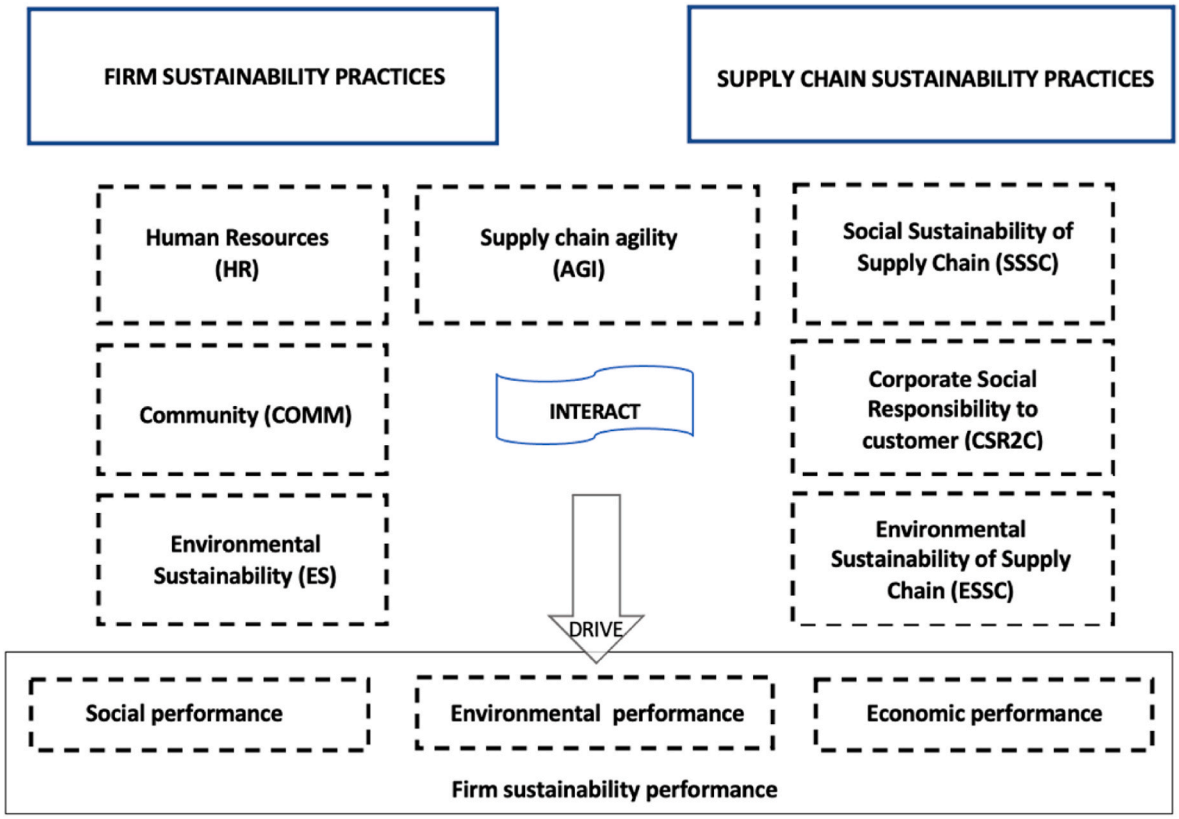

Fig. 1. The configurational framework of resources leading to firm sustainability performance.

practices under the lens of stakeholder theory, relying on resource dependence to identify, map, and analyze multi-stakeholder relationships that succeed in meeting the 2030 Agenda (Di Vaio et al., 2023).

Very few studies have focused on the social dimension of sustainability and analysing the impact of social practices on operational performance (Croom et al., 2018; Silva et al., 2023; Wu, 2017). Some researchers analysed the effect of social practices on financial and social performance (Sancha et al., 2015a), finding that supplier social development practices help improve supplier and firm social performance, while they did not affect financial performance. However, these studies are limited. Finally, the relatively few studies that have addressed both the social and environmental aspects of sustainability have focused only on their impact on financial performance (e.g. Agan et al., 2016; Cantele and Zardini, 2018; Das, 2018). Our study presents a more holistic vision of sustainability practices and performance, by integrating all the three dimensions of TBL and both the external (supply chain) and internal (firm) focus.

2.3. Sustainability practices and supply chain agility

Supply chain agility is defined as a strategic capability or resource that helps organisations quickly adjust their tactics and operations in reaction to changes in the external business environment (Gligor et al., 2020). Agility allows firms to be more flexible in their supply chain operations, quickly change direction, anticipate changes in the external environment, and empower the customer (Gligor et al., 2019). Importantly, suppliers' agility is also a critical component to efficiently and effectively implement changes in the global competitive environment (Al Humdan et al., 2020).

The combination of supply chain agility and sustainability practices is a critical strategic pairing, as firms need supply chain agility to respond quickly and effectively to sustainable needs in the business environment (Al Humdan et al., 2020; Nath and Agrawal, 2020; Geyi et al., 2020). Ciccullo et al. (2018) reveal that supply chain agility and SSCM can be integrated as a supporting and synergistic precursor and competing paradigm. Furthermore, the development of supply chain agility practices can enable the implementation of SSCM and help evolve and sustain sustainability initiatives and practices into the future (Nath and Agrawal, 2020). Geyi et al. (2020) suggest that agile capabilities are necessary conditions for maximizing the outcomes of implementation of sustainability practices, but further research is needed to explore other dimensions of sustainability which should be included. Also, Nath and Agrawal (2020) found that agility, through social sustainability orientation and implementation of lean practices influences firm operational performance. Thus, similar relationships among the primary dimensions of sustainability, supply chain agility, and performance are found in our configurational framework (Fig. 1).

2.4. Formulation of the research propositions

The theoretical lens of ROT explains that firms and their extended supply chains are unique and can possess different resources and capabilities than their competitors (Chen and Tian, 2022; Malik et al., 2021; Sirmon et al., 2011). Managers' orchestration of these resources is at least as relevant as their possession; the specific resources managers choose to identify, develop, and combine are critical to improved performance and creating competitive advantage (Gligor et al., 2022). The configurational framework supports the concept of optimal resource combinations where performance does not depend on a single condition, but rather on interactions between different sustainability practices and supply chain agility.

FsQCA helps identify combinations of causal attributes that lead to equifinality (e.g., high firm performance). FsQCA assumes asymmetric tests and considers high values of X indicating high values of Y without predicting how low values of X relate to values of Y (Malik et al., 2021; Russo et al., 2019). Asymmetric tests are more likely to capture the

complexity of business practices because the causes of high Y could be significantly different from the causes of low Y (Fiss, 2011). Thus, ROT provides the theoretical arguments linking each resource of interest (sustainability practices and supply chain agility) to firm performance, while fsQCA uncovers the various configurations of resources that lead to superior firm sustainability performance.

This study also uses complexity theory to suggest the possibility of a more intricate relationship among resources where the relationship between input and output variables may not always be linear and in the same direction. These relationships may produce different results when considered in combination with other resources. As such, we adopt the tenets of complexity theory to help guide our qualitative comparative analysis research approach (Woodside, 2014). Furthermore, within a system characterized by complexity, the interaction between variables can be asymmetric and heterogeneous can produce different effects and configurations (Meuer and Fiss, 2020; Kumar et al., 2022). The ROT and the complex causality perspective help specify how firm and supply chain sustainability practices, combined with supply chain agility, interact to affect sustainability performance.

The fsQCA approach is used by this study to analyze the data to address three research propositions and to better explain why different combinations of sustainability practices and agility can lead to high firm sustainability performance:

RP 1: *Disparate configurations of firm sustainability practices, supply chain sustainability practices and supply chain agility are equifinal in leading to high firm sustainability performance.*

RP2: *Each individual factor of firm sustainability practices, supply chain sustainability practices and supply chain agility is necessary, but not sufficient, to obtain high firm sustainability performance.*

RP3: *Across configurational causes, firm sustainability practices, supply chain sustainability practices and supply chain agility can contribute positively, negatively or make no contribution to firm performance, depending on the presence or absence of other practices in the configuration.*

3. Methodology

3.1. Data collection

This study used fsQCA to identify combinations of firm and supply chain sustainability practices and the role supply chain agility that led to a high level of firm sustainability performance. Through fsQCA, multiple conjunctural causality and equifinality can be identified (Rihoux and Ragin, 2008), enabling researchers to better address the complexity of the relationship among sustainability practices and supply chain agility, as concurring resources, and the firm outcome. QCA helps determine which causal factors combine to produce an outcome, their different configurations, and how these configurations are associated with a specific outcome (Greckhamer et al., 2018).

To achieve this aim, an online questionnaire was used to collect data from manufacturing and wholesale firms operating in Italy. Participant firms had a mean size of 58 employees. Manufacturing was the most representative industry, with 90 responding firms out of 150. The questionnaire was sent using the Limesurvey platform, with an email briefly presenting the purpose of the study. Data collection occurred in three waves (the baseline survey plus two follow-up surveys) over three months and targeted only participants at the manager level and higher. This process yielded 175 responses, of which 150 were complete and useable. Demographics are shown in Table A1(Appendix A). Non-response bias was assessed using the two-wave comparison approach (early and late respondents). No statistical differences across the constructs were found between the two groups of participants. Therefore, non-response bias was not considered a factor in the survey results.

3.2. Measures

All variables in this study were identified through a comprehensive literature review and finalised with a pre-test conducted with a panel consisting of five managers and three researchers, all of whom have expertise in supply chain management and supply chain sustainability practices. Feedback from the panel helped improve the structure, wording and clarity of the survey, which improved the face validity of the variables.

The variables of interest were measured using adapted versions of existing scales. Human resources (HR) was measured using an eight-item scale (Agan et al., 2016; Das, 2018; Wang and Dai, 2018; Zhang et al., 2018), community (COMM) was measured using a seven-item scale (Agan et al., 2016; Wang and Dai, 2018; Zhang et al., 2018), and environmental sustainability (ES) were assessed using a seven-item scale (Agan et al., 2016; Kirchoff et al., 2016a; Laari et al., 2016). These three constructs constitute the firm sustainability practices. Social sustainability of supply chain (SSSC) and environmental sustainability of supply chain (ESSC) were measured using nine-item scales (Croom et al., 2018; Laari et al., 2016; Wang and Dai, 2018; Zhang et al., 2020). Corporate social responsibility to customer (CSR2C) was measured using an 11-item scale (Agan et al., 2016; Kirchoff et al., 2016a; Laari et al., 2016). These three constructs constitute supply chain sustainability practices. Supply chain agility (AGI) was assessed with six items adapted from Gligor et al. (2020). All variables are measured using a five-point Likert scale, from 1 'strongly disagree' to 5 'strongly agree'.

The constructs used to measure firm sustainability performance were social performance (8 items), environmental performance (10 items), and economic performance (7 items), adapted from Wang and Dai (2018), Kirchoff et al. (2016a), Zailani et al. (2012), and Das (2018). The outcome variable was measured using a five-point Likert scale, from 1 'strongly disagree' to 5 'strongly agree' (with reference to having or not experienced improvement in each performance item) and is the mean of the three TBL dimensions of social, environmental and economic performance (Wang and Dai, 2018; Wu, 2017).

Scale reliability was determined by means of Cronbach's alpha and composite reliability. Our results were higher than the 0.70 literature threshold (Hair and Lukas, 2014). A confirmatory factor analysis provided support for the measures' convergent validity. All factor loadings exceeded the recommended 0.6 threshold (Bagozzi and Yi, 1988), and the average variance extracted (AVE) was greater than the recommended 0.5 threshold (Fornell and Larcker, 1981). Appendix A (Table A2) provides details.

4. Data analysis

4.1. Qualitative comparative analysis steps

The fsQCA process follows four sequential steps. These steps include defining the property space, developing set membership measures, evaluating the consistency in set relations, and the logical reduction and analysis of configuration (Ragin, 2008; Russo et al., 2019). Each step is discussed in the following sections.

4.1.1. The property space

The first step of the fsQCA procedure entails defining the property space, where all possible configurations of the attributes of high firm performance are identified from the extant literature as discussed in the literature review. The property space is composed of all combinations of binary states; that is, the presence or absence of the influence attributes that can impact firm sustainability performance (i.e., HR, COMM, ES, SSSC, ESSC, CSR2C, AGI). The property space in this study has 128 (i.e. 2^7) different combinations for each row.

4.1.2. Set membership measures

FsQCA is founded on the concept of set membership and requires the calibration of all variables included in the study. This allows scholars to capture fine-grained differences in degrees of membership. Since the variables in the study are not dichotomous, fuzzy set membership scores

were used that specify membership in the 0 to 1 range. All the variables in the model were calibrated into fuzzy sets and used three memberships scores (0.95 = fully in; 0.5 = the crossover point; 0.05 = fully out) (Ragin, 2008). By allowing for partial memberships, the data sets become 'fuzzy' (Rihoux and Ragin, 2008), thereby minimising the loss of information. The endpoints and the midpoint of the five-point Likert scales served as the three qualitative anchors for calibration of full membership in the set (value 0.95), full non-membership (value 0.05), and the crossover point (value 0.5). The calibration process followed the recommendation of 'effective calibration is a half-conceptual, half--empirical process' by Greckhamer et al. (2018). The crossover point was computed by observing the distribution and median score of each attribute (Woodside et al., 2018). Appendix A(Table A3) summarises the rules of calibration for this study, as suggested by recent studies (e.g., Malik et al., 2021; Russo and Confente, 2019). The fs/QCA program applied the log-odds method for an automatic calibration procedure.

4.1.3. Consistency in set relations

Consistency is analogous to correlation in statistical analysis and indicates the degree to which the solution or result is sufficient to produce the outcome. Therefore, we set the cases that led to high levels of firm performance. A value of '1' is indicative of an outcome of high firm sustainability performance. The combinations are captured by a truth table that is an analysis of a logic function by listing all possible values the function can attain to meaningful configurations; to reduce the truth table, a frequency threshold of two observations was chosen to exclude less important configurations using two criteria: frequency and consistency (Ragin, 2008). The consistency measure is calculated as the sum of the consistent, or shared, membership scores in a causal set, divided by the sum of all the membership scores that pertain to that causal set (Pappas and Woodside, 2021; Russo et al., 2019). This study used the intermediate solution studies, in line with Russo et al. (2019) and Malik et al. (2021), who argue the intermediate solution to be optimal compared to the complex and parsimonious solutions.

Coverage assessed how much of the outcome is explained by each configuration and by the solution, while consistency is analogous to correlation in statistical analysis and shows the degree to which the solution or result is sufficient to produce the outcome. The lowest acceptable consistency score was set at 0.80, which is above the minimum recommended threshold of 0.75 (Fiss, 2011). The results show an overall solution coverage of 0.83 and an overall consistency of 0.82, signifying that a substantial proportion of the outcome is captured by the six configurations. The total coverage refers to the degree to which the desired outcome can be accounted for by the configurations and can be likened to the R-square value obtained from regression-based techniques (Woodside, 2014). Raw coverage shows the proportion of membership in the outcome and denotes the proportion of memberships in the outcome expounded by each term of the solution. The configuration (Table 1) shows the combination of antecedents that offers the best representation of high firm sustainable performance (0.60), this is followed by Solution 5 (0.55) and then Solution 2 (0.39). In other words, raw coverage shows how important is a given configuration with respect to the outcome. Unique coverage captures the proportion of memberships in the outcome explained solely by each individual solution term (no other configuration covers those cases). It also controls for overlapping by partitioning the raw coverage (Ragin, 2008; Pappas and Woodside, 2021; Saridakis et al., 2022).

Table 1
Configurations for firm sustainability performance.

	1	2	3	4	5	6
HR			⊗	⊗	●	●
ES	●	⊗	⊗		●	●
SSSC	●	⊗	⊗	●	●	⊗
ESSC	●	⊗	⊗	●	●	⊗
COMM		⊗	⊗	⊗	●	●
CSR2C	●	⊗		●	●	⊗
AGI	●	⊗	●	●		●
Raw coverage	*0.60*	*0.39*	*0.35*	*0.35*	*0.55*	*0.35*
Unique coverage	0.05	0.04	0.02	0.01	0.03	0.02
Consistency	0.99	0.75	0.86	0.99	0.98	0.98

● = Core causal condition present; ⊗ = Core causal condition absent.
Solution coverage: 0.83.
Solution consistency: 0.82.

4.1.4. Logical reduction and analysis of configuration

Coverage also indicates how well the model explains the available empirical information and indicates the degree to which a cause or causal combination accounts for instances of high firm performance (Woodside, 2013). The coverage measure for each sufficient configuration was computed in a way that ensured it exceeded 0.10 (Woodside et al., 2018). This study adopted the intermediate solution following current conventions in other studies (Pappas and Woodside, 2021). The intermediate solution is acquired by conducting a counterfactual analysis on the simple and concise solutions that involve only logically possible counterfactual scenarios (Ragin, 2008). In our case, the intermediate solution includes core conditions that appear in both the parsimonious and intermediate solutions, meaning, a strong causal relationship with the outcome. Table 1 groups the solutions according to core conditions.

5. Analysis and discussion

The findings from the fuzzy set analysis present combinations of the causal conditions that are sufficient to explain high firm performance (Table 1). Black circles indicate the presence of a condition, while crossed-out circles represent its absence. A blank space means that a causal condition does not play a role in the specific solution and may either be present or negated. The identification of multiple sufficient conditions described in Table 1 suggests equifinality (Fiss, 2011). This finding provides support for Proposition 1 and indicates that numerous paths may exist that lead to superior firm sustainability performance.

Six combinations for superior firm sustainability performance were ultimately identified. Solution 1 indicates that firms can obtain high sustainability performance when companies exhibit high ES, SSSC, ESSC, CSR2C and AGI; COMM and HR do not matter under these conditions. This solution indicates a complete commitment to sustainable supply chain management practices, while internal practices are focused exclusively on green management. Solution 2 shows that firms can deliver overall performance without any of the other variables. This configuration suggests that there might even be additional variables in these firms that are unaccounted for in this study.

In contrast to Solutions 1 and 2, Solution 3 reveals that firms can obtain high sustainability performance when they have high levels of agility (AGI) and low levels of HR, ES, SSSC, ESSC and COMM. In other words, the presence of a single attribute (i.e., agility) alone may allow companies to achieve a high level of sustainability performance. Given that Solution 3 indicates that supply chain agility is sufficient for higher outcomes without being combined with other antecedents, Proposition 2 is not supported.

Solution 4 indicates that firms can experience high sustainability performance when they exhibit high levels of SSSC, ESSC, CSR2C and agility. Interestingly, ES does not matter under these conditions. Solution 4 is further characterised by an exclusive focus on sustainable supply chain practices and thus fits with the configuration where the pressures from the supply chain have pushed the firm to collaborate with customers and suppliers but have not been internalised in terms of firm sustainability practices.

Solution 5 indicates that firms can experience high sustainability performance when they exhibit high level of all antecedents, except agility, which seems unimportant in this configuration. This solution

indicates that the most integrated approach to sustainability which can lead the firm to high performance, results independently from the speed of supply chain adaptation. Finally, Solution 6 show firms can create higher sustainability performance when they exhibit high levels of HR, ES, COMM and agility. Here we see the absence of SSSC, ESSC and CSR2C. This solution appears consistent with an "internal" sustainability approach, where internal green management practices are combined with social responsibility.

In summary, some firms without SSSC, ESSC and CSR2C can still experience high organisational performance (i.e., Solution 6), while the presence of the same antecedents (i.e., Solution 4) can contribute positively or negatively, or have no contribution at all, depending on the presence or absence of other antecedents. This evidence and these configurations align with Proposition 3.

Finally, as shown in Table 1, the configuration shows the combination of antecedents that offers the best representation of high firm sustainable performance is Solution 1 (i.e., 0.60), followed by Solution 5 (0.55).

6. Conclusion

This study suggests that the development of resources to improve TBL performance may hinge on various combinations of carefully selected sustainability practices and supply chain agility, rather than the development of all potential resources related to supply chain sustainability. This includes balancing relationships among different stakeholders and focusing on both internal departments and supply chain partners. In making resource allocation decisions, managers can employ different combinations to impact performance outcomes, depending on how the managers orchestrate and combine the resources. Furthermore, it is crucial for firms to foster a culture of sustainability orientation that assists managers in adjusting resource activities to align with the changes and challenges brought about by disruptions, innovation, and new technologies. This study analyses the relationship between internal and external sustainability practices, supply chain agility and firm TBL performance in an innovative manner.

Evidence in the literature shows that SSCM studies are mainly oriented towards "external" supply chain sustainability, analysed in terms of performance impacts (Laari et al., 2016; Rao and Holt, 2005; Vachon and Klassen, 2008) or perceived pressures (Mathivathanan et al., 2022). In this study, sustainability practices related to the supply chain are combined with "internal" firm sustainability practices (CSR practices towards the employees, the community, the environment) within the same configurational framework.

Furthermore, previous empirical studies have often focused on social or environmental practices separately and tested the impact of practices separately on social performance (Sancha et al., 2015a, 2016), environmental performance (Laari et al., 2016; Large and Thomsen, 2011; Zhang et al., 2020) or financial performance (Agan et al., 2016; Croom et al., 2018; Grekova et al., 2016; Kirchoff et al., 2016b). This study combines the ROT framework with complexity theory and fsQCA methodology to build a theoretical framework that considers the presence of different combinations of resources that lead to a high level of a more comprehensive measure of firm performance. A broader and more innovative discussion of sustainability is considered in this study, as both social and environmental, internal (firm) and external (supply chain) practices are considered resources that combined, represent the complexity of managerial choices.

6.1. Theoretical implications

The results of this study found support for RP1 and RP3 which leads to several theoretical and managerial contributions. First, the fsQCA analysis showed that with the six unique solutions, firms may develop alternative configurations that lead to high firm sustainability performance. That is, the firms may not need to development and implement of all combinations of sustainability practices and supply chain agility. Sustainability is a complex phenomenon that encompasses different salient resources. The fsQCA solutions indicate that both high and low levels of sustainability practices can lead to high firm performance when certain conditions are present. The analysis therefore suggests that firms can choose between different combinations of resources that impact their TBL performance throughout their operations. These results further show the relevance of accounting for the complexity associated with different sustainability practices, indicating that complexity theory and QCA can help illustrate new insights beyond the traditional multiple regression analysis also in B2B context (i.e. Geyi et al., 2020). This finding also has implications for the growing, but still nascent literature which explores the relationship between SSCM, sustainability, and all three dimensions of TBL (Das, 2018; Wang and Dai, 2018; Nichols et al., 2023).

The second contribution resides in the identification of different combinations of resources in light of ROT by means of a configurational approach and the demonstration of how resource orchestration affects TBL performance (Malik et al., 2021; Gligor et al., 2020). Previous research has mostly been devoted to discovering the net effect of single sustainability practices on firm performance (Grekova et al., 2016; Sancha et al., 2015a, 2015b; Wu, 2017). In contrast, our results show different resource combinations and different possible allocation decisions in line with complexity theory, which sustains the idea of configurations of attributes (i.e., sustainable practices) (Gligor et al., 2020). Furthermore, the findings contribute to the ROT literature by offering a more in-depth examination of how bundles of resources might be orchestrated to produce an overall sustainable performance. In particular, the ROT research framework suggests how different sustainability practices and supply chain agility may constitute a strategic resource portfolio where different combinations may lead to similar levels of sustainable performance.

A third contribution stems from having combined both firm-related practices and supply chain management-related practices within an overarching framework with the aim of revealing the possible mixes of internal (firm) and external (supply chain) sustainability resources leading to high sustainability performance. Interestingly, Solution 5 indicates that firms could possess all sustainability practices to reach a high sustainability performance, while Solution 4 indicates firms could possess a high level of supply chain sustainability practices. Finally, Solution 6 shows the possibility of developing only firm sustainable practices.

Finally, this study contributes to scholars by including supply chain agility as a relevant resource in combination with sustainability practices to impact performance. Supply chain agility allows a rapid response to changes in the external business environment and the literature is replete with research focused on the impact of agility on performance. However, the literature has rarely considered the inclusion of supply chain agility and its interaction sustainability (Ciccullo et al., 2018; Nath and Agrawal, 2020).

6.2. Managerial and policy implications

Managers and policymakers can also glean several insights from this study. Contrary to anecdotal arguments, firms do not need to simultaneously develop all of sustainability practices and supply chain agility to achieve high sustainable performance. This is a noteworthy managerial takeaway, considering that allocating resources can require significant financial effort; the findings here suggest that when facing financial constraints, rather than focusing on a single resource or on resources that may be costly to develop, more appropriate configurations of resources for the firm may be better to pursue for high sustainability performance. Managers can improve their practice-based knowledge on how resources are best combined by employing the pivotal role of resource management and orchestration. Furthermore, managers should formulate sustainability strategies by interacting with those

organisational units that oversee the multiple aspects of sustainability (e.g., HR; health, safety and environment; public relations; marketing and supply chain departments). Ultimately, firms that pursue a more holistic view of sustainability do not necessarily need to maximise investments in all resources of all organisational units.

Finally, from the policymaker's point of view, this study suggests that government incentives to support specific firm or industry sustainability goals may not be effective and may not lead to the expected impact without a granular study of the potential different practices enacted by the firm and its supply chain relevant to the sustainability outcome. Policymakers can use the results of this study to help craft industry or even firm-specific regulation and incentives that encourage sustainability and agility resource development that is most efficient and effective for that industry or firm.

6.3. Limitations and future research

This study has several limitations, which also present opportunities for future research. First, while fsQCA provides significant insights into the business phenomenon, additional methods such as archival or secondary data can help improve the findings' generalizability and improve external validity. Furthermore, investigating the potential applications of QCA as an inductive approach to empirical theorizing could be a promising avenue for future research in the field of sustainability and supply chain management. This could lead to a reassessment and re-examination of current concepts in the field.

Also, the data in this study was collected in the Italian business context, which limits corporate national culture and managerial decision-making to one specific geographic area. Future research should explore additional regions of the world, included emerging economies where the attitude toward sustainability practices is less developed and regulated.

In addition, the unit of analysis in this study is on the focal firm. This is a limitation because it potentially misses relevant details of where suppliers, third party logistics, and customers collaborate to improve sustainable performance. Thus, future research should use dyadic data collection to take into consideration other variables, including internal resources such as leadership and culture, and external resources such as digitalization. Furthermore, future research is needed that focuses on the application of SSCM practices under conditions of supply and demand variability and scarcity, including the role of technology (i.e. use of data analytics and artificial intelligent to improve decision making) and organizational factors. Multidisciplinary research and collaboration are also needed to better understand and manage supply networks to face extreme uncertainty in the future.

Finally, this study highlights the importance of developing a specific business strategy with the goal of a more detailed exploration of the management of resources for innovative sustainable practices. Consistent with this, future research should focus on the application of ROT and resource advantage theory (RAT), and in particularly, on how resources are being managed and allocated to determine different outcomes for firms.

CRediT authorship contribution statement

Silvia Cantele: Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Supervision. **Ivan Russo:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Jon F. Kirchoff:** Conceptualization, Writing – original draft, Writing – review & editing. **Silvia Valcozzena:** Investigation, Data curation, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A

TABLE A1
Demographic profile of the respondents

Categories		%
Age of respondents (years)	≤ 35	14
	35–44	15.3
	45–54	38.7
	55–64	24
	≥ 65	8
Years of experience	≤ 1	2
	1–3	10
	4–7	16
	8–10	11.3
	≥ 10	60.7
Gender	Male	61.3
	Female	38.7

TABLE A2
Measurement scales

Variable and measurement items	Mean	SD	Composite reliability	Cronbach's alpha	AVE
Human Resources (HR)	**4.44**	**0.58**	**0.92**	**0.89**	**0.60**
HR1: The firm provides a positive working environment for its employees					
HR2: The firm guarantees the health and safety of its staff at work					
HR3: The firm implements flexible policies to provide a good work/life balance for its employees					
HR4: The firm's policies encourage its employees to develop their skills and careers					
HR5: The firm provides opportunities for continuing education for employees					
HR6: The firm strictly complies with labour laws, no child labour					
HR7: The firm pays a living wage greater than the country's or region's minimum wage					
HR8: All workers have equal opportunity for employment, promotion, and wages (i.e., no differences between gender, nationality)					
Community (COMM)	**3.35**	**0.95**	**0.92**	**0.90**	**0.62**
COM1: The firm strives to improve employment opportunities for the local community					
COM2: The firm strives to create wealth and income for the local community					
COM3: The firm continuously promotes community education and cultural development					
COM4: Your employees often volunteer for local charities					
COM5: The firm is involved in local community development plans					
COM6: The firm supports nongovernmental organisations working in problematic areas (health care, education, culture)					
COM7: The firm promotes CSR in the industry					
Environment Sustainability (ES)	**3.19**	**1.01**	**0.91**	**0.88**	**0.60**
ES1: The firm implements special programs to minimise its negative impact on the natural environment					
ES2: The firm participates in activities that aim to protect and improve the quality of the natural environment					
ES3: Environmental performance metrics are used regularly by corporate management					
ES4: The firm encourages cross-functional cooperation to create environmental improvements					
ES5: The firm adopts environmental management systems (i.e., ISO 14001 certification or any comparable EMS)					
ES6: The firm conducts internal environmental audits/considers ecological design requirements to ensure that products and/or services meet environmental goals					
ES7: The firm uses green marketing or green labelling practices for products and/or services offered					
Social Sustainability of Supply Chain (SSSC)	**2.90**	**0.93**	**0.95**	**0.91**	**0.69**
SSSC1: The firm visits its suppliers' plants to ensure that they are not using sweatshop labour, comply with child labour laws, discrimination					
SSSC2: The firm asks suppliers to pay a living wage greater than the country's or region's minimum wage					
SSSC3: The firm asks suppliers to operate in a safe manner and provide safe products					
SSSC4: The firm takes a positive view of suppliers who have certifications of health and safety at work or other social responsibility certifications					
SSSC5: The firm considers aspects of social responsibility in selecting its suppliers					
SSSC6: The firm requests information from its suppliers on aspects of social responsibility					
SSSC7: The firm develops an ethical code of conduct system with its key supplier					
SSSC8: The firm seeks to include social enterprises or non-profit organisations in its supply chain					
SSSC9: The firm has a supply chain strategy that is careful to minimise negative impacts on communities					
Environmental Sustainability of Supply Chain (ESSC)	**2.34**	**1.03**	**0.96**	**0.94**	**0.71**
ESSC1: The firm has developed a mutual understanding of environmental responsibilities with its suppliers					
ESSC2: The firm works with suppliers to reduce the environmental impact of its activities					
ESSC3: The firm makes decisions with suppliers about ways to reduce the environmental impact of its products/services					
ESSC4: The firm accumulates and shares environmental knowledge with its suppliers					
ESSC5: The firm selects suppliers based on their environmental impacts					
ESSC6: The firm requires its suppliers to provide information on their environmental compliance					
ESSC7: The firm requires its suppliers to implement an environmental management system (e.g., ISO 14000, EMAS)					
ESSC8: The firm performs environmental audits for suppliers' internal management systems					
ESSC9: The firm sets environmental performance goals for its suppliers					
CSR to Customer (CSR2C)	**3.80**	**0.76**	**0.85**	**0.89**	**0.59**
CSR1: The firm provides full and accurate information about its products to its customers					
CSR2: The firm respects consumer rights beyond the legal requirements					
CSR3: Customer satisfaction is highly important for the firm					
CSR4: The firm cooperates with its customers to reduce the environmental impact of its products/activities					
CSR5: The firm cooperates with its customers to anticipate and/or resolve environmental-related problems					
CSR6: The firm cooperates with its customers to reduce packaging requirements					
CSR7: The firm has developed methods for more environmentally friendly deliveries/logistics operations with its customers					
CSR8: The firm implements reverse logistics programs (returns management programs)					
CSR9: The firm develops a mutual understanding with its customers regarding environmental responsibilities					
CSR10: The firm provides for its customers with safe product/services					
CSR11: The firm aims to achieve environmental goals with its customers					
Supply Chain Agility (AGI)	**3.16**	**0.89**	**0.91**	**0.95**	**0.78**
AG1: Our supplier(s) can quickly reconfigure their resources to respond to short-term changes in supply					
AG2: Our supplier(s) can quickly reconfigure their resources to respond to short-term changes in demand					
AG3: Our supplier(s) can quickly reconfigure their resources to respond to short-term changes in its environment (e.g., currency fluctuations, economic policies, political changes)					

(*continued on next page*)

TABLE A2 (*continued*)

Variable and measurement items	Mean	SD	Composite reliability	Cronbach's alpha	AVE
AG4: As compared to our competitors, we, along with our supplier(s), are usually quicker to respond to short-term changes in supply					
AG5: As compared to our competitors, we, along with our supplier(s), are usually quicker to respond to short-term changes in demand					
AG6: As compared to our competitors, we, along with our supplier(s), are usually quicker to respond to short-term changes in our environment (e.g., currency fluctuations, economic policies, political changes)					
Social Performance (SP)	**3.60**		**0.80**	**0.92**	**0.51**
SP1: The firm has reduced potential negative social impacts and increased positive social impacts on the community					
SP2: The firm has improved the occupational health and safety standards of its employees					
SP3: The firm has perceived an improvement in the image of its products/services					
SP4: The firm has perceived an improvement in its image in the eyes of its customers					
SP5: The firm has perceived an improvement in its social reputation					
SP6: The firm has improved the work environment, resulting in greater employee satisfaction					
SP7: The firm has expanded employment and business opportunities in the surrounding community					
SP8: The firm has perceived an improvement in its relationships with community stakeholders (e.g., local governments, non-profits)					
Environmental Performance (ENP)	**3.16**		**0.81**	**0.93**	**0.59**
ENP1: The firm has reduced waste and emissions					
ENP2: The firm has reduced and/or eliminated the use of potentially hazardous/harmful/toxic materials					
ENP3: The firm has achieved energy savings					
ENP4: The firm has improved its compliance with environmental standards					
ENP5: The firm has improved its ability to reuse/recycle materials					
ENP6: The firm has acquired and/or consolidated a reputation as an environmentally conscious firm					
ENP7: The firm has improved the eco-friendliness of return/transport/logistics procedures					
ENP8: The firm has reduced the consumption of materials in relation to the volume of activity (per unit of product/service offered)					
ENP9: The firm has increased the share of renewable energy use					
ENP10: The firm has improved the environmental impact of its products/services and packaging					
Economic Performance (ECP)	**3.27**		**0.88**	**0.89**	**0.78**
ECP1: The firm increased sales					
ECP2: The firm has increased profits					
ECP3: The firm has increased the return on investment					
ECP4: The firm increased profitability of sales					
ECP5: The firm reduced operating costs					
ECP6: The firm has reduced waste costs or other environmental costs					
ECP7: The firm has increased revenues from eco-friendly products					

TABLE A3
Fuzzy set calibration rules

Construct	Original scale	Full non-membership	Full membership	Crossover
HR	5-point Likert scale	1	5	4.62
COMM	5-point Likert scale	1	5	3.43
ES	5-point Likert scale	1	5	3.14
SSSC	5-point Likert scale	1	5	2.90
ESSC	5-point Likert scale	1	5	2.11
CSR2C	5-point Likert scale	1	5	3.90
AGI	5-point Likert scale	1	5	3.00
PERF	5-point Likert scale	1	5	3.43

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