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Learn to survive crises: The role of firm resilience, innovation capabilities and environmental dynamism

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ABSTRACT

Exogenous crises, while disruptive, may also present learning opportunities that could affect a firm's viability and performance. In this study, we examine how exogenous crises can constitute learning opportunities and assess their impact on firm survival. In particular, we investigate the role of learning in response to exogenous crises and how firm resilience, innovation capabilities, and environmental dynamism influence this relationship. Drawing from crisis management and organisational learning literature, we propose that these factors can bolster the connection between learning from crises and firm survival. To test our hypotheses, we conduct a nuanced analysis using both regression analysis and Fuzzy Set Qualitative Comparative Analysis (fsQCA) on data from 249 Italian manufacturing Small and Medium-sized Enterprises (SMEs). This approach allows us to simultaneously examine the impact of firm resilience, innovation capabilities, and environmental dynamism on the relationship between learning from crises and firm survival. Our findings offer theoretical and practical insights into the role of learning from crises in a firm's survival. They also highlight the importance of embracing learning opportunities in crisis situations and suggest that how firms deal with crises could be an opportunity to fine-tune their internal processes and thrive in the long run.

1. Introduction

Scholars in management literature have pointed out various typologies of crises, characterised by different levels of predictability, scale, and root causes [1]. Overall, crises typically manifest with discernible warning signs rather than sudden onset [2], underscoring the importance of robust crisis preparedness for firms to mitigate risks, address consequences, and maintain business continuity [3]. However, given the uniqueness of each crisis, a one-size-fits-all management approach can hardly be applied [4]. For example, the recent COVID-19 pandemic, driven by socio-biological factors, has challenged both crisis preparedness and overall firm performance, requiring firms to effectively implement novel strategies and adapt to such turbulences [5].

The crisis management literature emphasises the vital role of learning in enhancing crisis readiness and facilitating adaptation to market environment shifts. Crises, by generating heightened uncertainty, prompt firms to acquire new knowledge to address challenges [6]. Firm failures might stimulate decision-makers to engage in deep learning processes for developing adaptive approaches, as these failures expose gaps in knowledge and reveal limitations in existing strategies [7], but also lead to innovation opportunities [8], enhanced strategic flexibility [9], and firm resilience [10].

Despite evidence on how firms utilise learning during crises, some gaps remain in the literature. For example, scant attention has been devoted to the factors shaping the learning-survival relationship, especially in the context of SMEs (Small and Medium-sized Enterprises) [11]. Also, although studies suggest a relationship between crisis management learning and firm performance (e.g. [12], there is little evidence on how learning from crises affects performance outcomes [13]. As a result, this study focuses on the learning-firm survival relationship, considering the potential moderating influence of innovation capabilities, firm resilience, and environmental dynamism. Drawing on organisational learning and crisis management literature, we analyse the role of learning from crises in SMEs, which are more vulnerable to market

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changes [14].

In particular, we explore the direct impact of learning from crises on the survival of SMEs. Learning, as a response to crises, is seen as a tool in equipping firms with the knowledge and flexibility to adapt to and recover from market shocks [11,13]. We contend that learning in the face of crises provides firms with essential knowledge and insights, enabling them to bolster their survival potential in turbulent environments. This perspective aligns with the concept of crisis-triggered learning, which asserts that a crisis can ignite a profound process of learning and adaptation within firms [6]. Such experiences, though cultivated under challenging circumstances, facilitate a threefold transformation in firms. In fact, learning from crises allows firms to expose and address inherent vulnerabilities in their structures and strategies, thereby enhancing their resilience [7]. Secondly, it enables firms to adapt effectively to environmental shifts, adjusting their operations to thrive in the changed market landscape [15]. Lastly, it improves the firm's anticipatory capacity, preparing them better for potential future crises by identifying common patterns and developing proactive measures [16]. We believe such a transformative process, stimulated by crisis-triggered learning, holds significant potential to bolster firm survival by paving the way for more adaptable and foresighted operations [17]. Beyond the direct relationship between learning from crises and firm survival, we also examine the moderating influence of firm resilience, innovation capabilities, and environmental dynamism.

Firm resilience, conceptualised as the capacity to weather adversities and rebound, is postulated to act as a moderator in the relationship between learning from crises and firm survival. This moderation effect is underscored by the three key constituents of resilience: robustness, agility, and integrity [18]. Robustness offers the endurance necessary for firms to withstand crisis-induced disruptions, agility enables prompt responses and adaptive strategies to market changes, and integrity encourages a collective understanding and cooperation during crisis management. We propose that firms with robust innovation capabilities are better equipped to translate crisis-induced knowledge into competitive advantages, thereby strengthening the survival prospects. Simultaneously, we argue that high environmental dynamism may pose challenges to the learning process due to its rapid and unpredictable nature. This dynamic environment can render past knowledge obsolete, inhibit the exploration of new strategies, and compromise strategic planning due to heightened urgency and uncertainty, thereby potentially weakening the positive effect of learning from crises on firm survival.

To test our hypotheses, we focus on Italian manufacturing firms that survived the recent COVID-19 pandemic. The developed theoretical model is tested through regression analysis, complemented by Fuzzy Set Qualitative Comparative Analysis (fsQCA).

The contribution of this study is threefold. First, we shed light on the direct impact of learning from crises on SME survival. By identifying learning as a critical adaptive tool in managing crises, our study answers call for more nuanced insights into the learning-survival relationship. Our work extends the crisis management and organisational learning literature by explicitly articulating the role of crisis-triggered learning in enhancing firm survival. Second, our study offers a more nuanced understanding of the baseline relationship by examining the moderating influence of firm resilience, innovation capabilities, and environmental dynamism. We contend that these factors may alter the intensity of the learning-survival relationship in different ways, thereby introducing a more nuanced perspective to the existing body of knowledge. Third, our methodological approach, combining regression analysis and fsQCA, provides robustness to our findings and allows us to capture the complex interplay of the aforementioned factors. This comprehensive approach not only strengthens the validity of our results but also sets a precedent for future research that seeks to investigate complex relationships within crisis management and organisational learning.

The reminder of this paper is structured as follows. The next section presents the literature background and hypotheses development on how learning from crises impacts firm survival and how firm resilience, innovation capabilities, and environmental dynamism might affect this relationship. Based on the literature, a set of four hypotheses is developed. Section 3 introduces the quantitative research methods applied to test the hypotheses on a sample of Italian SMEs. Then, Section 4 presents the results obtained from Regression and fsQCA analysis, followed by a discussion and the study's implications. The final section provides concluding remarks, limitations, and future research avenues.

2. Theoretical background and hypotheses development

2.1. Learn to survive: lessons from crisis

Learning has been conceptualised as the process whereby an organisation modifies its knowledge base and behaviour in response to acquired experience [19,20]. This transformative process, when triggered by crises, can stimulate a deep process of learning and adaptation [6], impacting the organisation's survival prospects. This effect could arise for three main mechanisms.

We argue that the first mechanism by which learning from crises can enhance firm survival is through the identification and addressing of vulnerabilities. Organisations are typically complex systems with numerous interdependencies, and a crisis can expose vulnerabilities and weaknesses that might otherwise remain undetected in more stable times [7]. These vulnerabilities might involve deficiencies in knowledge, structural weaknesses, or gaps in strategies that, if left unaddressed, could significantly hamper the firm's ability to respond effectively to future crises. By learning from crises, organisations can undertake a thorough examination of these vulnerabilities. This process might involve a systematic review of the decision-making processes, the analysis of failed strategies and the exploration of unexpected outcomes. This deep learning experience allows the firm to understand the root causes of these vulnerabilities and take appropriate measures to address them, thereby enhancing its resilience and increasing its chances of survival in future crises [21].

The second mechanism relies on the adaptation to environmental changes. In particular, in a constantly evolving business landscape, the ability to adapt to environmental shifts is crucial for firm survival [15]. Crises often represent significant environmental changes, disrupting established norms and introducing new challenges and opportunities [15]. Learning from crises allows firms to understand these shifts at a deeper level, enabling them to adjust their strategies and operations accordingly. This process might involve the assimilation and interpretation of new information, the re-evaluation of assumptions and the development of new competencies to meet the demands of the changed environment. By doing so, the firm not only survives the crisis but also positions itself more effectively for future environmental shifts [22].

The third mechanism lies in the enhancement of anticipatory capacity. In fact, previous crises can provide firms with invaluable insights into potential future crises, thereby helping to improve their foresight [16]. This might involve identifying common patterns in crises, developing predictive models, or using the knowledge gleaned from previous crises to forecast potential risks and challenges [16]. This improved anticipatory capacity can allow the firm to take proactive measures, such as developing contingency plans, creating crisis response teams or investing in risk mitigation strategies. By enhancing its anticipatory capacity, the firm can better prepare for future crises, thereby increasing its chances of survival when such crises occur [23].

In summary, learning from crises serves to enhance firm survival through the addressing of vulnerabilities, adaptation to environmental shifts, and the enhancement of anticipatory capacity. Based on these lines of reasoning, we propose our first hypothesis:

Hypothesis 1. Learning from crises has a positive impact on firm survival.

2.2. The moderating role of firm resilience

In this section, we argue that firm resilience, a dual-faceted construct viewed as inherent capacity and a dynamic process, might constitute a moderating variable in the relationship between learning from crises and firm survival. The inherent capacity perspective perceives firm resilience as the ability of a firm to withstand and rebound from adversities, grounded in preparedness, adaptability, and learning [10,24,25]. In this view, firm resilience is a composite construct, comprising three key elements: robustness, agility, and integrity [18]. Each of these elements plays a distinct role in enhancing the firm's ability to endure crises and learn from them, thereby influencing firm survival.

Robustness refers to the firm's endurance and ability to withstand disruptions and stressors [18]. It is reinforced by learning from crises, which provides firms with experiential knowledge that can be used to refine their resources, strategies, and processes for survival. This involves learning about the root causes of past failures, identifying potential threats and vulnerabilities, and devising effective strategies to prevent or mitigate such issues in the future [18]. By doing so, firms can build a solid foundation that can withstand future crises and recover more quickly when they occur. Robustness is also about building and maintaining strong, reliable networks with external stakeholders such as suppliers, customers, and partners [18]. These networks can provide valuable support and resources during times of crisis, thereby contributing to the firm's overall robustness.

Agility, on the other hand, refers to the firm's capacity to respond promptly and effectively to changes in the surrounding environment [18]. Agility is enhanced by learning from crises, which provides firms with insights into the dynamic nature of the market and equips firms with the skills and strategies needed to swiftly adapt to evolving market conditions. This may involve adjusting their business models, reallocating resources, or pivoting their strategies to seize emerging opportunities and mitigate emerging threats. Agile firms are thus able to navigate the uncertainties of the market with greater ease and confidence, enabling them to maintain their competitive edge even in the midst of crises [26].

Integrity is about the unity and cohesion within an organisation, particularly during crises. It is strengthened as learning from crises fosters a shared understanding of crisis management and strategy among employees, promoting cooperation and collaboration in crisis situations [18]. By sharing knowledge and learning collectively from crises, firms can build a strong, resilient culture that values adaptability, innovation, and continuous learning. This not only enhances the firm's internal capacity to manage crises but also maintains employee engagement during challenging times.

In a volatile and uncertain market environment, the role of firm resilience becomes even more critical. Resilience enhances the firm's ability to learn from crises, enabling it to uncover its vulnerabilities, learn from past failures and successes, and adapt its strategies to new market conditions. Firms with a high level of resilience can absorb and leverage the knowledge derived from crisis experiences more effectively [10]. This learning, in turn, helps in refining their strategies, improving their capabilities, and thus, increases their survival likelihood [27,28].

In contrast, firms with low resilience may struggle to harness the value of crisis-induced learning due to their inability to adequately address vulnerabilities and adapt effectively. These firms may find it challenging to translate the learnings from crises into tangible improvements in their strategies and operations [27,29]. As a result, the benefits of learning may not be sufficient to outweigh the challenges, potentially compromising the firm's survival. Thus, the level of resilience can significantly influence the extent to which firms can benefit from crisis-induced learning and thereby enhance their survival prospects. Thus, we propose the following hypothesis:

Hypothesis 2. Firm resilience strengthens the relationship between learning from crises and firm survival.

2.3. The moderating role of innovation capabilities

Firm innovation capabilities can be seen as the capacity to generate superior value by creating advanced products, processes, services, technologies, or ideas that are valued by markets, governments, and society [30,31]. These capabilities are inherently proactive and often involve embracing new creations or technologies ahead of competitors, in response to internal or external changes, or to advocate for environmental sustainability [32–34].

Firm innovation capabilities, as a moderating factor, play a pivotal role in the relationship between learning from crises and firm survival. This moderation is built on the notion that the depth of innovation is directly proportional to the amount of learning required [35]. Hence, firms with superior innovation capabilities are likely to have a stronger learning orientation. This iterative learning cycle, fuelled by the pursuit of innovation, makes firms more resilient, enabling them to anticipate potential crises, develop novel solutions to mitigate their impacts, and recover faster from adverse conditions [13,36].

Firm innovation capabilities allow firms to translate the knowledge gained from learning into the development of new products, services, or processes [37]. This applicability of learning to innovation enhances a firm's adaptability and capacity to build new competitive advantages in the marketplace. Furthermore, the effectiveness and impact of firm innovation capabilities are associated with the level of market turbulence [38]. In highly volatile environments, firms with stronger innovation capabilities can translate crisis experiences into actionable innovations more effectively, thereby enhancing their survival prospects [39].

On the contrary, firms characterised by a lower level of innovation capabilities may struggle to reap the benefits of learning from crises due to their limited ability to generate and implement new knowledge [39]. This may result in slower adaptation to evolving conditions and diminished ability to exploit emerging opportunities, potentially compromising firm survival. Thus, we propose:

Hypothesis 3. Firm innovation capabilities strengthen the relationship between learning from crises and firm survival.

2.4. The moderating role of environmental dynamism

Environmental dynamism can be seen as the rapidity and intensity of changes within the external business environment, driven by factors such as the increasing size and number of firms, accelerating technological change, and its diffusion within the industry [40]. This environmental dynamism introduces uncertainty into the business landscape, which poses risks to a firm's operations and performance [41].

The impact of environmental dynamism on business activities is twofold. It can either facilitate or hinder risk mitigation, depending on the firm's capabilities [42]. Firms with stronger market capabilities can leverage arising opportunities in an unstable market, as compared to firms with lower capabilities. For example, innovation-oriented firms can become more cost-efficient in a highly dynamic environment [43]. Firm performance hinges on its ability to effectively respond to environmental dynamics through their learning capacity [44]. A higher degree of firm resilience is achieved as more knowledge is acquired by the firm [18], enabling it to respond to and manage negative externalities more efficiently. However, in a dynamic market environment, firms' knowledge becomes obsolete more quickly, necessitating continuous learning [40]. This dynamic environment increases market uncertainty and risks [41], potentially leading to inefficient decision-making driven by organisational inertia [45]. In such contexts, firms with greater technological diversity may be better equipped to navigate environmental dynamics and use firm-specific knowledge to improve performance [45]. In a highly dynamic environment, the urgency to adapt quickly can create ambiguity and uncertainty, affecting

the quality of forecasts and strategic planning [46]. This can potentially affect the relationship between learning from crises and firm survival, as increasing market uncertainty, time constraints, and adaptability challenges come into play. Consequently, environmental dynamism can be considered as a key moderator in shaping the relationship between learning and the survival performance of firms. Firms operating in highly dynamic environments must constantly innovate and adapt to survive, whereas in stable environments, firms can leverage their existing capabilities to maintain their competitive advantage. This leads us to propose the following hypothesis:

Hypothesis 4. Environmental dynamism weakens the relationship between learning from crises and firm survival.

In Fig. 1, we summarise our research model graphically.

3. Methods

3.1. Setting and sample

We test our hypotheses in the context of Italian SMEs belonging to the manufacturing industry from November 2020 to January 2022. Our sample includes SMEs belonging to various industries (e.g., food, furniture, motor vehicles and transports). Our empirical context is particularly suitable for testing our hypotheses for three main reasons. First, the Italian business context has been severely affected by the COVID-19 pandemic, which posed several complex challenges for firms. Also, Italy has a strong manufacturing sector characterised by the presence of a large number of SMEs [47,48]. Second, as the first COVID-19 outbreak arrived in Italy in March 2020 [49], we consider the dramatic consequences of the first and the following COVID-19 outbreaks as systemic economic crises that severely hit Italian manufacturing SMEs. Third, from November 2020 to January 2022, the COVID-19 pandemic increased the environmental uncertainty in the whole European zone. The effects of this uncertainty were particularly pronounced for SMEs as opposed to large corporations, as the former typically have a less stable financial position and a less solid structure [14]. The structural fragility of SMEs can thus amplify the effects of multiple unexpected events, such as the various COVID-19 outbreaks, which considerably enhanced the environmental dynamism of worldwide business contexts.

Consistently, in this study, we developed a survey to collect data from managers working in Italian SMEs which have successfully survived the COVID-19 pandemic till January 2022. The responses were collected from different level managers and entrepreneurs representing manufacturing SMEs. The selected diversity of the firms enables the avoidance of single-source bias that arises from overlapping variability [50]. Therefore, the self-administered survey was designed to eliminate the potential directional responses. To do so, the questions were organised into different sections along with no references to the model in Fig. 1. Such steps allow for keeping a comprehensive nature of the study without shifting participants' attention to possible cause-effect relationships, which are aimed at investigating the research.

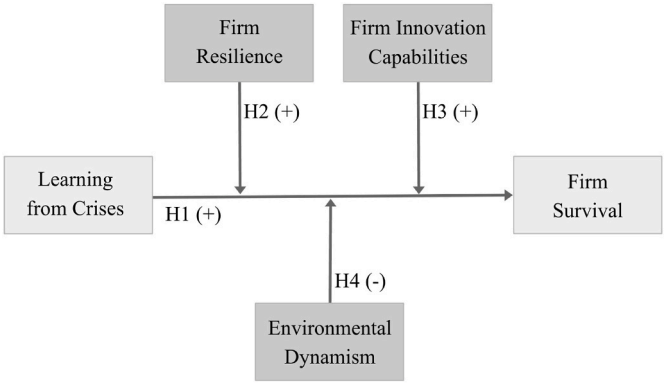

Fig. 1. Research model.

In total, 258 answers were collected. However, the sample was reduced due to the failure of respondents to answer at least one of the three manipulation checks designed to control participants' attention while filling out the survey. At last, the sample consisted of 249 responses that were included for further analysis. A more detailed description of the final sample is introduced in Table 1.

The next step to proceed with the collected sample is related to the data validity examination. We performed a set of robustness checks in line with previous research [51]. In regard to non-response bias, independent sample t-tests and Harman's single factor test were conducted. The results of the first one revealed any statistically significant difference between the responses in terms of control variables such as age, gender, industry expertise, firm position, size (as a number of employees), manufacturing sector and technological level. In the case of the second test, we obtained a total variance of 26.12%, which fit the criteria of the suggested threshold of 50%. Besides, to ensure accuracy, cross-checks with a market variable and correlation matrix were developed. Concerning self-selection bias, we found no significant difference comparing the responses of the excluded informants with those of the included ones.

3.2. Measures

We measured the constructs included in our conceptual model by applying scales already tested in the prior literature. In turn, it ensures the validity of the selected scales. Respondents rated the items on a five-point Likert scale, namely, 1 as "Strongly disagree" to 5 – "Strongly agree".

Table 2 provides a more detailed description of the selected constructs.

Firm survival, our dependent variable, was measured with the 4-item scale from Naidoo [52]. Learning from crises was measured as an adapted version of the scale from Saunders et al. [53] and consisted of 3 items. Firm resilience was measured with a 4-item scale from Ambulkar

Table 1
Sample characteristics.

Respondents' characteristics					
Age			***Gender***		
18–30	12	4.82%	Male	196	78.71%
31–45	138	55.42%	Female	53	21.29%
46–60	86	34.54%			
>60	13	5.22%			
Industry expertise			***Firm position***		
<5 years	36	14.46%	Senior Manager	54	21.69%
5–10 years	172	69.08%	Middle Manager	75	30.12%
>10 years	41	16.47%	Junior Manager	32	12.85%
			Owner/ Entrepreneur	88	35.34%
Firms' characteristics					
Size (employee number)			***Manufacturing Sector (NACE)***		
3–20	57	22.89%	Chemicals	14	5.62%
21–50	37	14.86%	Computer and Electronics	16	6.43%
51–125	71	28.51%	Electrical and Machinery	31	12.45%
126–250	84	33.73%	Food	35	14.06%
Technological Level			Furniture	33	13.25%
High-Tech	137	55.02%	Metallic	7	2.81%
Low-Tech	112	44.98%	Motor vehicles and transports	33	13.25%
			Pharmaceutical	31	12.45%
			Plastics and non-metallic	18	7.23%
			Textile	31	12.45%
Grand Total	**249**				

Table 2
Items and reliability of latent variables.

	Omega	AVE
Firm Survival [52]	.85	.70
My firm will survive the current economic crisis.		
My firm possesses the ability to withstand the challenges of the current economic crisis.		
My firm is in a good position to address the slowdown in business activity currently being experienced as a result of the economic crisis.		
Sales volume has decreased in the last three months as a result of the economic crisis, but sales will rebound back to the pre-crisis level.		
Learning from crises [53]	.87	.61
Crisis events have led us to change the way we do things.		
We learn from crisis events that are critical for our business.		
Crisis events have shaped our business activities.		
Firm resilience [54]	.85	.72
We are able to cope with changes brought about by supply chain disruption.		
We are able to adapt to the supply chain disruption easily.		
We are not able to provide a quick response to the supply chain disruption (R).		
We are able to maintain high situational awareness at all times.		
Firm innovation capability [55]	.85	.70
Our knowledge and skill base are building up at the right pace.		
Our firm placed emphasis on creativity through substantial investment in RandD.		
Our firm is able to identify and create new value for customers.		
Our firm has harnessed organisational intelligence and managed technology to increase innovation.		
Environmental dynamism [31]	.79	.54
Environmental changes in our local market are intense.		
Our clients regularly ask for new products and services.		
In our local market, changes are taking place continuously.		
In a year, nothing has changed in our market (R).		
In our market, the volumes of products and services to be delivered change fast and often.		

n = 249. Items are denoted with an (R) have been reversed during the data collection.

et al. [54]. Next, firm innovation capability was measured with a 4-item scale from Yang [55]. Environmental dynamism was measured with a 5-item scale from Jansen et al. [31]. All items of those latent variables are reported in detail in Table 2.

Also, a set of control variables has been considered. In particular, to measure firm size, we asked respondents about the total number of employees working in a firm at a given time. To measure firm age, we asked respondents about the year of the foundation of a firm and calculated the total number of years. Moreover, we asked respondents if the firm had significantly engaged in international business activities in the last 3 years. If it did, we coded this variable as 2, 1 otherwise. We also measured as a control variable the industry expertise of the respondent, asking how many years of expertise they have in the sector in which they are operating. Finally, to control for potential industry effects, we constructed a categorical variable based on the industry in which the SME operated.

To enhance the validity of the latent variables, we employed congeneric methods to estimate the items of the latent variables using the CLC Estimator as suggested by Marzi et al. [37].

3.3. Multiple regression approach

The research model was firstly tested using multiple regression [56] with R Studio 2022.02.1. The multiple regression approach is often used to predict the value of an outcome variable by considering multiple independent variables. Multiple regression approaches are ideal procedures to add a set of control effects on the main independent variables to explore to which extent a hypothesised relationship provides theory with additional insights in predicting a given dependent variable [56]. In this study, the multiple regression approach mainly encompasses two procedures: the (1) development of seven regression models built upon an incremental logic and (2) the assessment of each of the models in the light of the central hypothesised relationships. However, despite their considerable predictive power, multiple regression models do not embed information on the various sets of optimal configurations of independent variables in complex scenarios. Thus, to complement the regression analysis, the fsQCA approach was implemented.

3.4. fsQCA approach

The fsQCA is the non-linear modelling approach that is based on the implementation of a distinct configuration of causal variables that are considered as antecedents to the prediction of an outcome [57,58]. In other words, it is used to explain the difference between how possible combinations of causal conditions may affect the variable being measured, since in real-world settings the outcome may depend on a number of combinations of antecedents [59].

The fsQCA could be both a primary or complementary investigation method, eventually supporting linear analysis results [60–62]. As our developed model includes several moderating factors, the fsQCA approach could be considered appropriate for exploring the nature of the complex relationships existing in an empirical setting.

4. Results

Before proposing the seven regression models that have been developed for the purpose of hypotheses testing, we report the results of Omega and Average Variance Extracted (AVE) for each of the adopted latent constructs. The assessment of these reliability coefficients has been performed, and all latent constructs present a satisfactory level of Omega and AVE. Specifically, in Table 2, we report the Omega and AVE for each construct. All constructs presented acceptable levels of internal consistency, reliability, and convergent validity. In particular, all constructs exhibited an Omega above 0.75; thus, they all confirmed the internal consistency and reliability of the measurements. Lastly, AVE values exceeded the minimum recommended threshold of 0.50, supporting the construct measures' convergent validity.

In Table 3, we present the means, the standard deviations, and correlations among the considered variables. As shown in the table, multiple independent variables are positively and significantly correlated. For example, innovation capabilities are positively and significantly associated with firm resilience ($\rho = 0.20$, $p < 0.01$) and environmental dynamism ($\rho = 0.37$, $p < 0.01$).

Although it is beyond the scope of the present study to assess each correlation coefficient of Table 3, we also noted several interesting evidence. While on one hand, the positive relationship between firm size and age ($\rho = 0.46$, $p < 0.01$) sounds natural as older firms had more time to achieve a higher size, Table 3 also shows a negative and statistically significant coefficient between firm age and innovation capabilities, indicating that the younger firms might be more inclined towards innovative capabilities. This empirical evidence is consonant with previous studies [63].

Moreover, there is a direct, positive and statistically significant relationship between firm resilience and firm survival. This insight is also theoretically collaborated by other studies [64], highlighting the paramount importance of resilience in incrementing survival chances. Similar patterns are observed between firm size and resilience ($\rho = 0.15$, $p < 0.05$). Additionally, learning from crises is positively and significantly correlated with environmental dynamism ($\rho = 0.14$, $p < 0.05$), suggesting that uncertainty stimulates SMEs to activate learning mechanisms to cope with enhanced environmental pressures [41].

Table 3
Correlation among variables.

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Firm survival	3.84	.35	–									
2. Learning from crises	3.32	.74	.18***	–								
3. Firm Resilience	3.80	.51	.28***	.04	–							
4. Innovation capabilities	3.87	.56	.09	−.05	.20***	–						
5. Environmental dynamism	3.32	.50	.01	.14**	−.05	.37***	–					
6. Firm size	97.73	72.05	.08	−.10**	.15**	.08	−.17***	–				
7. Age	20.41	15.39	.11*	−.01	−.00	−.22***	−.12**	.46***	–			
8. Industry	–	–	−.02**	−.14**	.10	−.06	−.15**	.04	−.07	–		
9. Industry expertise	7.68	2.93	.03	.18***	.01	.02	.02	.00	−.01	−.14**	–	
10. International business	1.55	.50	−.01	−.07***	.01	.01	−.10	−.02	−.04	.09	−.13**	–

Numbers are rounded to the nearest hundredth. ***p < 0.01; **p < 0.05; *p < 0.1. n = 249.
Note. International business has been coded as 1 if the firm did not engage in significant international business activity in the last 3 years, 2 otherwise.

Table 4
Results of regression models.

	Hyp.	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Constant		−.10 (.38)	−.13 (.38)	.02(.37)	−.09 (.36)	−.10 (.37)	−.12 (.38)	.02 (.36)
Independent variables								
Learning from crises	***H1***		.18 (.06)***	.18 (.06)***	.16 (.06)***	.16 (.06)**	.18 (.07)***	.15 (.06)**
Firm resilience				.28 (.06)***	.30 (.06)***			.29 (.06)***
Innovation capabilities				.08 (.07)		.12 (.06)*		.11 (.07)
Environmental dynamism				−.04 (.07)			−.01 (.07)	−.05 (.07)
Interaction effects								
Learn. X Resilience	***H2***				.19 (.06)***			.17 (.06)***
Learn. X Innov. cap.	***H3***					.19 (.08)**		.21 (.08)***
Learn. X Env. dyn.	***H4***						−.00 (.07)	−.09 (.07)
Control variables								
Firm size		.04 (.06)	.06 (.06)	−.00 (.06)	.01 (.06)	.05 (.06)	.06 (.06)	−.02 (.06)
Firm age		.06 (.05)	.05 (.05)	.09 (.05)*	.07 (.05)	.06 (.05)	.05 (.05)	.07 (.05)
Industry		−.04 (.02)**	−.03 (.02)**	−.04 (.02)**	−.03 (.02)**	−.03 (.02)*	−.03 (.02)**	−.03 (.02)
Industry expertise		.01 (.12)	−.04 (.11)	−.04 (.11)	.00 (.11)	−.06 (.11)	−.04 (.12)	−.02 (.11)
International business		.02 (.10)	.06 (.10)	.05 (.10)	.18 (.06)	.05 (.10)	.06 (.10)	.02 (.10)
Model fit								
Adjusted R-Squared		.02	.04	.12	.15	.07	.03	.17
N		249	249	249	249	249	249	249

Both dependent and independent variables are standardised (i.e. $\bar{x} = 0$; $s^2 = 1$). The dependent variable is Firm Survival. ***p < 0.01; **p < 0.05; *p < 0.1. (Standard errors in parentheses). Numbers are rounded to the nearest hundredth.

4.1. Results of the regression analysis

In Table 4, we report the results of the regression analysis. In particular, we built seven models, such that: Model 1 includes control variables only; Model 2 adds to Model 1 the direct effect of learning from crises (i.e. our main independent variable); Model 3 adds to Model 1 all the effects of the considered independent and moderating variables; Models 4–6 are three models with each interaction effect separately tested; Model 7 is a complete model with the three moderating effects, direct effects, and control variables. Before assessing the coefficients of direct and indirect effects related to our hypotheses, we point out that control variables do not reach statistical significance in the presence of all independent and moderating variables, as shown in Model 7 (Table 3).

Fig. 2 integrates the research model presented in Fig. 1 with the β coefficients emerging from our regression analysis (Model 7).

Concerning the learning from crises on firm survival (Hypothesis 1), as shown in Models 2–7, we found a positive and significant relationship (in Model 2, $\beta = 0.18$, $p < 0.01$; in Model 7 with all the three interaction effects, $\beta = 0.15$, $p < 0.05$). Therefore, our first hypothesis is empirically supported. Turning to Hypothesis 2, which states that firm resilience strengthens the relationship between learning from crises and firm survival, as shown in Models 4 and 7, the coefficient is positive and significant (in Model 3, $\beta = 0.19$, $p < 0.01$; in Model 7 with all the three interaction effects, $\beta = 0.17$, $p < 0.01$). Thus, Hypothesis 2 receives

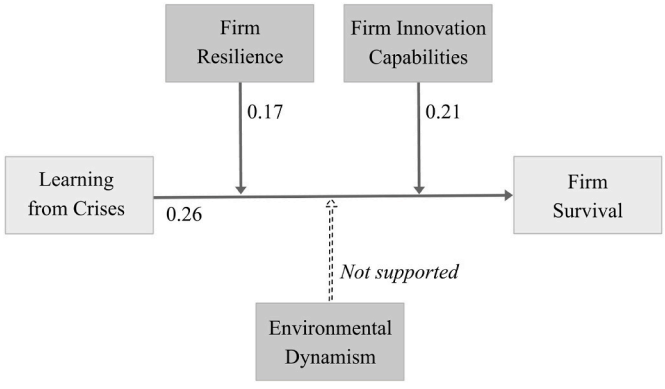

Fig. 2. Summary of hypothesised effects.

strong empirical support. Hypothesis 3 states that firm innovation capabilities strengthen the relationship between learning from crises and firm survival. As shown in Models 5 and 7, the coefficient is positive and significant (in Model 5, $\beta = 0.19$, $p < 0.05$; in Model 7, with all three interaction effects, $\beta = 0.21$, $p < 0.01$). Thus, also Hypothesis 3 receives empirical support. We now turn to Hypothesis 4, which states that environmental dynamism weakens the relationship between learning

from crises and firm survival. As shown in Models 6 and 7, the coefficient is slightly negative, but it does not reach statistical significance (in Model 6, $\beta = -0.00$, $p > 0.10$; in Model 7, with all the three interaction effects, β increases its absolute value to -0.09, but also in this case the p-value exceeds the 0.10 threshold). Thus, Hypotheses 4 does not receive empirical support. Interestingly, as it was partly anticipated by the correlation matrix (Table 3), the direct effect of firm resilience on firm survival is positive and does not lose its significance in Model 7 ($\beta = 0.29$, $p < 0.01$).

Finally, it can be seen that the incremental logic of the proposed regression models allow a remarkable appreciation of Adjusted R-Squared values, which raised from 0.02 in Model 1 (control variables only) to 0.17 in Model 7 (the full model), manifesting an increased predictive power in the relationship between learning from crises and firm survival when incorporating the considered interaction effects.

Fig. 3 graphically depicts the significant interaction effects emerging from our analysis.

Particularly, we examined the interaction patterns consistently with Aiken et al. [65]. Learning from crises exhibited a more positive relationship with firm survival when the level of firm resilience was high than when it was low. Similar results emerged in the analysis of innovation capabilities. To complement the findings of the regression analysis, we developed a fsQCA analysis, offering further insights into our research.

To guarantee the robustness of the regression analysis, we carried out a series of robustness checks. First, we used a Ramsey Regression Equation Specification Error Test (RESET) method to test if non-linear combinations of the fitted values help explain the dependent variable. Since the p-value was more than 0.1, then we can conclude that omitted variable issues are limited. Secondly, we used the Breuch–Pagan method to control for potential heteroskedasticity problems. As the p-value was higher than 0.1, heteroskedasticity problems were minimised. Moreover, to determine if our regression analysis can suffer from multicollinearity issues, we computed the Variance Inflation Factors (VIFs). All VIF scores were below 1.6, which is well below the recommended threshold of 10 [66]. Specifically, the maximum VIFs were, respectively, 1.49 and 1.46. Lastly, we considered various subgroups of SMEs based on size and age. The results were confirmative of our previous analysis.

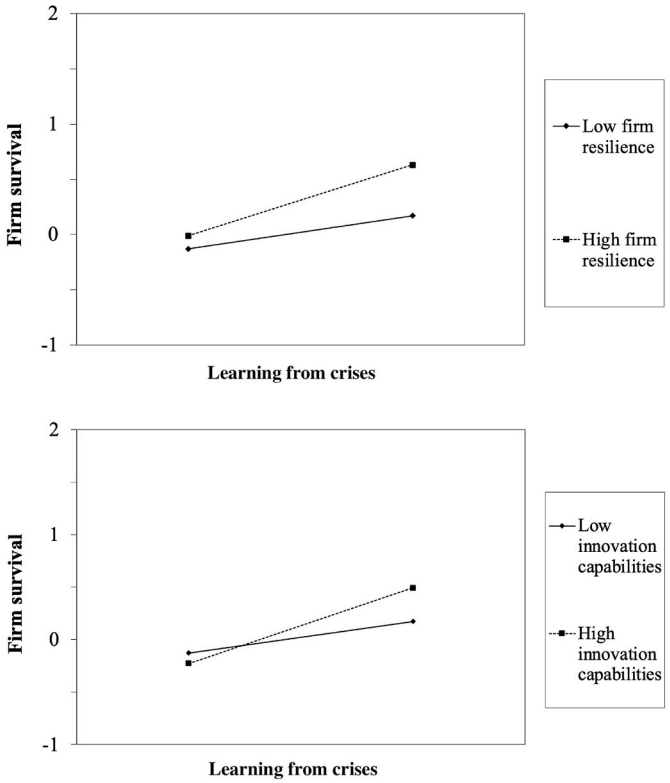

Fig. 3. Significant interaction effects.

4.2. Results of the fsQCA analysis

Taking as a reference the work of Ragin [58], we calibrated the initial five-point Likert scale values into fuzzy sets ranging from 0 to 1, where 0 introduces "non-membership" and 1 was "full membership". Following the direct calibration approach [67], we identified three critical breakpoints which refer to the membership level in the fuzzy set for each case, namely, full membership, the crossover points and non-membership. In doing so, we applied the percentile method [68], which found the threshold for each defined case. More precisely, the results demonstrated fuzzy scores of 0.05, 0.50 and 0.95 for non-membership, the crossover point and full membership, respectively.

The analysis of the necessary conditions confirmed the requirement for the study of causal conditions given consistency and coverage levels lower than 0.9, as suggested by prior literature [68,69].

At first, the solutions' robustness was checked by conducting a sensitivity analysis [57], particularly by setting various crossover points for calibration (±25%). Second, in line with Woodside [62], the sample was divided into two groups and purposelessly checked for potential differences in results. Overall, the obtained findings validated the robustness of the fsQCA results.

As reported in Table 5, the analysis introduces three configurations (S1, S2, S3) that lead to firm survival. Depending on their interactions, these solutions adjust combinations with the examined factors present or absent. In turn, firm survival is achieved by various relevant combinations of configurations rather than a single condition. Besides, each configuration showed a high level of coverage and consistency, while the overall solution coverage for the cases associated with firm survival can explain 71% of the cases.

The outcomes of our fsQCA analysis (Table 5), employed as a complementary method to regression analysis, delineate configurations that promote higher firm survival. These results corroborate the findings of the regression analysis, providing additional insights into the dynamics of firm survival.

Configuration S1 underscores the pivotal role of learning from crises

Table 5
Configurations leading to firm survival.

	Solutions		
Configurations	**S1**	**S2**	**S3**
Learning from Crises	●	●	•
Firm Resilience	•	•	●
Firm Innovation Capabilities	●	•	
Environmental Dynamism		⊗	⊗
Consistency	0.833	0.830	0.812
Raw Coverage	0.571	0.489	0.381
Unique Coverage	0.071	0.072	0.009
Overall solution consistency	0.802		
Overall solution coverage	0.712		

Note: Black circles (●) indicate the presence of a condition, and circles with "x" (⊗) indicates its absence. Large circle; core condition, Small circle; peripheral condition; Blank space; "don't care" condition

and firm innovation capabilities in enhancing firm survival, with firm resilience playing a lesser role. Notably, environmental dynamism does not feature in S1, suggesting that external catalysts may have a limited influence on firm survival chances. The insights from S1 bolster our regression results, indicating that firm innovation capabilities exert a more pronounced influence on the learning-survival linkage than firm resilience. This suggests firms with strong innovation capabilities, which prioritise learning from crises, can ensure their survival in volatile environments, for any level of environmental dynamism.

Configuration S2 aligns with S1 in terms of influential factors. Nevertheless, it distinguishes itself through the equal impact of firm innovativeness and resilience, with learning from crises demonstrating a strong correlation with firm survival. The diminished significance of innovativeness in this learning-survival relationship is noteworthy as it defies the conventional belief that innovation invariably impacts firm survival, regardless of the environmental milieu. Conversely, this configuration implies that in certain conditions, such as relatively stable environments, past learning may take precedence over innovation for survival.

Lastly, Configuration S3 exhibits intriguing results with firm innovation capabilities and the absence of both environmental dynamism, indicating that firms in low volatility industries with resilient business models should prioritise value maintenance over innovation capacity building. It was demonstrated that firms exhibiting resilience and learning propensity have higher survival rates. The central role of absence of environmental dynamism, which traditionally spur learning and innovation, lessens the pressure for continuous learning and innovative solution implementation to remain competitive.

5. Discussion

Overall, this study makes a contribution to the literature on crisis management and organisational learning by investigating the effects of learning from crises on the survival of manufacturing SMEs. By integrating various factors, including firm resilience, innovation capabilities, and environmental dynamism, the analysis offers a nuanced understanding of the dynamics between learning crises and firm survival.

5.1. Theoretical implications

This study contributes to the management literature in various ways, providing insights into the role of crisis learning for firm survival and the moderating role of firm resilience, firm innovation capabilities and environmental dynamism in the context of SMEs.

First, the results of this study contribute to broadening the view of the learning-survival relationship by providing empirical evidence on the role of learning from crises in firm survival. Previous studies [70,71] have explored this relationship, and our findings further support the notion that learning plays a crucial role in enhancing a firm's chances of survival during exogenous crises. By adding to the existing body of literature, this study strengthens the understanding of the mechanisms through which learning impacts long-term viability.

Second, this study contributes to the body of knowledge on organisational learning and crisis management literature by integrating multiple moderating factors into a single model. While previous research has separately examined the impact of firm resilience, firm innovation capabilities, and environmental dynamism, our study analyses their combined influence. Notably, our findings indicate that innovation capabilities have a greater impact on the learning-survival relationship compared to resilience. This suggests that firms that actively enhance their innovation capabilities are more likely to amplify the effects of learning on firm survival, ultimately leading to improved overall performance. Furthermore, the firm's embeddedness in the market makes it susceptible to contingency factors, such as environmental dynamism. As highlighted by previous scholars [72], highly dynamic market conditions pose greater challenges to firm operations compared to stable environments. This complexity complicates the learning process, as the increasing level of environmental dynamism reduces access to crucial knowledge in the decision-making process [40].

Finally, the findings of the current study challenge the initial hypothesis by indicating that environmental dynamism does not strictly weaken the relationship between learning and firm survival. Contrary to expectations, the presence of uncertainty and risk in the market can actually serve as incentives for firms to seek new opportunities and solutions, leading to continuous learning [42]. This suggests that, in dynamic environments, firms that embrace learning and adaptability can leverage market volatility to their advantage, fostering firm resilience and enhancing their chances of survival.

5.2. Practical implications

This study provides a number of practical implications for firms in navigating crises and enhancing their survival. The findings highlight the crucial role of learning in overcoming the consequences of crises, aligning with previous research that emphasises learning as a key condition for firm survival [9,12,73]. By bridging management and organisational learning literature, this study examines the factors that influence the relationship between learning from crises and firm survival, specifically focusing on firm resilience, innovation capabilities, and environmental dynamism.

Managing crises in a highly dynamic environment can be challenging SMEs, given their constraints in terms of finance and resources. In light of this, firms can benefit from investing in crisis preparedness and adopting a strategic approach to enhance their resilience. Policymakers should also draw on their experiences and insights from competitors to develop effective strategies for crisis management and long-term survival.

The study underscores the importance of innovation capabilities in strengthening the relationship between learning and survival. Firms are encouraged to prioritise innovation and allocate resources to research and development (R&D) activities. Furthermore, building firm resilience is key for business survival, particularly in dynamic environments. This necessitates flexibility and responsiveness to market adversity, including effective planning and modelling of potential business risks.

While environmental dynamism was included in the analysis, it was found to be statistically insignificant in influencing the relationship between learning and survival. This suggests that, in the specific context of this study, environmental dynamism does not attenuate the positive impact of learning on firm survival. However, firms should remain aware of market conditions and adapt their strategies accordingly.

Finally, the study highlights the synergistic relationship between resilience and innovation capabilities, reinforcing the impact of learning on firm survival performance. By recognizing and leveraging the interplay between these factors, firms can better position themselves to withstand crises, adapt to changing circumstances, and enhance their chances of long-term survival.

Overall, this study provides practical insights for firms, emphasising the importance of learning, resilience, and innovation in navigating crises and enhancing survival. By adopting a strategic approach, investing in crisis preparedness, and fostering a culture of serendipity, innovation, firms can improve their resilience, adaptability, and overall performance [17]. Policymakers and managers can use these findings to develop effective strategies and policies to support firms in managing crises and ensuring long-term viability.

6. Conclusions

While this study has provided valuable insights into the role of learning in a firm's survival during exogenous crises, there are limitations that call for further research. Firstly, the sample of Italian

manufacturing SMEs may not be easily applicable to other country settings, and the specific impact of the COVID-19 pandemic on different industries warrants exploration in diverse institutional and market environments. Additionally, relying on data from a single survey introduces single-source bias and limits the generalizability of the results. To address this, future studies could consider incorporating multiple data sources for analysis. Furthermore, the examined variables of resilience, innovation capabilities, and environmental dynamism provide an incomplete understanding of organisational learning and crisis management during exogenous crises. Future research could explore new measures and influential factors, such as organisational culture, leadership style, and engagement with external stakeholders, to enhance the implementation of learning initiatives and adaptation. Finally, considering the unique context of COVID-19 pandemic, it is important to investigate the transferability of findings to other crisis contexts and the implications for policymakers and practitioners. By addressing these limitations and exploring the complex dynamics of learning and crisis management, future studies can further enhance our understanding of how firms navigate adversity and thrive in the face of exogenous crises.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

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