Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?

Article *in* British Journal of Management · July 2023

DOI: 10.1111/1467-8551.12748

Maciel Queiroz
Escola de Administração de Empresas de São Paulo da Fundação Getulio Vargas

Samuel Fosso Wamba
Toulouse Business School

Ilias Pappas
Universitetet i Agder

Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?

Maciel M. Queiroz[1,*], Samuel Fosso Wamba[2], Rakesh D. Raut[3], Ilias O. Pappas[4,5]

[1]*FGV EAESP, R. Itapeva 474, Sao Paulo, 01332-000, Brazil.* maciel.queiroz@fgv.br
[2]*TBS Business School, 1 Place Alphonse Jourdain, Toulouse, 31068, France.* s.fosso-wamba@tbs-education.fr
[3]*Department of Operations and Supply Chain Management, National Institute of Industrial Engineering (NITIE), Vihar Lake, Mumbai, 400087, India.* rraut@nitie.ac.in
[4]*University of Agder, Universitetsveien 25, Kristiansand, 4630, Norway.* ilias.pappas@uia.no,
[5]*Norwegian University of Science and Technology (NTNU), Sem Sælands vei7–9, Trondheim, 7491,Norway.* ilpappas@ntnu.no

* Corresponding author

Abstract
In today's disruptive world, firms and supply chains are facing massive disruptions, primarily owing to resource scarcity. We develop a model supported by resilience and resource-based theories to assess supply chain decision-makers in the US. We validate the model by employing partial least squares structural equation modeling and fuzzy-set qualitative comparative analysis. We find that supply chain agility and flexibility can support supply chain resilience, which in turn sustains supply chain performance. Furthermore, we find a mediation effect of supply chain resilience in the relationship between agility and supply chain performance, as well as between flexibility and supply chain performance. Furthermore, the findings suggest that supply chain performance under severe disruptions can be achieved when supply chains are resilient based on the combination with agility or flexibility. Our study contributes to the supply chain resilience and resource-based theory literature by identifying that resource configuration plays a decisive role in resilience and performance in severe disruptions due to resource scarcity. Our findings suggest that not all resilience-related resources are necessary to build resilience and support performance. Therefore, when confronted by a disruptive crisis, managers, practitioners, and policymakers should identify the best resource configurations to create resilience and support performance.

Keywords – Supply chain performance; Resilience; Agility; Flexibility; Fuzzy-set qualitative comparative analysis; Resource configuration

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

Introduction

With the unparalleled effects caused by severe global crises, such as the COVID-19 pandemic (Fosso Wamba *et al.*, 2021; Papagiannidis *et al.*, 2022; Puthusserry *et al.*, 2022; Queiroz *et al.*, 2022; Verbeke, 2020), firms have experienced various and severe disruptions in their management and supply chains (Mertzanis, 2021; Nikookar and Yanadori, 2022; Sheng *et al.*, 2021; Gupta *et al.*, 2023). More specifically, traditional sectors, such as the food (Singh *et al.*, 2021), manufacturing (Okorie *et al.*, 2020), and automotive industries (Hoeft, 2021), as well as international trade (Mena *et al.*, 2022), have been severely impacted.

Resilience theory provides the necessary insights for understanding how actors involved in disruption processes operate at different levels (individual, organizational, network) and how they interact with the environment to face adverse situations, either by supporting the return to normal business operations (Williams *et al.*, 2017) or by adapting to a novel scenario after the crisis (Duchek, 2020; Ivanov and Dolgui, 2020). Resilience, as related to supply chains, is defined as the capability of firms to face unexpected events with an adequate response to support recovery during and after a disruption (Choudhary *et al.*, 2022; Nikookar & Yanadori, 2022). Resilience aims to enable supply chains to face disruptions better and quickly restore normality (El Baz and Ruel, 2021; Yao and Fabbe-Costes, 2018). Supply chain performance, in this context, reflects the capacity to keep meeting customer expectations with regard to product delivery (Gu *et al.*, 2021).

Moreover, the supply chain resilience literature has found a positive relationship between supply chain disruption orientation and performance (Stekelorum *et al.*, 2022). This means that, by associating the focal firm's disruption orientation with the supplier's disruption orientation, economic performance can be achieved (Stekelorum *et al.*, 2022). The COVID-19 crisis triggered a frenzy in the resilience and supply chain literature (Wulandhari *et al.*, 2022). The scarcity of resources can be impacted by the way supply chain networks are configured, which may support the restoration strategies. The relevant literature has also reported that operational resilience coupled with flexibility, in contexts of crises such as COVID-19, leads to a successful combination of internal and external resources for firms and their networks (Li *et al.*, 2022). Similarly, agility has been found to be a crucial variable that helps supply chains to respond in a timely manner and supports their resilience (Do *et al.*, 2021).

From this perspective, supply chain agility is related to firms' efforts towards the proper use of available resources to respond quickly to disruptions (Belhadi *et al.*, 2021) and supply chain flexibility to the adjustments and absorption capacity to meet the requests efficiently (Shin and Park, 2021). This implies resorting to easily triggered options that contribute to meeting the market requirements during a disruption (Jüttner and Maklan, 2011; Shin and Park, 2021). The supply chain's agility and flexibility can be viewed both at strategic and operational levels. For example, agility can quickly adapt processes to improve lead times, reduce product development cycle time, etc. (Shin and Park, 2021). Similarly, flexibility can be seen in the form of rescheduling suppliers' delivery times according to the evolution of the crisis, the alteration of production volume capacity, etc. (Shin and Park, 2021).

Over recent decades, the extant literature has concentrated on understanding the contribution of agility and flexibility, especially in a context where external uncertainties have

Accepted version. **Cite as:**

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

increased (Gligor *et al.*, 2015; Huo *et al.*, 2018; Prater *et al.*, 2001; Yi *et al.*, 2011). In addition, agility and flexibility can be viewed through the lens of the related resource-based theory (RBT) (Altay *et al.*, 2018; El Baz and Ruel, 2021; Fayezi *et al.*, 2017; Li *et al.*, 2023). In addition, in a structured literature review, Fayezi *et al.* (2017) tackled the issue by analysing 83 articles, enabling them to suggest that, in the supply chain context, agility and flexibility need an integrative approach to provide an adequate response to external perturbations.

There is no doubt that the literature on supply chain resilience has evolved. For example, it provides novel perspectives for network reconfiguration in times of crises (Ivanov and Dolgui, 2020) and reports the need to develop adequate resources and capabilities (Li *et al.*, 2022; Qi *et al.*, 2023; Wulandhari *et al.*, 2022). However, it is important to define an approach to determine how resilience is built and how the performance of the supply chain can be achieved and supported in the case of severe disruptions. This question arises more frequently when resource constraints lead to resource scarcity throughout the network. Accordingly, following Cohen *et al.* (2022), who stated that supply has different resilience requirements and different ways to achieve resilience, we postulate that, in the case of severe crises such as COVID-19, where firms' and their supply chains' resources are extremely limited, flexibility and agility may be sufficient to determine supply chain resilience and thus support supply chain performance. We therefore address the following research questions (RQs):

RQ1: In situations of extreme resource scarcity, such as COVID-19, are agility and flexibility enough to support supply chain resilience?

RQ2: Can resilience built on agility and flexibility support the performance of supply chains in situations of extreme resource scarcity?

Cases of severe disruptions also increase the load on managers' shoulders and put great pressure on them to minimize resource consumption. However, the importance of sensitizing managers concerning how best they can combine resources (resource configuration) to support adequate supply chain performance in severe disruptions contexts remains an un-investigated topic. We therefore address the following question:

RQ3: In a situation of extreme resource scarcity, should managers use all their available resources related to agility and flexibility to achieve supply chain performance?

To answer these questions, this paper proposes a conceptual model based on supply chain resilience literature and RBT, focusing on highly disruptive contexts (Bag *et al.*, 2021; El Baz and Ruel, 2021; Huang *et al.*, 2023). In terms of contributions, our paper provides new perspectives concerning, and insights into, the management of scarce resources and how supply chains can achieve resilience and performance during severe disruptions such as COVID-19. Under such circumstances, supply chain agility and flexibility can be critical due to the availability of resources that managers and policymakers should consider when formulating their resilience strategies. Moreover, our article advances the supply chain resilience literature and RBT by suggesting that, when facing severe disruptions, managers do not need to use all the available resources related to supply chain agility and flexibility to achieve supply chain performance, although resilience is necessary.

This paper begins by introducing the basic foundations of resilience theory and RBT, along with the hypotheses and the research model. The methodological approach is then described in

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

detail. Next, the results and data analysis are presented using the partial least squares structural equation modeling (PLS-SEM) approach, followed by a complementary analysis using fuzzy-set qualitative comparative analysis (fsQCA). In sequence, the findings, their implications, the limitations of the study, and future research directions are presented. Finally, the main conclusions are summarized.

Theoretical approach and hypothesis development

Resilience theory

Resilience theory is a well-explored topic in areas encompassing the organizational, business, and management perspectives (Do *et al.*, 2022; Duchek, 2020; Durach *et al.*, 2020; Kahiluoto *et al.*, 2020; Linnenluecke, 2017; Yuan *et al.*, 2022). Resilience approaches have also been successfully applied in the fields of operations and supply chains (Choudhary *et al.*, 2022; Dubey *et al.*, 2021c; Ivanov and Dolgui, 2020; Scholten *et al.*, 2020). The advent of COVID-19 gave rise to a sharp increase in the number of studies concerning the resilience of supply chains. Scholars have focused on developing new strategies for resource mobilization and combination and for developing capabilities to respond adequately to perturbations and support firm and supply chain recoverability (Cohen *et al.*, 2022; Shen and Sun, 2021).

In another COVID-19 context, Wulandhari *et al.* (2022) explored the interplay between organizational resilience and supply chain risks, considering the UK food industry. The authors underlined the importance of dynamic capabilities to support resilience construction. They showed that the organizational structure configurations affect supply chain risk management. In a study undertaken in China, Shen and Sun (2021) investigated the supply chain resilience strengthening of a major Chinese retailer. They found that an integrated supply chain structure, combined with intelligent platforms, enabled excellent levels of collaboration, information sharing, agility, and, consequently, flexibility and resilience.

Cohen *et al.* (2022) highlighted the importance of having managers who deal with resilience strategies and implementation. These authors highlighted the role of managers while considering the particularities of the supply chains and how they influence the achievement of resilience. In other words, supply chain resilience depends on whether managers consider the related requirements and the various alternatives to achieve resilience.

In another resilience context, Choudhary *et al.* (2022) investigated the influence of reshoring on the resilience and sustainability of the Apple and Jaguar Land Rover global supply chain network. They reported that the influence position of an international supplier, which enables more control and influence in the network and which is being impacted by the disruption, does not expand the disruption to the rest of the network.

Resource-based theory (RBT)

RBT is a classical organizational theory that directs attention toward the resources required for firms to effectively leverage their capabilities, thereby enhancing their performance (Barney, 1991; Dubey *et al.*, 2019; Huang *et al.*, 2023; Wernerfelt, 1984). Notably, RBT focuses on the firm's resources to support the creation of capabilities to attain a competitive

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

advantage (superior performance) when its resources possess rarity, value, non-imitability, and non-substitutability (Barney, 1991).

However, RBT has encountered criticism (Sirmon *et al.*, 2011), primarily due to the need to further elucidate how resources are transformed into capabilities. The literature pertaining to general business management and the supply chain has successfully investigated resilience using RBT (Brusset and Teller, 2017; El Baz and Ruel, 2021) as well as other resource approaches, such as resource dependence (Jiang *et al.*, 2023) and supply chain resources (Qi *et al.*, 2023). In this regard, RBT has proven to be useful in comprehending disruptions and resilience (Bag *et al.*, 2021; El Baz and Ruel, 2021). Thus, it is clear that resources (internal and/or external) can play a decisive role in building the resilience of firms and supply chains (Li *et al.*, 2022).

Supply chain agility

Supply chain agility is related to a set of actions that firms perform to respond to specific requests quickly in their supply chains (al Humdan *et al.,* 2020). In an extreme situation, such as COVID-19, the quick adaptation of supply chain processes can increase on-time delivery, enhance lead times, and add value to the supply chain's performance. Prior literature has highlighted the multifaceted dimension of agility, which encompass a firm's ability to respond quickly to change, anticipate problems, etc. (Gligor *et al.*, 2019). Regarding the COVID-19 pandemic, Müller *et al.* (2022) proposed an ad hoc agility supply model to minimize the effects of disruptions caused mainly by resource scarcity. The ad hoc agility model was developed to support a particular necessity that has an immediate demand and exists for a specific time horizon.

Do *et al.* (2021) showed that agility responses based on sensing and seizing capabilities played an essential role both during the disruption caused by the COVID-19 pandemic and in the post-crisis recovery period. Recently, Ivanov (2022) showed that the survivability of a supply chain during severe disruptions is related to three properties, namely agility, resilience, and sustainability. More recently, Çetindaş *et al.* (2023) found, during the COVID-19 pandemic, that agility positively contributed to demand stability and firms' performance. Additionally, Shen and Sun (2021), examining the case of JD.com (the largest retailer in China) during COVID-19, showed the importance of related agility processes in facing disruptions, including quickly modifying processes to respond promptly.

Supply chain agility represents an important aspect of supply chain resilience management and firm performance (Li *et al.*, 2017). From this perspective, the development and implementation of supply chain agility capabilities are instrumental in addressing major disruptions (Belhadi *et al.*, 2021). In addition, collaboration between the supply chain members can help improve agility and resilience in highly disruptive contexts. As a result, supply chain performance can also be significantly improved (Shen and Sun, 2021). Thus, we hypothesize:

H1a: Supply chain agility has a positive effect on supply chain resilience during a disruptive crisis scenario.

H1b: Supply chain agility has a positive effect on supply chain performance during a disruptive crisis scenario.

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

Supply chain flexibility

Supply chain flexibility is characterized by the capacity of adjustments made by managers to support the options available to firms and supply chains to respond to requests efficiently (Shin and Park, 2021). Notably, in highly disruptive contexts, supply chain flexibility is essential to address market requirements by enabling and adjusting the management of several processes, such as production levels, purchase orders, transport capacity, workforce scheduling, etc., taking into account the availability of the resources. In this vein, due to the uncertainty of the contemporary environments in which firms and supply chains operate today, supply chain flexibility can be enabled by different combinations of internal and external resources (Li *et al.*, 2022).

In their study of operational resilience during COVID-19, Li *et al.* (2022) showed that firms should try to strike a balance between internal and external flexibility in order to maximize their resilience. Accordingly, the heterogenous matchings between these types of flexibility can leverage the flexibility of firms and supply chains and, thus, resilience. Therefore, it is important to consider firms' and supply chains' available resources in order to build flexibility in disruptive contexts (Li *et al.*, 2022). In uncertain environments, using flexibility strategies plays a decisive role in the resilience and performance both of firms and their supply chains. More specifically, it can minimize uncertainties, thus consequently supporting resilience and performance (Yi *et al.*, 2011).

In this regard, it is clear that flexibility can positively influence different processes and activities in the supply chain (El Baz and Ruel, 2021; Shin and Park, 2021). It has previously been reported in the literature that flexibility in supply chains helps achieve resilience (Singh *et al.*, 2019). Against this background, the supply chain flexibility enabled by different resources becomes an important aspect that can support the aforementioned activities and processes and improve supply chain resilience and performance in disruptive scenarios. Accordingly, flexibility can help make supply chain management more efficient and resilient in terms of the different processes and operations. For this reason, we hypothesize:

H2a: Supply chain flexibility has a positive effect on supply chain resilience during a disruptive crisis scenario.

H2b: Supply chain flexibility has a positive effect on supply chain performance during a disruptive crisis scenario.

Supply chain resilience and supply chain performance

In the present study, supply chain resilience refers to the ability to anticipate and address disruptions and to recover operations (El Baz and Ruel, 2021; Yao and Fabbe-Costes, 2018). Supply chain performance refers to the ability to maintain the flow of available products and services and ensure on-time delivery in line with customer demand (Gu *et al.*, 2021). Owing to the disruptions exacerbated by the COVID-19 pandemic, interest in the resilience of supply chains has gained momentum over the last few years (Fjellström *et al.*, 2023; Gillani *et al.*, 2022).

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

In addition, in a robust systematic review of the supply chain agility definitions, al Humdan *et al.* (2020) suggested that agility can support different types of performance, encompassing operational, marketing, relational, cost, and financial performance. Furthermore, the literature suggests that supply chain resilience plays a key role in recovering performance (El Baz and Ruel, 2021) both during and after catastrophic disruptions (Ivanov, 2021).

In the context of a severe disruption, such as COVID-19, firms and their supply chains have tried several strategies to improve resilience and performance. Examining the disruption orientation considering the COVID-19 pandemic, Stekelorum *et al.* (2022) found a positive relationship between the disruption orientation of suppliers and performance.

The combination of internal and external resources can support the creation of operational resilience (Li *et al.*, 2022) and, consequently, improve supply chain performance. Some actions related to resources for risk management (i.e., risk capture and assessment) can enable resilience and support supply chain performance (Wulandhari *et al.*, 2022). In large-scale disruptive contexts, the resilience of supply chains, enabled by agility, flexibility, and other variables, is critical for the performance of supply chains (Shen and Sun, 2021). Hence, we propose:

H3: Supply chain resilience has a positive effect on supply chain performance during a disruptive crisis scenario.

The mediation effect of resilience in the agility/flexibility–performance relationship

Supply chain disruption impacts are perceived as a negative and unforeseen discontinuation of the regular stream of supply and demand in the supply chain (Ambulkar *et al.*, 2015; Craighead *et al.*, 2007). Furthermore, supply chains can suffer severe setbacks mainly due to ripple effects (Dolgui *et al.*, 2018). Recent literature on supply chain resilience has agreed on its importance in directly and indirectly supporting performance (Bahrami and Shokouhyar, 2022).

Moreover, in the context of supply chain disruptions, El Baz and Ruel (2021) found that supply chain risk management, including resilience, directly and indirectly contributes to the performance of operations and recovery actions in severe disruptive contexts. In this regard, it is clear that risk management can enable different types of resources and support performance during a severe crisis (Mertzanis, 2021). Accordingly, we suggest that, during a disruptive crisis scenario, supply chain resilience plays a decisive role in supporting performance, enabled by key capabilities such as agility and flexibility. Therefore, the following hypotheses emerge:

H4: Supply chain resilience, as a mediator, has a significant positive effect on the relationship between supply chain agility and supply chain performance during a disruptive crisis scenario.

H5: Supply chain resilience, as a mediator, has a significant positive effect on the relationship between supply chain flexibility and supply chain performance during a disruptive crisis scenario.

In summary, Figure 1 highlights the conceptual model of this study with the respective hypotheses.

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

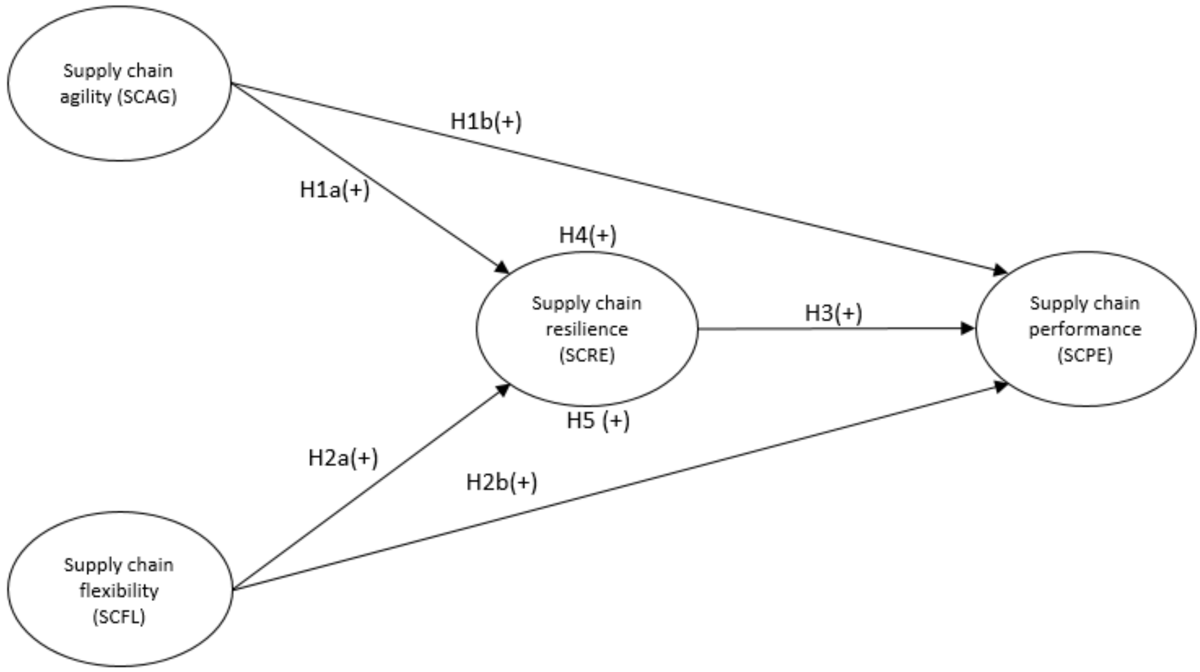

Figure 1. Research model

Methodological approach

Data collection and respondents

We used a web-based questionnaire to collect data from supply chain professionals in the US. Our survey was supported by Prolific, a leading market research company (Palan and Schitter, 2018; Peer *et al.*, 2017; Queiroz *et al.*, 2022). Prolific has been widely proposed as a good strategic partner for data collection in management fields (Koch and Schermuly, 2021; Schaarschmidt *et al.*, 2022). We set specific parameters to ensure the quality of the appropriate respondents and used pre-screening filters from the Prolific platform, combined with manual filters that we defined ourselves. For instance, on the Prolific platform, we filtered the profile by considering only respondents with managerial experience. We also added the eligibility restriction of including only respondents who are working (or have worked) in a decision-making position (C-suite senior executives who make key strategic decisions, president/vice-president, director, or manager) in the supply chain context during the COVID-19 pandemic. Additionally, we used an attention check to ensure the quality of responses (Abbey and Meloy, 2017).

The data were collected in April 2021. Only respondents who held a decision-making role within a supply chain were considered. The questionnaire was adapted from previous validated literature (see the Appendix). We pretested the questionnaire with five experienced supply chain professionals and several scholars. We also applied the 10-times rule to ensure a sufficient sample size (Hair *et al.*, 2017) and employed a stop criterion considering the number of respondents. We ultimately obtained 153 usable questionnaires. In addition, we used the well-known G*Power software to calculate the minimum required sample, considering the

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

medium effect size f^2=0.15 and power=0.80 (Cohen, 1988), which revealed the minimum sample size to be 85 respondents. We also utilized the bootstrapping method considering 5,000 resamples. Table 1 details the profile of the survey respondents.

Table 1. Demographic profile of the questionnaire respondents

Criteria	Number of respondents (*N*=153)	Percentage (%)
Age (years)		
18–25	13	8.50
26–33	66	43.14
34–41	40	26.14
42–49	20	13.07
50+	14	9.15
Gender		
Male	112	73.20
Female	41	26.80
Highest level of education		
No formal qualification	3	1.96
Primary qualification	1	0.66
Secondary qualification	10	6.54
Undergraduate degree	79	51.63
Postgraduate degree/MBA	31	20.26
MSc	26	16.99
PhD	3	1.96
Company size		
1–49 employees	35	22.88
50–99 employees	23	15.03
100–499 employees	46	30.07
500–999 employees	26	16.99
≥1,000 employees	23	15.03
Industry		
Food/beverage	8	5.23
Healthcare	14	9.15
Retail	26	16.99
Logistics/transportation	30	19.61
Consumer goods	20	13.07
Telecommunications	10	6.54
Machinery and equipment	9	5.88
Oil and gas	2	1.31
Import/export	6	3.92
Manufacturing	15	9.80
Construction	2	1.31
Others	11	7.19
Position		
President/vice-president	10	6.54
C-suite	24	15.69
Director	23	15.03
Manager	96	62.74

Nonresponse bias

In order to assess whether nonresponse bias could be a concern in this study, we performed a two-wave comparison approach (early and late respondents) (Armstrong and Overton, 1977).

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

We applied an independent samples *t*-test (Dubey *et al.*, 2021a) using IBM SPSS v.27 to compare a subsample of the early and late respondents (Armstrong and Overton, 1977). Considering a value of 5% as significant, we found no differences between the two groups of respondents.

Results and data analysis

We analysed the model using PLS-SEM (Dubey *et al.*, 2019; 2021b; Hair *et al.*, 2019). PLS-SEM is a popular variance-based technique that does not require assumptions about the normal distribution of data or large sample sizes (Hair *et al.*, 2017, 2019). In addition, we used SmartPLS 3.0 (Hair *et al.*, 2017) and version 7 of WarpPLS software (Dubey *et al.*, 2021c; Kock, 2020; Schriber *et al.*, 2022).

Model assessment

In order to assess our proposed model, we first performed some important reliability and validity tests (Hair *et al.*, 2017, 2019), as shown in Table 2. We measured the internal consistency reliability by means of Cronbach's alpha and composite reliability. Our results were higher than the accepted 0.70 threshold (Hair *et al.*, 2017; Nunnally, 1978). The average variance extracted (AVE) value was used to assess the convergent validity. Our results exceeded the accepted threshold of 0.50 (Hair *et al.*, 2017, 2019), which means that a minimum of 50% of the variance of the items in a particular construct is explained by construct. We also used the loadings to assess each item's reliability. All the values were greater than the required 0.708 threshold (Hair *et al.*, 2017), thus showing that each construct explains a minimum of 50% (0.708×0.708) of the indicator's variance.

Table 2. Internal consistency reliability and convergent validity

Variable	Indicator	CA	CR	AVE	Loadings
Supply chain agility (SCAG)	SCAG1	0.839	0.892	0.674	0.807
	SCAG2				0.845
	SCAG3				0.836
	SCAG4				0.795
Supply chain flexibility (SCFL)	SCFL1	0.852	0.910	0.772	0.880
	SCFL2				0.841
	SCFL3				0.914
Supply chain performance (SCPE)	SCPE1	0.934	0.947	0.718	0.873
	SCPE2				0.809
	SCPE3				0.751
	SCPE4				0.870
	SCPE5				0.896
	SCPE6				0.866
	SCPE7				0.856
Supply chain resilience (SCRE)	SCRE1	0.931	0.951	0.829	0.908
	SCRE2				0.896
	SCRE3				0.926
	SCRE4				0.912

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

Note: CA=Cronbach's alpha; CR=composite reliability; AVE=average variance extracted.

Two approaches were used to measure the discriminant validity. As shown in Table 3, we applied the Fornell–Larcker criterion and used the AVE values of the constructs (Fornell and Larcker, 1981) to show the difference between the constructs (see the bold values along the diagonal highlighting the inter-construct correlation). We then performed a more recent discriminant validity test by means of the heterotrait-monotrait (HTMT) ratio (Henseler *et al.*, 2015), as shown in Table 4. Our results (below 0.90) are in line with the HTMT threshold (Henseler *et al.*, 2015), so we can conclude that the constructs are quite different from each other.

Table 3. Discriminant validity (performed using average variance extracted)

Variable	SCAG	SCFL	SCPE	SCRE
SCAG	**0.821**			
SCFL	0.627	**0.879**		
SCPE	0.612	0.648	**0.847**	
SCRE	0.598	0.636	0.808	**0.911**

Notes: The diagonal values highlight the square roots of average variances extracted. SCAG=supply chain agility; SCFL=supply chain flexibility; SCPE=supply chain performance; SCRE=supply chain resilience.

Table 4. Discriminant validity (performed using the heterotrait-monotrait ratio)

Variable	SCAG	SCFL	SCPE	SCRE
SCAG				
SCFL	0.735			
SCPE	0.685	0.722		
SCRE	0.669	0.710	0.862	

Notes: HTMT ratios (good if <0.90, best if <0.85). SCAG=supply chain agility; SCFL=supply chain flexibility; SCPE=supply chain performance; SCRE=supply chain resilience.

Common method bias (CMB)

In order to verify a possible impact on the model of an inflated relationship between endogenous and exogenous variables, as can be the case in self-reported surveys, we conducted a CMB test (Podsakoff and Organ, 1986). To evaluate the CMB, the recommendations of Kock (2020) were applied, i.e., using a full collinearity test of variance inflation factors. All the values were lower than the 3.3 threshold: supply chain agility=1.887; supply chain flexibility=2.068; supply chain resilience=3.073; and supply chain performance=3.205. As a result, the model is not influenced by CMB (Kock, 2015, 2020).

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

Endogeneity evaluation

To assess any possible causality in the model, we performed the nonlinear bivariate causality direction ratio (NLBCDR) test (Dubey *et al.*, 2021b; Kock, 2020). The NLBCDR assesses the causal links in a model by considering the directions hypothesized. Accordingly, the NLBCDR is acceptable when the values obtained are higher than or equal to 0.7. In our study, the value is 1.0, so we can conclude that the model is not affected by causality.

Predictive relevance power and variance explained

Table 5 reports the *Q*-squared and adjusted *R*-squared coefficients. First, we assessed the predictive validity power of the model by conducting the Stone–Geisser test, which uses a blindfolding algorithm approach (Hair *et al.*, 2017; Stone, 1974). Ultimately, all the *Q*-squared values appeared to be in line with the requirement according to the literature: the threshold value must be higher than zero (Hair *et al.*, 2019; Kock, 2020). Therefore, the predictive relevance of the model can be validated. Second, the variance explained by the model was also consistent with the literature (Dubey *et al.*, 2019; Hair *et al.*, 2017; Kock, 2020). Besides, the model explains 68.7% of the variance in supply chain performance (SCPE).

Table 5. Q*-squared and adjusted* R*-squared coefficients*

Latent variable coefficients	*Q*-squared coefficients	Adjusted *R*-squared coefficients
Supply chain resilience (SCRE)	0.382	0.462
Supply chain performance (SCPE)	0.488	0.687

Hypotheses analysis

Regarding the hypotheses, Table 6 shows the path coefficients and other important measurements. Via *H1a*, we aimed to investigate the positive effect of supply chain agility on supply chain resilience. The results (SCAG→SCRE; β=0.336, p<0.001) reveal a significant positive effect, thus validating *H1a*. *H1b* aimed to assess the positive effect of supply chain agility on supply chain performance. Unexpectedly, we found a nonsignificant positive effect (SCAG→SCPE; β=0.136, p=0.091), meaning that *H1b* is rejected. Via *H2a*, we aimed to evaluate the relationship between supply chain flexibility and supply chain resilience, and via *H2b* the relationship between supply chain flexibility and supply chain performance. The results for the former (SCFL→SCRE; β=0.424, p=0.000) and the latter (SCFL→SCPE; β=0.170, p=0.026) show that both hypotheses are strongly supported. Regarding *H3*, we tested the positive effect of supply chain resilience on supply chain performance. This hypothesis was strongly supported (SCRE→SCPE; β=0.619, p=0.000).

Finally, we assessed the mediation effect of supply chain resilience. Regarding *H4*, we found a full mediation of supply chain resilience in the relationship between supply chain agility and supply chain performance (SCAG→SCRE→SCPE; β=0.207, p=0.002). *H5* was also supported, as supply chain resilience was proven to play a partial mediation role in the relationship between supply chain flexibility and supply chain performance

Accepted version. **Cite as:**

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

(SCFL→SCRE→SCPE; β=0.263, p=0.000). Figure 2 shows the results of the paths and the R-square values of the dependent variables.

Table 6. Structural path coefficients

Hypothesis	Path	Beta	Standard deviation	*t*-values	*p*-values	Decision
H1a	SCAG→SCRE	0.336	0.100	3.288	0.001	Accepted
H1b	SCAG→SCPE	0.136	0.080	1.695	0.091	Rejected
H2a	SCFL→SCRE	0.424	0.096	4.485	0.000	Accepted
H2b	SCFL→SCPE	0.170	0.076	2.226	0.026	Accepted
H3	SCRE→SCPE	0.619	0.074	8.367	0.000	Accepted
Mediation						
H4	SCAG→SCRE→SCPE	0.207	0.065	3.108	0.002	Full mediation
H5	SCFL→SCRE→SCPE	0.263	0.069	3.869	0.000	Partial mediation

Note: SCAG=supply chain agility; SCRE=supply chain resilience; SCPE=supply chain performance; SCFL=supply chain flexibility.

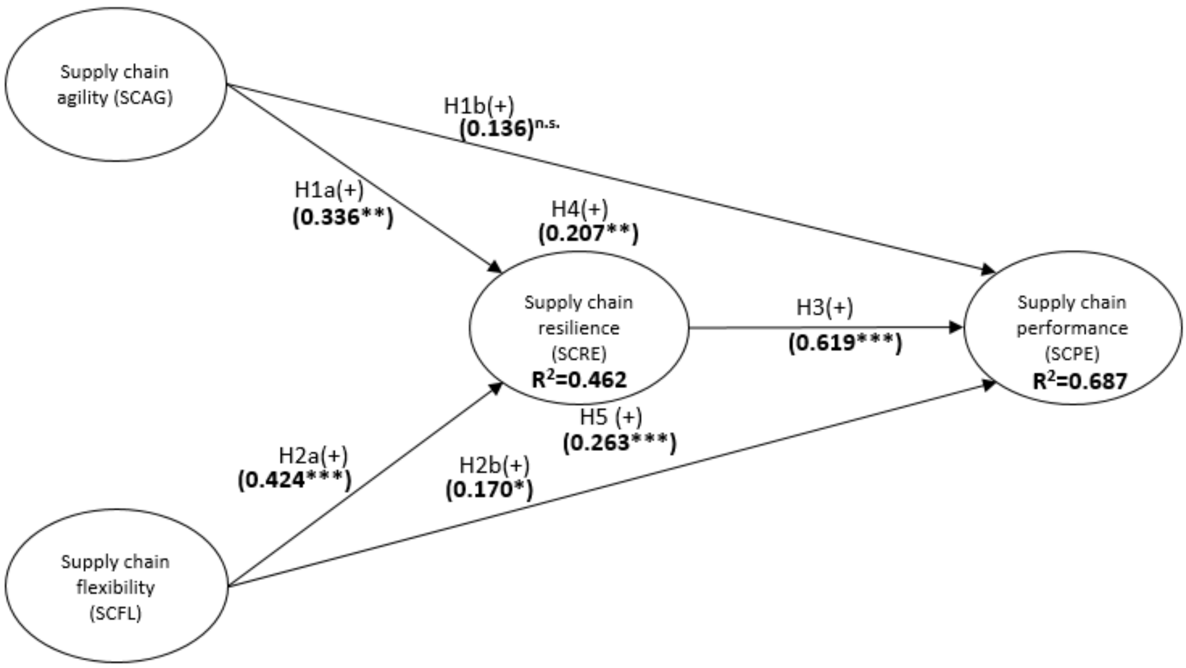

Figure 2. Research model with results

Note: * p<0.05, ** p<0.01, *** p<0.001, n.s.=not significant.

Complementary analysis with fuzzy-set qualitative comparative analysis (fsQCA)

We used fsQCA to explore all aspects of our dataset (Beynon *et al.*, 2021; Kaya *et al.*, 2020; Ragin, 2008; Xie *et al.*, 2021). Thus, fsQCA allowed us to complement the findings from the PLS-SEM analysis by identifying the conditions that are: (1) sufficient or necessary to

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

explain the outcome and its negation; and (2) insufficient on their own but necessary parts of solutions that can explain the result. We used fsQCA following related recommendations from extant research (Pappas and Woodside, 2021; Ragin, 2008; Salonen *et al.*, 2021). The objective here was to identify the conditions that explain why supply chain performance may or may not be very high.

Data calibration

The choice of three thresholds was based on the recommendations of Ragin (2008): 0.95 (full membership); 0.5 (crossover point); and 0.05 (full non-membership). Through these thresholds, we were able to examine the factors that explain a steep rise in supply chain performance (e.g., 7 on the Likert scale). Table 7 shows the set thresholds.

Table 7. Data calibration thresholds

Variable	0.95 (full membership)	0.5 (crossover point)	0.05 (full non-membership)
SCFL	7	5.66	2.90
SCAG	7	5.00	2.50
SCRE	7	5.50	2.67
SCPE	7	5.00	2.57

Note: SCFL=supply chain flexibility; SCAG=supply chain agility; SCRE=supply chain resilience; SCPE=supply chain performance.

Analysis of necessity

We first verified whether any of the individual conditions (both their presence and absence) was necessary to explain very high supply chain performance or its absence. We verified the absence of a significant performance rise by assessing the outcome obtained ("*not* very high supply chain performance"). Table 8 shows the results of the analysis of necessity. Concerning very high supply chain performance, the consistency values range between 0.48 and 0.93 both for the presence and absence of the causal conditions.

A condition is considered necessary when the threshold reaches 0.9 (Schneider and Wagemann, 2010). Supply chain resilience is a necessary condition, which means that it needs to be present in all solutions in order to explain why supply chain performance is very high. However, conditions exceeding 0.9 consistency are not automatically *meaningful* necessary conditions for the outcome; instead, testing for *trivialness* is recommended. Thus, we computed the relevance of necessity (RoN) indicator (Schneider and Wagemann, 2012). The results showed that supply chain resilience is non-trivial (values over 0.6). The other conditions are not considered necessary. Similarly, in the absence of very high performance ("*not* very high supply chain performance"), none of the conditions are necessary to obtain an outcome. The next step consisted of conducting the fuzzy-set analysis to identify sufficient combinations of causal conditions that explain the significant rise in supply chain performance.

Table 8. Analysis of necessity

Causal conditions	Supply chain performance (SCPE)	Negation of supply chain performance (~SCPE)

	Consistency	Coverage	Consistency	Coverage
SCFL	0.87	0.75	0.54	0.57
~SCFL	0.51	0.47	0.76	0.88
SCAG	0.82	0.75	0.54	0.61
~SCAG	0.56	0.50	0.77	0.84
SCRE	**0.93 (RoN: 0.65)**	0.82	0.50	0.54
~SCRE	0.48	0.44	0.83	0.94

Thus, fsQCA produces a truth table of 2^k rows, where k represents the number of outcome predictors, and each row represents all possible combinations. The truth table is then sorted based on frequency and consistency. Here, frequency refers to the number of observations for each possible combination, while consistency refers to "the degree to which cases correspond to the set-theoretic relationships expressed in a solution" (Fiss, 2011, p.402). A frequency threshold should be set to ensure that a minimum number of empirical observations is required for the assessment of the relationships. For samples having more than 150 cases, the threshold should be set at 3 (Pappas and Woodside, 2021; Ragin, 2008). Next, the threshold for raw consistency was set at 0.85, higher than the recommended threshold of 0.75. Furthermore, the threshold for PRI consistency was set at 0.75, above the minimum threshold of 0.5 (Greckhamer *et al.*, 2018; Pappas and Woodside, 2021). Observations above the consistency threshold are those that fully explain the outcome.

The findings from the fuzzy-set analysis present combinations of the causal conditions that are sufficient to explain very high supply chain performance and its negation (see Table 9). The solution presents the core conditions, as the intermediate and parsimonious solutions are the same. Black circles (●) indicate the presence of a condition, while crossed-out circles (⊗) represent its negation (or absence). An empty cell means that a causal condition is not playing a role in the specific solution and may be either present or negated. Table 9 presents consistency values for each combination and for the overall solutions, with all values being above the recommended threshold (>0.75). The overall solution coverage shows the extent to which very high supply chain performance and its negation (~SCPE) can be determined based on the identified configurations and is comparable to the *R*-squared value. The overall solution coverage of 0.89 (for both SCPE and ~SCPE) suggests that the solutions account for a substantial proportion of very high supply chain performance and its negation, respectively.

Table 9. Configurations for achieving a very high level of supply chain performance and its negation

	Supply chain performance (SCPE)		Negation of supply chain performance (~SCPE)	
	S1	**S2**	**N1**	**N2**
SCFL	●			⊗
SCAG		●		⊗
SCRE	●	●	⊗	
Raw coverage	0.83	0.79	0.83	0.67
Unique coverage	0.10	0.07	0.21	0.05

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

Consistency	0.89	0.88	0.94	0.93
Overall solution coverage	0.89		0.89	
Overall solution consistency	0.87		0.91	

Note: Black circles (●) refer to the presence of a condition, while crossed-out circles (⊗) show its absence. Thus, all conditions are considered core conditions. The empty cells refer to "don't care" conditions.

The findings show that two configurations exist (S1 and S2) that can explain very high supply chain performance. More specifically, very high supply chain flexibility combined with high supply chain resilience explains the outcome, regardless of supply chain agility. The combination of very high supply chain agility and supply chain resilience can also explain the outcome, regardless of supply chain flexibility. The configurations show that supply chain resilience is a necessary condition, as identified from the analysis of necessity, and if it is combined with either flexibility or agility, it will lead firms to very high performance. Both S1 and S2 explain an extremely large proportion of the sample, i.e., 83% and 79%, respectively. These findings complement our PLS-SEM analysis. S1 is in accordance with the findings from PLS-SEM, based on which flexibility and resilience will lead to very high performance. However, fsQCA also indicates that agility can play a role in a smaller number of cases when combined with resilience (S2).

We then went beyond the traditional explanation of positive outcomes, testing for the negation of very high supply chain performance. This allowed us to test and verify that the conditions that explain very high supply chain performance are not necessarily mirroring opposites for its negation. Our findings show that two negation configurations exist (N1, N2). In other words, in the absence of very high supply chain resilience, a firm cannot reach a very high level of supply chain performance. Indeed, supply chain resilience is necessary to reach very high supply chain performance (N1). Furthermore, in the absence of flexibility and agility, a firm will not be able to reach very high performance, regardless of resilience (N2).

Discussion

Regarding our first question ("In situations of extreme resource scarcity, such as COVID-19, are agility and flexibility enough to support supply chain resilience?"), we found adequate supportive data. Supply chain agility and flexibility have a strong positive effect on the supply chain's resilience during severe disruptions, and the combination of both can explain nearly half the variation (R^2=46.2%) in the supply chain's resilience.

On the one hand, the results corroborate those already obtained by previous literature, highlighting the critical role of agility and flexibility in supporting operations and supply chain performance during severe uncertainties (Fayezi *et al.*, 2017). On the other hand, this research provides novel perspectives for highly disruptive situations. For instance, it suggests that agility and flexibility play a significant positive role in supporting supply chain resilience in severe

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

crises, in which firms and supply chains are constrained by a very low level of resource availability.

Furthermore, our findings from the PLS-SEM showed that, whereas flexibility positively affects resilience and supply chain performance directly, agility contributes to supply chain performance only through resilience (mediating effects). In this context, Li *et al.* (2022) highlighted the critical role of flexibility in supporting operational resilience through the combination of internal and external resources. Our findings reveal the complementary role of agility and flexibility in influencing resilience and performance. Our findings thus contribute to the resilience theory and RBT literature by showing the influence that two key capabilities (agility and flexibility) have on resilience and the strong effect that resilience has on supply chain performance, both directly and as a mediator.

With respect to the second question ("Can resilience built on agility and flexibility support the performance of supply chains in situations of extreme resource scarcity?"), the findings also provide a positive response. This relationship was found to have a strong positive effect (0.619, $p<0.001$). Previous research has identified the prominence of resilience practices on supply chain performance, but our findings provide novel perspectives. For instance, while Stekelorum *et al.* (2022) found a positive association between supply chain disruption orientation and environmental and economic performance, our findings suggest that, in severe scarce resource situations, agility and flexibility are significant capabilities enabled by scarce resources (i.e., supply chain delivery process adaptation, product development cycle time reduction, the adjusted delivery time of suppliers' orders, adjusted production volume capacity, etc.) in supporting the building of resilience, which, in turn, has a strong positive effect on supply chain performance.

In addition, our results emphasize resilience's decisive role in supply chain performance under severe disruptions, thus aligning with Shen and Sun (2021). Our findings, however, extend those of Shen and Sun (2021). For example, while they stressed the importance of developing strong collaborations, information sharing, and agility through a robust integration of supply chain members to strengthen operational flexibility, our findings focus on managing agility and flexibility shaped by scarce resources to support different configurations to achieve supply chain performance. Furthermore, exploring a highly disruptive context such as COVID-19, in which the available resources in the supply chains suffer from severe constraints, our findings show that agility and flexibility become critical in building resilience. From this perspective, resources related to agility and flexibility are critical as these capabilities together can explain almost 50% of the variance in resilience, as mentioned previously. Consequently, this finding contributes to the literature on resilience theory and RBT by suggesting that agility and flexibility can be two of the most important capabilities in severe contexts where there is a lack of resources in the supply chains. Accordingly, in this context, agility and flexibility are able to lead to high levels of resilience.

Concerning the third question ("In a situation of extreme resource scarcity, should managers use all their available resources related to agility and flexibility to achieve supply chain performance?"), the results from the fsQCA complement and expand the PLS-SEM results. Accordingly, the results suggest that not all available resources potentially associated

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

with the resilience and performance of supply chains should be used during the crisis. This means that different combinations of resources can support resilience and supply chain performance. In this regard, our findings suggest that a combination of only a few resources can support resilience and performance. For instance, combining flexibility and resilience can support high levels of supply chain performance. Similarly, the combination of agility and resilience can also support supply chain performance. These findings expand the body of knowledge on resilience theory and RBT. For instance, while Sreedevi and Saranga (2017) showed the importance of flexibility in mitigating supply chain risk, our findings suggest that flexibility combined with resilience can support high levels of supply chain performance in situations of a severe lack of resources in the network.

The presence of supply chain resilience is essential to explain supply chain performance, complementing our PLS-SEM findings in which resilience had a direct effect on supply chain performance as well as a mediating role. The findings of our research represent a step forward by showing the importance of finding the essential resources associated with agility and/or flexibility, both of which, when combined with resilience, support supply chain performance. In this regard, our findings reinforce those of previous studies reporting the importance of different configurations in supporting resilience (Xia *et al.*, 2022). On the other hand, the absence of supply chain flexibility and agility prevents firms from achieving very high supply chain performance, regardless of supply chain resilience. This is an interesting result because a recent study by Delbufalo (2022), exploring the supply base design in Italian supply chains, found some tension between supply chain agility and resilience if deployed in a simultaneous manner. In the present study, we found that these constructs can be part of the same configuration to address disruptions.

Furthermore, Dohmen *et al.* (2022), investigating the efficacy of reactive techniques on business continuity for a food manufacturer, found that the planning process cadence and time horizons, when there are severe disruptions such as COVID-19, have a more positive impact on business continuity than strategies related to resource reconfiguration. Our results contrast with these findings, suggesting that firms and their supply chains should try different types of configurations to create resilience, which in turn will positively impact supply chain performance.

Theoretical implications

Our study makes several contributions to the literature on supply chain resilience and RBT, including resource configuration. First, while the current literature has explored agility and flexibility in a dispersed manner (Li *et al.*, 2022; Shen and Sun, 2021; Wulandhari *et al.*, 2022), we proposed an integrative model that considers these two variables as the antecedents of resilience when there is a lack of resources available during severe situations. In this regard, our findings suggest that agility and flexibility can be critical to building resilience in the supply chains (both explain nearly 50% of the variance of resilience) during severe disruptions such as COVID-19.

In view of this, our study makes a significant contribution to advancing the body of knowledge on supply chain resilience and RBT in the context of severe disruptions (Cohen *et*

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

al., 2022; El Baz and Ruel, 2021; Li *et al.*, 2022; Shen and Sun, 2021). For instance, while Essuman *et al.* (2022) found that resource slack and operational resilience are not related directly, we found that agility- and flexibility-related resources directly affect resilience in scarcity situations. Furthermore, combining agility with resilience or flexibility with resilience can support supply chain performance in severe disruptive contexts. In this sense, one of our contributions lies in demonstrating that agility and flexibility act as the core of supply chain resilience when the available resources are extremely limited.

In addition, our study found that flexibility can directly contribute to resilience and performance, while agility can only support resilience directly and supply chain performance indirectly (via resilience). Such findings, in relation to a severe disruption context, have not yet been reported in the literature, which so far has focused on network configuration (Ivanov and Dolgui, 2020), risk management (Wulandhari *et al.*, 2022), manufacturing relocation (Fjellström *et al.*, 2023), the combination of internal and external competencies (Li *et al.*, 2022), supplier concentration (Jiang *et al.*, 2023), etc. Furthermore, we extend recent findings on the importance of considering resilience particularities and the different means and strategies to achieve them (Cohen *et al.*, 2022) by employing two different types of analysis (i.e., PLS-SEM and fsQCA).

Moreover, our study extends the literature concerning the role of resources as critical competencies to support operational resilience during severe events such as COVID-19 (Li *et al.*, 2022). In this vein, our work suggests the importance of building suitable configurations based on key agility and/or flexibility resources to support resilience during severe disruptions. The complementary analysis (using fsQCA) suggests that firms and supply chains operating during scarce resource situations should identify key resources related to flexibility and agility, which in turn can operate with resilience to support their performance. In other words, they could avoid using all their available resources, which are scarce, to build resilience.

From this perspective, our findings advance the body of knowledge on resource management (Essuman *et al.*, 2022) and resources configuration in severe situations such as COVID-19 (Li *et al.*, 2022; Fjellström *et al.*, 2023; Stekelorum *et al.*, 2022). Our results indicate that resilience should be a mandatory strategic lever to support the performance of supply chains, as should be its combination with agility or flexibility. However, it is not necessary to build agility, flexibility, and resilience at the same time. Therefore, understanding resource configuration (combination) during severe disruptions is essential to achieve supply chain performance.

These findings advance the body of knowledge on supply chain resilience and RBT. In relation to the extant literature investigating the behaviour of countries, we find both alignments and novel results. For instance, by investigating firms in Ghana, a representative sub-Saharan African market, Essuman *et al.* (2022) found no direct relationship between resource slack (abundance of resources) and operational resilience. Our findings in the US supply chain context expand this perspective by suggesting that a few key resources (in a resource scarcity situation) related to agility and flexibility can support supply chain resilience and performance. In addition, Chen *et al.* (2023), investigating Chinese manufacturers' supply chains, reported that operational slack could play an important role in boosting resilience. For example, the inventory excess contributes to supporting supply chain resilience, while the slack of financial resources contributes to flexibility (Chen *et al.* 2023). However, these authors pointed out the need to pay attention to the cost effect caused by the excess of inventory.

Hence, based on our findings and their comparison with the extant literature, two propositions emerge:

P1. High-maturity supply chains in severely disrupted situations can operate satisfactorily with a few critical resources, with a minimal negative impact.

P2. A supply chain's location (country) can be critical in building resilience in severely disrupted situations.

Practical implications

This study makes valuable contributions in terms of practical implications. First, it shows that managers, practitioners, and decision-makers should consider developing and implementing key strategies related to agility and flexibility to support supply chain resilience and performance during a disruptive crisis scenario. Furthermore, our findings suggest that resilience is a critical variable that managers should prioritize in times of resource scarcity so as to leverage survivability by activating high levels of performance.

Second, managers, practitioners, and decision-makers need to employ robust agility and flexibility strategies when carrying out resource configuration for the sake of resilience. Specifically, managers should identify whether their firms should prioritize operations with agility and resilience to build and support supply chain performance, or with flexibility instead of agility. During severe disruptions, managers whose firms have scarce resources must be able to ensure the sound management of such resources and capitalize on resource configuration, which is a decisive aspect of the strategy for the resilience and performance of supply chains.

Limitations and future research

This study does have some limitations that could be addressed in future studies. First, we offer a perspective from only one leading economic country, which means that empirical data from other developed and emerging economies could result in different outcomes. Thus, the cultural differences between the countries (Gupta and Gupta, 2019; Gupta *et al.*, 2022; Marshall *et al.*, 2016) in which the supply chains operate should be considered in future studies. Second, the use of longitudinal data collection could be an interesting approach to understanding the dynamics of resource configuration in line with crisis evolution. Finally, although we have validated a model that focuses on agility and flexibility (in a situation of scarce resources), this model could be expanded by replacing agility and/or flexibility with other resilience-related variables.

Conclusions

We have developed a model that considers resource scarcity and the importance of resource configuration in supporting supply chain resilience and performance in a disruptive crisis scenario. Our findings offer important contributions to the fields of management, operations, supply chains, and other related areas. We first drew on the resilience literature and

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

RBT to develop and validate an original model, which was used to examine the antecedents of resilience and the effects of a disruptive crisis scenario on performance. The results suggest that agility and flexibility are capable of supporting resilience during severe crises such as COVID-19. Moreover, we found that resilience mediates the relationships between agility and performance and between flexibility and performance. Our results also suggest that, if resilience is present, supply chains can achieve high performance in times of severe disruptions. We also acknowledged that severe resource constraints are generally imposed on firms and supply chains by highly disruptive crises. In this case, it is necessary to rely on two types of configurations, agility and resilience or flexibility and resilience, to support supply chain performance. Thus, one of the major contributions of this article is to show the decisive role that resource configuration plays in severe disruption contexts when the availability of resources is extremely limited. In this context, our findings advance the body of knowledge on supply chain resilience by showing that agility and flexibility can be critical for supporting resilience. Similarly, the findings advance the literature on RBT by demonstrating that only a few resources may be critical in building capabilities to support resilience and performance. To conclude, our findings suggest that not all firms' and supply chains' available resources that could be used to build resilience should be used. Instead, managers and policymakers should identify the best viable configurations using minimum resources/capabilities to face these crises.

References

Abbey, J. D. and M. G. Meloy (2017). 'Attention by design: using attention checks to detect inattentive respondents and improve data quality', *Journal of Operations Management*, **53–56**, pp. 63–70. https://doi.org/10.1016/j.jom.2017.06.001

al Humdan, E., Y. Shi and M. Behnia (2020). 'Supply chain agility: a systematic review of definitions, enablers and performance implications', *International Journal of Physical Distribution and Logistics Management*, **50**, pp. 287–312. https://doi.org/10.1108/IJPDLM-06-2019-0192

Altay, N., A. Gunasekaran, R. Dubey and S. J. Childe (2018). 'Agility and resilience as antecedents of supply chain performance under moderating effects of organizational culture within the humanitarian setting: a dynamic capability view', *Production Planning & Control*, **29**, pp, 1158–1174. https://doi.org/10.1080/09537287.2018.1542174

Ambulkar, S., J. Blackhurst and S. Grawe (2015). 'Firm's resilience to supply chain disruptions: scale development and empirical examination', *Journal of Operations Management*, **33–34**, pp. 111–122. https://doi.org/10.1016/j.jom.2014.11.002

Armstrong, J. S. and T. S. Overton (1977). 'Estimating nonresponse bias in mail surveys', *Journal of Marketing Research*, **14**, pp. 396–402. https://doi.org/10.2307/3150783

Bag, S., P. Dhamija, S. Luthra and D. Huisingh (2021). 'How big data analytics can help manufacturing companies strengthen supply chain resilience in the context of the COVID-19 pandemic', *The International Journal of Logistics Management*, **ahead-of-print**, https://doi.org/10.1108/IJLM-02-2021-0095

Bahrami, M. and S. Shokouhyar (2022). 'The role of big data analytics capabilities in bolstering supply chain resilience and firm performance: a dynamic capability view', *Information Technology & People*, **35**, pp. 1621–1651. https://doi.org/10.1108/ITP-01-2021-0048

Barney, J. (1991). 'Firm resources and sustained competitive advantage', *Journal of Management*, **17**, pp, 99–120. https://doi.org/10.1177/014920639101700108

Belhadi, A., S. Kamble, S. Fosso Wamba and M. M. Queiroz (2021). 'Building supply-chain resilience: an artificial intelligence-based technique and decision-making framework', *International Journal of Production Research*, **60**, pp. 4487–4507. https://doi.org/10.1080/00207543.2021.1950935

Beynon, M., M. Battisti, P. Jones and D. Pickernell (2021). 'How institutions matter in the context of business exit: a country comparison using GEM data and fsQCA', *British Journal of Management*, **32**, pp. 832–851. https://doi.org/10.1111/1467-8551.12438

Brusset, X. and C. Teller (2017). 'Supply chain capabilities, risks, and resilience', *International Journal of Production Economics*, **184**, pp. 59–68. https://doi.org/10.1016/j.ijpe.2016.09.008

Çetindaş, A., İ. Akben, C. Özcan, İ. Kanuşağı and O. Öztürk (2023). 'The effect of supply chain agility on firm performance during COVID-19 pandemic: the mediating and moderating role of demand stability', *Supply Chain Forum: An International Journal*. https://doi.org/10.1080/16258312.2023.2167465

Chen, L., T. Li, F. Jia and T. Schoenherr (2023). 'The impact of governmental COVID-19 measures on manufacturers' stock market valuations: the role of labor intensity and operational slack', *Journal of Operations Management*, **69**, pp. 404–425. https://doi.org/10.1002/joom.1207

Choudhary, N. A., M. Ramkumar, T. Schoenherr, N. P. Rana and Y. K. Dwivedi (2022). 'Does reshoring affect the resilience and sustainability of supply chain networks? The cases of Apple and Jaguar Land Rover', *British Journal of Management*, **ahead-of-print**, https://doi.org/10.1111/1467-8551.12614

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). New York, NY: Psychology Press.

Cohen, M., S. Cui, S. Doetsch, R. Ernst, A. Huchzermeier, P. Kouvelis, H. Lee, H. Matsuo and A. A. Tsay (2022). 'Bespoke supply-chain resilience: the gap between theory and practice', *Journal of Operations Management*, **68**, pp. 515–531. https://doi.org/10.1002/joom.1184

Craighead, C. W., J. Blackhurst, M. J. Rungtusanatham and R. B. Handfield (2007). 'The severity of supply chain disruptions: design characteristics and mitigation capabilities', *Decision Sciences*, **38**, pp. 131–156. https://doi.org/10.1111/j.1540-5915.2007.00151.x

Delbufalo, E. (2022). 'Disentangling the multifaceted effects of supply base complexity on supply chain agility and resilience', *International Journal of Physical Distribution & Logistics Management*, **52**, pp. 700–721. https://doi.org/10.1108/IJPDLM-07-2021-0302

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

Do, H., P. Budhwar, H. Shipton, H.-D. Nguyen and B. Nguyen (2022). 'Building organizational resilience, innovation through resource-based management initiatives, organizational learning and environmental dynamism', *Journal of Business Research*, **141**, pp. 808–821. https://doi.org/10.1016/j.jbusres.2021.11.090

Do, Q. N., N. Mishra, N. B. I. Wulandhari, A. Ramudhin, U. Sivarajah and G. Milligan (2021). 'Supply chain agility responding to unprecedented changes: empirical evidence from the UK food supply chain during COVID-19 crisis', *Supply Chain Management*, **26**, pp. 737–752. https://doi.org/10.1108/SCM-09-2020-0470

Dohmen, A. E., J. R. W. Merrick, L. W. Saunders, T. P. Stank and T. J. Goldsby (2022). 'When preemptive risk mitigation is insufficient: the effectiveness of continuity and resilience techniques during COVID-19', *Production and Operations Management*, **32**, pp. 1529–1549. https://doi.org/10.1111/poms.13677

Dolgui, A., D. Ivanov and B. Sokolov (2018). 'Ripple effect in the supply chain: an analysis and recent literature', *International Journal of Production Research*, **56**, art. 1387680. https://doi.org/10.1080/00207543.2017.1387680

Dubey, R., D. J. Bryde, C. Blome, D. Roubaud and M. Giannakis (2021a). 'Facilitating artificial intelligence powered supply chain analytics through alliance management during the pandemic crises in the B2B context', *Industrial Marketing Management*, **96**, pp. 135–146. https://doi.org/10.1016/j.indmarman.2021.05.003

Dubey, R., D. J. Bryde, C. Foropon, M. Tiwari, Y. Dwivedi and S. Schiffling (2021b). 'An investigation of information alignment and collaboration as complements to supply chain agility in humanitarian supply chain', *International Journal of Production Research*, **59**, pp. 1586–1605. https://doi.org/10.1080/00207543.2020.1865583

Dubey, R., A. Gunasekaran, S. J. Childe, C. Blome and T. Papadopoulos (2019). 'Big data and predictive analytics and manufacturing performance: integrating institutional theory, resource-based view and big data culture', *British Journal of Management*, **30**, pp. 341–361. https://doi.org/10.1111/1467-8551.12355

Dubey, R., A. Gunasekaran, S. J. Childe, S. Fosso Wamba, D. Roubaud and C. Foropon (2021c). 'Empirical investigation of data analytics capability and organizational flexibility as complements to supply chain resilience', *International Journal of Production Research*, **59**, pp. 110–128. https://doi.org/10.1080/00207543.2019.1582820

Duchek, S. (2020). 'Organizational resilience: a capability-based conceptualization', *Business Research*, **13**, pp. 215–246. https://doi.org/10.1007/s40685-019-0085-7

Durach, C. F., F. Wiengarten and T. Y. Choi (2020). 'Supplier–supplier coopetition and supply chain disruption: first-tier supplier resilience in the tetradic context', *International Journal of Operations & Production Management*, **40**, pp. 1041–1065. https://doi.org/10.1108/IJOPM-03-2019-0224

El Baz, J. and S. Ruel (2021). 'Can supply chain risk management practices mitigate the disruption impacts on supply chains' resilience and robustness? Evidence from an empirical survey in a COVID-19 outbreak era', *International Journal of Production Economics*, **233**, art. 107972. https://doi.org/10.1016/j.ijpe.2020.107972

Essuman, D., P. A. Bruce, H. Ataburo, F. Asiedu-Appiah and N. Boso (2022). 'Linking resource slack to operational resilience: integration of resource-based and attention-based perspectives', *International Journal of Production Economics*, **254**, art. 108652. https://doi.org/10.1016/j.ijpe.2022.108652

Fayezi, S., A. Zutshi and A. O'Loughlin (2017). 'Understanding and development of supply chain agility and flexibility: a structured literature review', *International Journal of Management Reviews*, **19**, pp. 379–407. https://doi.org/10.1111/ijmr.12096

Fiss, P. C. (2011). 'Building better causal theories: a fuzzy set approach to typologies in organization research', *Academy of Management Journal*, **54**, pp. 393–420.

Fjellström, D., P. Hilletofth, T. Fang, V. Kumar, A. Kumar and K. Hua Tan (2023). 'Manufacturing relocation ambiguity model: a prerequisite for knowledge management', *British Journal of Management*, **ahead-of-print**, https://doi.org/10.1111/1467-8551.12710

Fornell, C. and D. F. Larcker (1981). 'Evaluating structural equation models with unobservable variables and measurement error', *Journal of Marketing Research*, **18**, pp. 39–50. https://doi.org/10.2307/3151312

Fosso Wamba, S., M. M. Queiroz, S. Roscoe, W. Phillips, D. Kapletia and A. Azadegan (2021). 'Guest editorial: Emerging technologies in emergency situations', *International Journal of Operations & Production Management*, **41**, pp. 1405–1416. https://doi.org/10.1108/IJOPM-09-2021-904

Gillani, A., S. Kutaula and P. S. Budhwar (2022). 'Heading home? Reshoring and sustainability connectedness from a home-country consumer perspective', *British Journal of Management*, **ahead-of-print**, https://doi.org/10.1111/1467-8551.12658

Gligor, D. M., C. L. Esmark and M. C. Holcomb (2015). 'Performance outcomes of supply chain agility: when should you be agile?', *Journal of Operations Management*, **33–34**, pp. 71–82. https://doi.org/10.1016/j.jom.2014.10.008

Gligor, D., N. Gligor, M. Holcomb and S. Bozkurt (2019). 'Distinguishing between the concepts of supply chain agility and resilience', *The International Journal of Logistics Management*, **30**, pp. 467–487. https://doi.org/10.1108/IJLM-10-2017-0259

Greckhamer, T., S. Furnari, P. C. Fiss and R. V. Aguilera (2018). 'Studying configurations with qualitative comparative analysis: best practices in strategy and organization research', *Strategic Organization*, **16**, pp. 482–495. https://doi.org/10.1177/1476127018786487

Gu, M., L. Yang and B. Huo (2021). 'The impact of information technology usage on supply chain resilience and performance: an ambidexterous view', *International Journal of Production Economics*, **232**, art. 107956. https://doi.org/10.1016/j.ijpe.2020.107956

Gupta, M., A. Gupta and K. Cousins (2022). 'Toward the understanding of the constituents of organizational culture: the embedded topic modeling analysis of publicly available employee-generated reviews of two major U.S.-based retailers', *Production and Operations Management*, **31**, pp. 3668–3686. https://doi.org/10.1111/poms.13843

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

Gupta, M. and S. Gupta (2019). 'Influence of national cultures on operations management and supply chain management practices—a research agenda', *Production and Operations Management*, **28**, pp. 2681–2698. https://doi.org/10.1111/poms.13100

Gupta, S., Y. Wang and M. Czinkota (2023). 'Reshoring: a road to Industry 4.0 transformation', *British Journal of Management*, **ahead-of-print**, https://doi.org/10.1111/1467-8551.12731

Hair, J. F., G. T. M. Hult, C. M. Ringle and M. Sarstedt (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (2nd ed.). London: Sage. https://doi.org/10.1016/j.lrp.2013.01.002

Hair, J. F., J. J. Risher, M. Sarstedt and C. M. Ringle (2019). 'When to use and how to report the results of PLS-SEM', *European Business Review*, **31**, pp. 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Henseler, J., C. M. Ringle and M. Sarstedt (2015). 'A new criterion for assessing discriminant validity in variance-based structural equation modeling', *Journal of the Academy of Marketing Science*, **43**, pp. 115–135. https://doi.org/10.1007/s11747-014-0403-8

Hoeft, F. (2021). 'The case of sales in the automotive industry during the COVID-19 pandemic', *Strategic Change*, **30**, pp. 117–125. https://doi.org/10.1002/jsc.2395

Huang, K., K. Wang, P. K. C. Lee and A. C. L. Yeung (2023). 'The impact of Industry 4.0 on supply chain capability and supply chain resilience: a resource-based view'. *International Journal of Production Economics*, art. 108913. https://doi.org/10.1016/j.ijpe.2023.108913

Huo, B., M. Gu and Z. Wang (2018). 'Supply chain flexibility concepts, dimensions and outcomes: an organisational capability perspective', *International Journal of Production Research*, **56**, pp. 5883–5903. https://doi.org/10.1080/00207543.2018.1456694

Ivanov, D. (2021). 'Lean resilience: AURA (active usage of resilience assets) framework for post-COVID-19 supply chain management', *International Journal of Logistics Management*, **33**, pp. 1196–1217. https://doi.org/10.1108/IJLM-11-2020-0448

Ivanov, D. (2022). 'Viable supply chain model: integrating agility, resilience and sustainability perspectives—lessons from and thinking beyond the COVID-19 pandemic', *Annals of Operations Research*, **319**, pp. 1411–1431. https://doi.org/10.1007/s10479-020-03640-6

Ivanov, D. and A. Dolgui (2020). 'Viability of intertwined supply networks: extending the supply chain resilience angles towards survivability. A position paper motivated by COVID-19 outbreak'. *International Journal of Production Research*, **58**, pp. 2904–2915. https://doi.org/10.1080/00207543.2020.1750727

Jiang, S., A. C. L. Yeung, Z. Han and B. Huo (2023). 'The effect of customer and supplier concentrations on firm resilience during the COVID-19 pandemic: resource dependence and power balancing', *Journal of Operations Management*, **69**, pp. 497–518. https://doi.org/10.1002/joom.1236

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

Jüttner, U. and S. Maklan (2011). 'Supply chain resilience in the global financial crisis: an empirical study', *Supply Chain Management: An International Journal*, **16**, pp. 246–259. https://doi.org/10.1108/13598541111139062

Kahiluoto, H., H. Mäkinen and J. Kaseva (2020). 'Supplying resilience through assessing diversity of responses to disruption', *International Journal of Operations & Production Management*, **40**, pp. 271–292. https://doi.org/10.1108/IJOPM-01-2019-0006

Kaya, B., A. M. Abubakar, E. Behravesh, H. Yildiz and I. S. Mert (2020). 'Antecedents of innovative performance: findings from PLS-SEM and fuzzy sets (fsQCA)', *Journal of Business Research*, **114**, pp. 278–289. https://doi.org/10.1016/j.jbusres.2020.04.016

Koch, J. and C. C. Schermuly (2021). 'Managing the crisis: how COVID-19 demands interact with agile project management in predicting employee exhaustion', *British Journal of Management*, **32**, pp. 1265–1283. https://doi.org/10.1111/1467-8551.12536

Kock, N. (2015). 'Common method bias in PLS-SEM: a full collinearity assessment approach', *International Journal of E-Collaboration*, **11**, pp. 1–10. https://doi.org/10.4018/ijec.2015100101

Kock, N. (2020). *WarpPLS User Manual: Version 7.0*. Laredo, TX: ScriptWarp Systems.

Linnenluecke, M. K. (2017). 'Resilience in business and management research: a review of influential publications and a research agenda', *International Journal of Management Reviews*, **19**, pp. 4–30. https://doi.org/10.1111/ijmr.12076

Li, L., S. Shan, Y. Shou, M. Kang and Y. W. Park (2023). 'Sustainable sourcing and agility performance: the moderating effects of organizational ambidexterity and supply chain disruption', *Australian Journal of Management*, **48**, pp. 262–283. https://doi.org/10.1177/03128962211071128

Li, Y., X. Wang, T. Gong and H. Wang (2022). 'Breaking out of the pandemic: how can firms match internal competence with external resources to shape operational resilience?', *Journal of Operations Management*, **69**, pp. 384–403. https://doi.org/10.1002/joom.1176

Li, X., Q. Wu, C. W. Holsapple and T. Goldsby (2017). 'An empirical examination of firm financial performance along dimensions of supply chain resilience', *Management Research Review*, **40**, pp. 254–269. https://doi.org/10.1108/MRR-02-2016-0030

Marshall, D., R. Metters and M. Pagell (2016). 'Changing a leopard's spots: a new research direction for organizational culture in the operations management field', *Production and Operations Management*, **25**, pp. 1506–1512. https://doi.org/10.1111/poms.12562

Mena, C., A. Karatzas and C. Hansen (2022). 'International trade resilience and the Covid-19 pandemic', *Journal of Business Research*, **138**, pp. 77–91. https://doi.org/10.1016/j.jbusres.2021.08.064

Mertzanis, C. (2021). 'Epidemiological susceptibility risk, adaptive management and firm performance', *British Journal of Management*, **32**, pp. 1242–1264. https://doi.org/10.1111/1467-8551.12529

Müller, J., K. Hoberg and J. C. Fransoo (2022). 'Realizing supply chain agility under time pressure: ad hoc supply chains during the COVID-19 pandemic', *Journal of Operations Management*, **69**, pp. 426–449. https://doi.org/10.1002/joom.1210

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

Nikookar, E. and Y. Yanadori (2022). 'Preparing supply chain for the next disruption beyond COVID-19: managerial antecedents of supply chain resilience', *International Journal of Operations & Production Management*, **42**, pp. 59–90. https://doi.org/10.1108/IJOPM-04-2021-0272

Nunnally, J. C. (1978). *Psychometric Theory*. New York, NY: McGraw-Hill.

Okorie, O. S., R. Subramoniam, F. Charnley, D. Widdifield, J. Patsavellas and K. Salonitis (2020). 'Manufacturing in the time of COVID-19: an assessment of barriers and enablers', *IEEE Engineering Management Review*, **84**, pp. 167–175. https://doi.org/10.1109/EMR.2020.3012112

Palan, S. and C. Schitter (2018). 'Prolific.ac—a subject pool for online experiments', *Journal of Behavioral and Experimental Finance*, **17**, pp. 22–27. https://doi.org/10.1016/j.jbef.2017.12.004

Papagiannidis, S., E. Alamanos, M. Bourlakis and C. Dennis (2022). 'The pandemic consumer response: a stockpiling perspective and shopping channel preferences', *British Journal of Management*, **34**, pp. 664–691. https://doi.org/10.1111/1467-8551.12616

Pappas, I. O. and A. G. Woodside (2021). 'Fuzzy-set qualitative comparative analysis (fsQCA): guidelines for research practice in information systems and marketing', *International Journal of Information Management*, **58**, art. 102310. https://doi.org/10.1016/j.ijinfomgt.2021.102310

Peer, E., L. Brandimarte, S. Samat and A. Acquisti (2017). 'Beyond the Turk: alternative platforms for crowdsourcing behavioral research', *Journal of Experimental Social Psychology*, **70**, pp. 153–163. https://doi.org/10.1016/j.jesp.2017.01.006

Podsakoff, P. M. and D. W. Organ (1986). Self-reports in organizational research: problems and prospects', *Journal of Management*, **12**, pp. 531–544. https://doi.org/10.1177/014920638601200408

Prater, E., M. Biehl and M. A. Smith (2001). 'International supply chain agility international supply chain agility tradeoffs between flexibility and uncertainty', *International Journal of Operations & Production Management*, **21**, pp. 823–839. https://doi.org/10.1108/01443570110390507

Puthusserry, P., T. King, K. Miller and Z. Khan (2022). 'A typology of emerging market SMEs' COVID-19 response strategies: the role of TMTs and organizational design', *British Journal of Management*, **33**, pp. 603–633. https://doi.org/10.1111/1467-551.12591

Qi, Y., X. Wang, M. Zhang and Q. Wang (2023). 'Developing supply chain resilience through integration: an empirical study on an e-commerce platform', *Journal of Operations Management*, **69**, pp. 477–496. https://doi.org/10.1002/joom.1226

Queiroz, M. M., S. Fosso Wamba, C. J. Chiappetta Jabbour and M. C. Machado (2022). 'Supply chain resilience in the UK during the coronavirus pandemic: a resource orchestration perspective', *International Journal of Production Economics*, **245**, art. 108405. https://doi.org/10.1016/j.ijpe.2021.108405

Ragin, C. C. (2008). *Redesigning Social Inquiry Fuzzy Sets and Beyond*. Chicago, IL: University of Chicago Press.

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

Salonen, A., M. Zimmer and J. Keränen (2021). 'Theory development in servitization through the application of fsQCA and experiments', *International Journal of Operations & Production Management*, **41**, pp. 746–769. https://doi.org/10.1108/IJOPM-08-2020-0537

Schaarschmidt, M., G. Walsh and H. Evanschitzky (2022). 'Hybrid offerings sales capability: conceptualization, scale development and validation', *British Journal of Management*, **33**, pp. 1560–1583. https://doi.org/10.1111/1467-8551.12527

Schneider, C. Q. and C. Wagemann (2010). 'Standards of good practice in qualitative comparative analysis (QCA) and fuzzy sets', *Comparative Sociology*, **9**, pp. 397–418. https://doi.org/10.1163/156913210X12493538729793

Schneider, C. Q. and C. Wagemann (2012). *Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis*. Cambridge: Cambridge University Press.

Scholten, K., M. Stevenson and D. P. van Donk (2020). 'Dealing with the unpredictable: supply chain resilience. *International Journal of Operations and Production Management*, **40**, pp. 1–10. https://doi.org/10.1108/IJOPM-01-2020-789

Schriber, S., D. R. King and F. Bauer (2022). 'Retaliation effectiveness and acquisition performance: the influence of managerial decisions and industry context', *British Journal of Management*, **33**, pp. 939–957. https://doi.org/10.1111/1467-8551.12480

Shen, Z. M. and Y. Sun (2021). 'Strengthening supply chain resilience during the COVID-19: a case study of JD.com', *Journal of Operations Management*, **69**, pp. 359–383. https://doi.org/10.1002/joom.1161

Sheng, J., J. Amankwah-Amoah, Z. Khan and X. Wang (2021). 'COVID-19 pandemic in the new era of big data analytics: methodological innovations and future research directions', *British Journal of Management*, **32**, pp. 1164–1183. https://doi.org/10.1111/1467-8551.12441

Shin, N. and S. Park (2021). 'Supply chain leadership driven strategic resilience capabilities management: a leader-member exchange perspective', *Journal of Business Research*, **122**, 1–13. https://doi.org/10.1016/j.jbusres.2020.08.056

Singh, C. S., G. Soni and G. K. Badhotiya (2019). 'Performance indicators for supply chain resilience: review and conceptual framework', *Journal of Industrial Engineering International*, **15**, pp. 105–117. https://doi.org/10.1007/s40092-019-00322-2

Singh, S., R. Kumar, R. Panchal and M. K. Tiwari (2021). 'Impact of COVID-19 on logistics systems and disruptions in food supply chain', *International Journal of Production Research*, **59**, pp. 1993–2008. https://doi.org/10.1080/00207543.2020.1792000

Sirmon, D. G., M. A. Hitt, R. D. Ireland and B. A. Gilbert (2011). 'Resource orchestration to create competitive advantage: breadth, depth, and life cycle effects', *Journal of Management*, **37**, pp. 1390–1412. https://doi.org/10.1177/0149206310385695

Sreedevi, R., & Saranga, H. (2017). Uncertainty and supply chain risk: The moderating role of supply chain flexibility in risk mitigation. *International Journal of Production Economics*, *193*, 332–342. https://doi.org/10.1016/j.ijpe.2017.07.024

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

Stekelorum, R., S. Gupta, I. Laguir, S. Kumar and S. Kumar (2022). 'Pouring cement down one of your oil wells: relationship between the supply chain disruption orientation and performance', *Production and Operations Management*, **31**, pp. 2084–2106. https://doi.org/10.1111/poms.13708

Stone, M. (1974). 'Cross-validatory choice and assessment of statistical predictions', *Journal of the Royal Statistical Society: Series B (Methodological)*, **36**, pp. 111–133. https://doi.org/10.1111/j.2517-6161.1974.tb00994.x

Verbeke, A. (2020). 'Will the COVID-19 pandemic really change the governance of global value chains?', *British Journal of Management*, **31**, pp. 444–446. https://doi.org/10.1111/1467-8551.12422

Wernerfelt, B. (1984). 'A resource-based view of the firm', *Strategic Management Journal*, **5**, pp. 171–180. https://doi.org/10.1002/smj.4250050207

Williams, T. A., D. A. Gruber, K. M. Sutcliffe, D. A. Shepherd and E. Y. Zhao (2017). 'Organizational response to adversity: fusing crisis management and resilience research streams', *Academy of Management Annals*, **11**, pp. 733–769. https://doi.org/10.5465/annals.2015.0134

Wulandhari, N. B. I., P. Budhwar, N. Mishra, S. Akbar, Q. Do and G. Milligan (2022). 'Organizational resilience to supply chain risks during the COVID-19 pandemic', *British Journal of Management*, **ahead-of-print**, https://doi.org/10.1111/1467-8551.12648

Xia, Q., Y. Xie, S. Hu and J. Song (2022). 'Exploring how entrepreneurial orientation improve firm resilience in digital era: findings from sequential mediation and FsQCA', *European Journal of Innovation Management*, **ahead-of-print**, https://doi.org/10.1108/EJIM-12-2021-0593

Xie, Z., X. Wang, L. Xie, S. Dun and J. Li (2021). 'Institutional context and female entrepreneurship: a country-based comparison using fsQCA', *Journal of Business Research*, **132**, pp. 470–480. https://doi.org/10.1016/j.jbusres.2021.04.045

Yao, Y. and N. Fabbe-Costes (2018). 'Can you measure resilience if you are unable to define it? The analysis of supply network resilience (SNRES)', *Supply Chain Forum: An International Journal*, **19**, pp. 255–265. https://doi.org/10.1080/16258312.2018.1540248

Yi, C. Y., E. W. T. Ngai and K. L. Moon (2011). 'Supply chain flexibility in an uncertain environment: exploratory findings from five case studies', *Supply Chain Management*, **16**, pp. 271–283. https://doi.org/10.1108/13598541111139080

Yuan, R., J. Luo, M. J. Liu and J. Yu (2022). 'Understanding organizational resilience in a platform-based sharing business: the role of absorptive capacity', *Journal of Business Research*, **141**, pp. 85–99. https://doi.org/10.1016/j.jbusres.2021.11.012

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748

Appendix

Table A1. Description of the constructs and indicators

Constructs	Items	Indicator	Adapted from
Considering a disruptive scenario like COVID-19, to what extent do these statements apply to your context? Our supply chain (SC) ...			Shin and Park (2021)
Supply chain agility (SCAG)	SCAG1	Adapted SC processes to decrease lead times	
	SCAG2	Adjusted SC processes to increase on-time delivery	
	SCAG3	Streamlined SC processes to decrease non-value-added activities	
	SCAG4	Adapted SC processes to decrease new product development cycle time	
Considering a disruptive scenario like COVID-19, to what extent do these statements apply to your context? Our supply chain ...			Shin and Park (2021)
Supply chain flexibility (SCFL)	SCFL1	Adjusted delivery time of suppliers' orders to mitigate disruptions	
	SCFL2	Adjusted production volume capacity in response to a disruption	
	SCFL3	Adjusted delivery schedules to cope with disruptions	
Considering a disruptive scenario like COVID-19, to what extent do these statements apply to your context?			El Baz and Ruel (2021)
Supply chain resilience (SCRE)	SCRE1	We are able to cope with changes caused by the supply chain disruption	
	SCRE2	We are easily able to adapt to the supply chain disruption	
	SCRE3	We are able to provide a quick response to the supply chain disruption	
	SCRE4	We are able to maintain high situational awareness at all times	
Considering a disruptive scenario like COVID-19, to what extent do these statements apply to your context?			Gu *et al.* (2021)
Supply chain performance (SCPE)	SCPE1	Our supply chain has the ability to quickly modify products to meet customers' needs	
	SCPE2	Our supply chain allows us to quickly introduce new products into our markets	
	SCPE3	The length of the supply chain process is getting shorter	
	SCPE4	We are satisfied with the speed of the supply chain process	
	SCPE5	Based on our knowledge of the supply chain process, we think that it is efficient	
	SCPE6	Our supply chain has an outstanding on-time delivery record	
	SCPE7	Our supply chain provides high-level customer services	

Accepted version. Cite as:

Queiroz, M.M., Fosso Wamba, S., Raut, R.D., Pappas, I.O. (2023). Does Resilience Matter for Supply Chain Performance in Disruptive Crises with Scarce Resources?. *British Journal of Management*. in press https://doi.org/10.1111/1467-8551.12748