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Multiple Driving Paths of High-Tech SME Resilience from a "Resource–Capability–Environment" Perspective: An fsQCA Approach

Teng Ma, Ya Liu * and Rongyan Jia

School of Economics and Management, Hebei University of Science and Technology, Shijiazhuang 050018, China; mateng@hebust.edu.cn (T.M.); he_jry@163.com (R.J.)
* Correspondence: liuyakf@163.com

Abstract: High-tech SMEs are the new drivers of economic growth and innovation development. The complex and turbulent operating environment of the volatility, uncertainty, complexity, and ambiguity (VUCA) era poses a serious threat to high-tech SME sustainability. Although studies have explored the factors influencing high-tech SME resilience, the equivalent effects of different combinations of factors on organizational resilience have yet to be considered. Based on the resources–capabilities–environment perspective, this study uses fuzzy-set qualitative comparative analysis (fsQCA) to analyze the driving paths of high-tech SME resilience. The configuration effects of financial and relationship resources, managerial abilities, innovation capabilities, the market environment, and government interventions on the organizational resilience of high-tech SMEs are examined, and a robustness test is passed. The results show the following: (1) high-tech SME resilience is affected by multiple factors; (2) high-tech SMEs have three high-resilience driving paths—resource–capability, resource–capability–environment, and resource–environment—and two non-high-resilience driving paths—resource–capability inhibition and resource–environment inhibition; and (3) the high and non-high resilience paths are asymmetric. Theoretically, the formation of organizational resilience is a complex nonlinear process with limited single condition effects on outcomes. This study explores the impact of the interaction of multiple factors on organizational resilience, reveals the multiple driving paths of high-tech SME resilience, and enriches the theoretical study of organizational resilience. Practically, this study helps managers identify the combined effects of "resource–capability–environment" perspectives on high-tech SMEs' resilience and provides intellectual support for them to achieve sustainable development and enhance resilience.

Keywords: high-tech SMEs; organizational resilience; resource–capability–environment; fsQCA

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1. Introduction

Combining both economic and technological advantages, high-tech small and medium-sized enterprises (SMEs) are new drivers of economic growth [1] and are strategically important for industrial transformation and upgrading, safeguarding technological security, and enhancing international competitiveness in China. High-tech SMEs face an unprecedented and severe volatility, uncertainty, complexity, and ambiguity (VUCA) situation, as firms are going all out to fight economic counter globalization, geo-conflicts, and the coronavirus disease 2019 (COVID-19) epidemic. Through corporate boundaries, the environment around the enterprise poses a serious and unpredictable threat to the sustainable development of high-tech SMEs in various forms. For example, geopolitical risks damaged financial markets and adversely affected business investments [2]; the bombing of the Nord Stream pipeline has left energy resources in short supply, and the natural gas industry, as well as industry and commerce in general, have been particularly hard hit; and the outbreak of the COVID-19 epidemic had numerous negative impacts on businesses, leaving SMEs to face logistical hurdles, labor shortages, and cost- and finance-related

challenges [3,4]. Compared to large enterprises, high-tech SMEs have some inherent weaknesses. High-tech SMEs are characterized by high investment and risk, making them face many unfavorable risk factors in the growth process [5]. Moreover, high-tech SMEs have very limited resources and fragile supply chains and corporate relationships [6] and usually face greater uncertainty than do other enterprises [7]. In this context, increasing numbers of scholars have turned their attention to organizational resilience, assuming that shaping the resilience of high-tech SMEs enables them to effectively cope with crises [8,9]. For example, Williams et al. [10] noted that resilience is inextricably linked to crisis management and that the integration of the two is an important way for organizations to cope with adversity. Therefore, high-tech SMEs need to be flexible, adaptable, and sufficiently creative, that is, sufficiently resilient [11], to ensure their survival.

Organizational resilience is the ability of an organization to recover to a previous level or state after a shock [12,13]. Throughout the literature, scholars have extensively explored the influencing factors of organizational resilience based on either the environmental [14], organizational [15,16], or individual level [17,18] or categorizing their influences as internal or external to the organization [19,20]. As high-tech SMEs face difficulties accessing external funding, internal funding becomes their main investment option [21], and relationship resources are key for them when managing disruptions [9]; thus, financial and relationship resources become indispensable for these enterprises in building their organizational resilience. Moreover, due to resource constraints, high-tech SMEs rely more on managers to achieve results [22] and on innovation to maintain their competitive advantages and organizational resilience [23]. The business environment is a major prerequisite for the survival and development of all types of enterprises, and a good business environment can stimulate enterprise vitality and protect their healthy development [24]. Therefore, shaping resilience from a resource, capability, and environment perspective has been promoted by many scholars. The resource perspective focuses on the impact of a firm's resource base [25], such as financial resources [26], relationship resources [27], and technological resources [28], on organizational resilience. The capability perspective explores how the core competencies of the firm, such as leadership [29,30], innovation [31], and organizational analysis [32], affect organizational resilience. The environmental perspective focuses on the role of internal and external environments, such as environmental disturbances [26], the institutional environment [33], and government support [34], on organizational resilience. Although the literature explores multiple influences on organizational resilience, this topic should be further explored as the external environment changes [35].

A review of the previous literature reveals that existing studies on organizational resilience and high-tech SME resilience have focused more on the "net effect" of one or more variables, ignoring the interactions between factors at different levels [25,36]. Moreover, regarding theoretical perspectives, most of the existing literature focuses on examining a single theoretical perspective, with less consideration of the integration and synergy between different theoretical perspectives. Finally, the field of management is also improving in terms of research methods and technological development and is undergoing a transition from a power–change paradigm to a configuration paradigm. Existing research also happens to lack the exploration of the causal complexity of the resilience of high-tech SMEs. In view of this, this study uses a fuzzy-set qualitative comparative analysis (fsQCA) approach to explore the configuration effects of financial resources, relationship resources, managerial abilities, innovation capabilities, the market environment, and government intervention on the organizational resilience of high-tech SMEs. This approach reveals how different antecedent conditions combine to produce outcomes [37], enabling complex causal analysis to be represented methodologically. It is particularly applicable in the study of organizational resilience, as it provides deeper empirical and theoretical insight into the factors and their interactions that affect the resilience of high-tech SMEs. This study answers the following questions: (1) whether the key antecedent conditions from the "resource–capability–environment" perspective constitute the necessary conditions for the resilience of high-tech SMEs; (2) how the key antecedent conditions are coupled to

stimulate the resilience of high-tech SMEs; and (3) whether the paths of high resilience of high-tech SMEs are the same as those of non-resilient ones.

The remainder of this paper is structured as follows: Section 2 reviews the literature on high-tech SMEs and organizational resilience; Section 3 presents the research methodology, data and sample, measurements, and calibration; Section 4 conducts a sufficiency and necessity analysis of organizational resilience and performs a robustness test; and Section 5 presents the conclusions, discussion, main contributions, and future research directions.

2. Theoretical Backgrounds

2.1. High-Tech SME Resilience

The resilience of high-tech SMEs is inextricably linked to crisis management [10,38–40]. SMEs have been plagued by two problems—vulnerability to and recovery from disruptions [41]—that pose major threats to the sustainability of high-tech SMEs, and maintaining resilience is an important means for them to cope with these problems [42]. For large firms, planning, resource abundance, formal processes and systems, and redundancy are all vital to developing resilience; however, SMEs may face significant deficiencies in these areas and, thus, require further consideration of the development factors for SME resilience [43]. Existing research has focused on firms' capabilities and resources. Regarding capabilities, managers with high capabilities can quickly perceive the environment and adequately coordinate the available resources for the firm's long-term development; thus, managerial abilities at the individual level are recognized by most researchers. For example, Liu et al. [44] showed that positive entrepreneurial thinking is positively associated with SME resilience. In terms of the organizational aspects of competencies, innovation competencies, change management process competencies, and dynamic competencies have also attracted the attention of researchers. Agile organizations, with characteristics such as resilience and innovation, are considered as having the key factors for business success [45]. Ates and Bititci [46] suggested that a firm's ability to develop and implement change is critical to achieving sustainability and resilience in SMEs. Zighan and Ruel [47] noted that the resilience of SMEs in the short and long term can be enhanced through continuous improvement. He et al. [48] explored the relationship between digital transformation and organizational resilience and noted that the intensity of transformation management can help employees grow their capabilities in the face of crises. Regarding resources, most researchers have focused on firms' relational resources and have argued that SMEs can gain resilience by building relationships. Branicki et al. [43] argued that the sources of resilience acquired by SMEs are often relationships, contexts, attitudes, and behaviors, and entrepreneurs play a key role in promoting resilience. The network resources established by firms before a crisis have a positive impact on and can be translated into organizational resilience using dynamic capabilities [9]. In addition, digitally mature SMEs perform better in terms of organizational resilience and can improve this resilience by enhancing digital leadership [49]. Furthermore, SMEs can develop their resilience potential by adapting their strategic assets and capabilities [50]. Despite the growing literature on organizational resilience, research on SME resilience is still limited. In particular, there is a lack of empirical studies on how SMEs achieve resilience [41,51].

2.2. Financial Resources and Organizational Resilience

Financial resources are some of the key resources of high-tech SMEs, reflect a firm's readily available resources, and play an important cushioning role when firm are faced with a crisis [52]. Cash holdings are a large part of SMEs' assets [53] and not only contribute to firm performance [54,55] but also help firms prepare before a crisis and overcome disasters [25]. Colombo et al. [56] pointed out that when encountering a crisis, high-tech SMEs are faced with threats, such as credit crunches and financing difficulties; thus, internal cash flow become an important resource for them to manage a crisis. For precautionary motives, firms can build cash reserves to cope with uncertainty risks and avoid capital

chain breakdowns. If firms can sustain these investments, then they have better chances of survival, stronger growth, and higher profitability [57].

2.3. Relationship Resources and Organizational Resilience

Relationship resources reflect the strength, quality, persistence, and intimacy of the value ties between a firm and its customers, partners, and suppliers [58]. Relationship resources are closely related to organizational resilience, and by maintaining relationships with various stakeholders, firms can have reliability and flexibility and ultimately build resilience [59]. Madrid-Guijarro et al. [60] showed that firms with longer-lasting relationships with banks face fewer financing constraints during a crisis. The building of better relationships with employees can create coping resources for and increase organizational resilience [27,61]. In addition, a firm can use its relational resources to access knowledge and resources that influence its recovery from a crisis [38]. Zeng et al. [62] examined Chinese manufacturing SMEs and found that interfirm cooperation had a significant positive impact on SME innovation performance. Thus, relationship resources are closely related to organizational resilience. By maintaining relationships with various stakeholders, companies can gain reliability and flexibility and build resilience.

2.4. Managerial Ability and Organizational Resilience

Managerial ability refers to the ability of managers to generate revenue for the firm given certain resource constraints [63]. Managerial ability is present throughout the different stages of a crisis that an organization is experiencing, and strong crisis leadership provides good management and decision making for business success [64]. Leaders who build relationships of trust, empowerment, motivation, and commitment among employees and other stakeholders through their own abilities can effectively nurture and enhance organizational resilience, which in turn can help deal with daily challenges and severe shocks [65]. The literature states that managers with high ability have better performance in the face of uncertainty [66], higher levels of innovation [67], and better performance [68,69].

2.5. Innovation Capability and Organizational Resilience

Innovation is a powerful trigger for the organizational resilience of high-tech SMEs in a crisis context [6] and a source of sustained competitiveness for high-tech SMEs [70]. In a highly competitive market, the superior performance of firms comes mainly from continuous innovation within the firm [71]. Teixeira and Werther [16] asserted that the innovation process and its management form the basis of a resilient organization. Innovation contributes to organizational resilience because it enables organizations to renew themselves over time [72]. Moreover, Wenzel et al. [73] stated that firms can respond to crises through four strategies—austerity, perseverance, innovation, and exit—with innovation being the strategic renewal of organizations in response to crises. Firms with long-term innovation activities are adept at capturing a dynamic business environment and complex market changes and creatively using organizational resources to provide additional competitive advantages to the firm. Moreover, firms can develop their flexibility and adaptability through product diversification during a crisis [10].

2.6. Market Environment and Organizational Resilience

Organizational resilience can be affected by the degree of competition in the marketplace. Competition has both creative and destructive effects. At the firm level, the degree of market competition affects not only managers' decisions and awareness [74,75] but also firm behavior [76]; e.g., a highly competitive market environment increases firms' technological innovation activities [77], which is a core competency of firms in developing resilience. At the macro level, firms in highly competitive regions face a better market and financial and legal regulatory systems, which can provide an adequate and soft environment for firms. At the same time, the government reduces the distortion of resource allocation by administrative monopolies and facilitates the functioning of market mechanisms [78].

However, these actions can also have a disincentive effect on firms. The destructive effect of market competition can increase the survival pressure placed on firms, forcing them to increase their investments in innovation and increasing the burden placed on their innovation resources [70]. Moreover, higher market competition is prone to malicious competition, such as product imitation [79], which makes customers' needs change rapidly and poses a great threat to managers.

2.7. Government Intervention and Organizational Resilience

Government intervention can have both positive and negative effects on high-tech SME resilience. On the one hand, governments can provide institutional and policy support for firm development through "helping hands" [80], which include government subsidies [81], credit guarantees [82], tax breaks [83], etc. These supportive behaviors can alleviate the problems related to the financing and production difficulties faced by high-tech SMEs and promote their research and development (R&D) and innovation. On the other hand, in the process, government intervention can play the role of a predatory hand [84] because the government's goals are inconsistent with those of the firm. The government interferes more or less in firm operations, relying on firms to shoulder their pressure, such as increasing jobs and assuming corporate social responsibility (CSR). Such actions can increase costs for firms and, thus, affect their performance [85,86] and inhibit their growth. Furthermore, due to information asymmetry, the government does not have comprehensive information on enterprises, thus affecting managers' decisions in the intervention process and then affecting enterprises' resource allocation [87], which is not conducive to the shaping of the resilience of high-tech SMEs.

In summary, factors of firm resources, capabilities, and the external business environment can have an impact on the resilience of high-tech SMEs. This study uses the fsQCA method to explore the complex dependencies between various interrelated conditions and equivalent paths. The research model of this paper is shown in Figure 1.

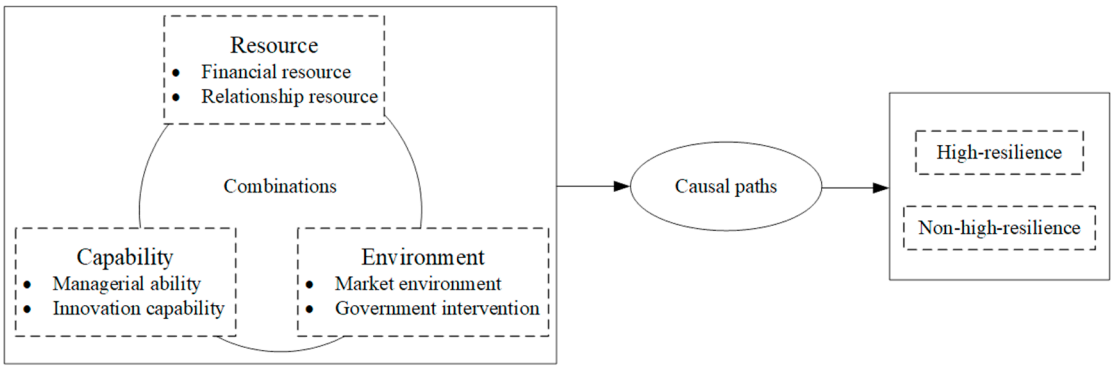

Figure 1. Research framework.

3. Design and Method

3.1. Methods

This paper uses the fsQCA approach to explore the causal and complex mechanisms affecting the resilience of high-tech SMEs. fsQCA is based on set theory and is particularly suitable for analyzing complex cause-and-effect relationships, enabling a holistic exploration of the effects of combinations of different antecedent conditions on outcomes [37]. This method is applicable to not only the analysis of small and medium-sized sample cases but also the analysis of large sample cases, combining the advantages of both qualitative and quantitative analysis. The qualitative comparative analysis (QCA) approach is particularly applicable to the study of the resilience of high-tech SMEs; by conceptualizing cases as different types of attribute configurations, QCA is able to capture the three elements of causal complexity—conjunction, equifinality, and asymmetry [37,88]. Conjunction implies that attributes may not affect outcomes in isolation from one another; i.e., multiple factors

may interact with one another and, thus, lead to organizational resilience among high-tech SMEs. Equifinality means that there are multiple configurations that lead to the same outcome; i.e., there is more than one path that causes high and non-high resilience in high-tech SMEs. Asymmetry implies that the cause of the occurrence of a certain outcome is not necessarily the opposite of its missing cause; i.e., the combination of conditions that produce high resilience is asymmetric to that of conditions that produce non-high resilience [89]. There are three main types of QCA, namely, clear-set qualitative comparative analysis (csQCA), multivalue set qualitative comparative analysis (mvQCA), and fsQCA [90]. Since fsQCA is more suitable for dealing with continuous conditions, this study uses it for analysis.

3.2. Data and Sample

The research period of this paper is 2021, and manufacturing SMEs listed on the growth enterprise market (GEM) of the Shenzhen Stock Exchange were selected as the research object. The reasons for choosing GEM manufacturing enterprises as the research object are as follows: (1) GEM is a supplement to the main board, and most companies listed on the GEM in China are technology innovative and generally small, providing a good background against which to study high-tech SMEs [91]; and (2) the manufacturing industry covers a wide range of enterprises and is well represented [92]. To ensure the validity of the research results, special treatment (ST) and ST* companies and those with missing data were excluded, and 592 sample companies were finally obtained. Among them, CSR data were from Hexun.com, government intervention data came from the statistical bulletins of cities in China, and the rest of the data were from the WIND database.

3.3. Measurements

3.3.1. Outcome Condition

Organizational resilience. The measurement methods of organizational resilience can be divided into two categories: direct and indirect methods. Direct methods measure organizational resilience by designing measurement scales, while indirect methods usually select publicly available financial data and design indicators for calculation [93]. Considering data availability, the indirect method is more appropriate for this study. Typically, there are two more common practices: one enables a consideration of organizational resilience as a firm's requirement for long-term survival and growth and an observation of the firm's long-term organizational outcomes [20], and the other enables an observation of the firm's outcomes after being subjected to specific environmental shocks [12]. The study period is 2021, just after the COVID-19 shock, and the second of the abovementioned methods was chosen as more appropriate for this study. Referring to Tognazzo et al. [26], the average of the return on assets (ROA) for 2020–2021 was chosen to measure organizational resilience.

3.3.2. Antecedent Conditions

(1) Financial Resources. Since SMEs are particularly vulnerable to cash flow constraints during crises, this paper used the level of cash holdings of firms to measure their financial resources, referring to Xiao et al. [94], which used "cash and cash equivalents/(total assets–cash and cash equivalents)".

(2) Relationship Resources. By fulfilling CSR, companies can maintain relationships with multiple stakeholders and build an extensive network of knowledge and resources [59]. Thus, CSR can be a good measure of a company's relationship resources. Referring to Zhang et al. [95], the average of the 2018–2020 scores of Hexun.com's CSR report of the rating system for listed companies was selected to measure the CSR performance of the sample companies.

(3) Managerial Ability. A data envelopment analysis (DEA)–tobit model was used to measure managerial ability [63] as the DEA method measures the full efficiency of the firm, and the tobit model decomposes firm efficiency into firm- and manager-level factors.

In the first stage, maximum firm efficiency was calculated by DEA. The output indicators were operating revenue (Sales), and the input indicators were net fixed assets (PPE), net intangible assets (Instan), goodwill (GW), R&D expenditures (R&D), operating costs (Cost), and the sum of selling and administrative expenses (Sga).

$$\text{Maximum firm efficiency} = \frac{\text{Sales}}{\varphi_1\text{PPE} + \varphi_2\text{Instan} + \varphi_3\text{GW} + \varphi_4\text{R\&D} + \varphi_5\text{Cost} + \varphi_6\text{Sga}} \quad (1)$$

In the second stage, managerial ability was estimated. The tobit method was used to decompose firm efficiency into firm- and manager-level factors, and the remaining residual was the level of managerial ability. Firm-level factors were selected as firm size (lnSize), measured using the natural logarithm of total assets at the end of the period; market share (Ms); free cash flow (Fcf), which takes a value of 1 when free cash flow exists and 0 otherwise; listed years (lnAge), the natural logarithm of the number of years a firm has been on the market; degree of internationalization (Fci), which takes a value of 1 when overseas operations exist and 0 otherwise; and diversification degree (Bsc), measured using the Herfindahl–Hirschman Index (HHI).

$$\text{Firm efficiency} = \alpha_0 + \alpha_1\text{lnSize} + \alpha_2\text{Ms} + \alpha_3\text{Fcf} + \alpha_4\text{lnAge} + \alpha_5\text{Fci} + \alpha_6\text{Bsc} + \varepsilon \quad (2)$$

Residuals were assigned values from largest to smallest and divided into four groups of 4, 3, 2, and 1, with larger values indicating stronger managerial abilities.

(4) Innovation Capability. The current research mostly used the ratio of R&D expenditure to prime operating revenue, the ratio of R&D technicians to the total number of employees, and the number of patents applied for by the enterprise to measure innovation capability [96]. Referring to Li and Liu [97], this paper used the ratio of annual R&D expenditures to prime operating revenue to measure innovation capability.

(5) Market Environment. The market environment was measured by the degree of market competition, and the degree of industry concentration, expressed as the industry HHI, was used to reflect the degree of market competition [98]. The higher the value, the greater the market concentration and the weaker the degree of market competition; therefore, its inverse was taken during data processing.

(6) Government Intervention. Government intervention is expressed as the ratio of local fiscal expenditures to local gross domestic product (GDP) [99,100], with larger ratios indicating greater government intervention. The conditions and measurements are shown in Table 1.

Table 1. Variables and measurement.

Variables	Measurement	Sources	References
Organizational resilience	The average ROA for 2020–2021	WIND Database	[26]
Financial resource	Cash and cash equivalents/(total assets–cash and cash equivalents)	WIND Database	[94]
Relationship resource	Average of the 2018–2020 scores of Hexun.com's CSR report	Hexun.com	[95]
Managerial ability	The DEA–Tobit model	WIND Database	[63]
Innovation capability	The ratio of annual R&D expenditure to prime operating revenue	WIND Database	[96,97]
Market environment	The inverse of HHI	WIND Database	[98]
Government intervention	The ratio of local fiscal expenditures to local GDP	Statistical bulletins of cities in China	[99,100]

3.4. Calibration

Using fsQCA, it is first necessary to calibrate all elements of the case to degrees of membership from 0 to 1. There are two calibration methods, direct and indirect. The direct method is more common in research [90] and thus was used in this study. Then, three thresholds, namely, the thresholds for full-set membership (0.95), intermediate-set

membership (0.5), and full-set non-membership (0.05), need to be determined [37]. Using the fsQCA method requires the full consideration of theoretical studies and practical experience in the calibration process, and for some conditions lacking theoretical bases and practical reference, the mainstream practice is to use objective quantile values of the data to determine three anchor points. Due to the lack of theoretical experience and practical reference, this study used quantile points for calibration. Referring to the literature, this paper chose 80%, 50%, and 20% as the above three thresholds [101]. To avoid cases with a membership score of 0.5, which are difficult to analyze, we added 0.001 to membership scores less than 1 [89]. The descriptive statistics and calibration information of the outcome and condition conditions are shown in Table 2.

Table 2. Descriptive statistics and calibration points.

Variables	Descriptives				Calibration		
	Mean	SD	Min	Max	0.95	0.5	0.05
Organizational resilience	0.051	0.088	−0.356	0.777	0.102	0.052	0
Financial resource	0.258	0.244	0.011	1.753	0.379	0.174	0.089
Relationship resource	18.885	6.981	−4.043	33.627	24.766	20.735	12.528
Managerial ability	2.5	1.118	1	4	4.000	2.500	1.000
Innovation capability	0.073	0.073	0	1.109	0.093	0.053	0.037
Market environment	33.366	17.065	2.069	71.983	39.592	30.332	25.197
Government intervention	0.139	0.041	0.059	0.420	0.179	0.133	0.107

4. Results

4.1. Necessity Analysis

Analysis of the necessary conditions was first performed using fsQCA 3.0. A condition is necessary for an outcome to occur if it is always present when the outcome occurs [88]. The consistency level is an important measure of necessity, which lies between 0 and 1; the higher the value, the stronger the degree of consistency. A condition is considered necessary to produce the results if the consistency level of an antecedent condition is greater than 0.9 [37] The results of the necessity analysis for antecedent conditions are shown in Table 3 and show that for both high resilience and non-high resilience, the consistency level of a single condition was not higher than 0.9 and therefore did not constitute a necessary condition.

Table 3. Analysis of necessary conditions.

Causal Conditions	High Resilience		Non-High Resilience	
	Consistency	Coverage	Consistency	Coverage
Financial resource	0.650	0.675	0.461	0.464
~Financial resource	0.484	0.481	0.677	0.652
Relationship resource	0.801	0.805	0.355	0.345
~Relationship resource	0.348	0.358	0.799	0.796
Managerial ability	0.671	0.680	0.492	0.483
~Managerial ability	0.490	0.499	0.674	0.665
Innovation capability	0.552	0.581	0.551	0.562
~Innovation capability	0.583	0.573	0.588	0.560
Market environment	0.567	0.586	0.505	0.506
~Market environment	0.522	0.521	0.586	0.567
Government intervention	0.553	0.582	0.547	0.558
~Government intervention	0.579	0.569	0.590	0.561

Note: the symbol~denotes the absence of a condition.

4.2. Sufficiency Analysis

After necessity analysis, sufficiency analysis was performed for the conditions that produced high and non-high resilience. A truth table was constructed based on the calibrated measurements. Since there were 6 antecedent conditions, a truth table containing 64 (2^6) rows was obtained. Then, two criteria, namely, the frequency and consistency thresholds, needed to be defined. The frequency threshold ensures the minimum number of observations; for cases with a sample size greater than 150, the frequency threshold can be chosen as 3 or higher [90]. If there is no theoretical reason to set case thresholds, then at least 80% of cases should be retained [102]. In this study, 3 was chosen as the frequency threshold to meet these requirements. Consistency thresholds were used to distinguish the causal combinations that were a subset of outcomes from those that were not, and, consistent with previous studies, 0.8 was chosen as the consistency threshold in this paper [89,103,104]. Proportional reduction in inconsistency (PRI) was used to avoid simultaneous subset relations between the outcome and the negation of the outcome. To reduce the number of potential contradictory configurations, PRI consistency was set to 0.75 [105]. Appendix A shows the truth table of the sufficiency analysis of high resilience.

Then, standard analysis was performed using the refined truth table, and three results appeared: the complex, intermediate, and parsimonious solutions. Consistent with existing studies, this work reported intermediate solutions supplemented by parsimonious solutions [106,107]. Parsimonious solutions included all possible counterfactuals in the analysis, while intermediate solutions used the available theoretical knowledge and empirical evidence to distinguish between plausible and unrealistic counterfactuals [108].

The results were reported according to the formulation of Ragin [37] and Fiss [89], where a large black circle indicates the core condition (present in both the parsimonious and intermediate solutions), a small black circle indicates the peripheral condition (present only in the intermediate solution), a large crossed-out circle indicates the absence of core conditions, a small crossed-out circle indicates the absence of peripheral conditions, and the blank space is an ambiguous state, indicating that the condition can be either present or absent. The results of sufficiency analysis are shown in Table 4.

Table 4. Analysis of sufficient conditions.

Causal Condition	High-Resilience						Non-High Resilience	
	H1	H2	H3	H4	H5	H6	NH1	NH2
Financial resource	●	●		●			⊗	⊗
Relationship resource	●	●	●	●	●	●	⊗	⊗
Managerial ability		●	●			●	⊗	
Innovation capability	⊗				⊗	●		
Market environment			●	⊗	⊗			⊗
Government intervention				⊗	●	⊗		⊗
Consistency	0.884	0.898	0.904	0.880	0.891	0.919	0.908	0.896
Raw coverage	0.328	0.385	0.356	0.204	0.165	0.202	0.422	0.256
Unique coverage	0.028	0.018	0.074	0.022	0.029	0.014	0.226	0.060
Solution consistency	0.875						0.903	
Solution coverage	0.623						0.482	

4.2.1. Sufficiency Analysis of High Resilience

Consistency and coverage were used to explain the quality of the results. Consistency indicates the extent to which a configuration is a subset of an outcome, and coverage describes the extent to which the outcome can be explained by the configuration. Unique

coverage indicates that cases are uniquely interpreted by that solution [37]. The results showed (Table 4) that sufficiency analysis yielded six high-resilience configurations, each of which made a unique contribution to high resilience among high-tech SMEs. The solution consistency was 0.875, which is a high level. The solution coverage was 0.623, indicating that these six configurations explained approximately 62.3% of the cases of high resilience. Configuration H1 included the existence of the core conditions of financial and relational resources and the absence of innovation capabilities. Configuration H2 was a combination of financial resources, relationship resources, and managerial ability, which were all peripheral conditions. Configuration H3 included relationship resources, managerial capabilities, and the market environment as core conditions. Configuration H4 included financial and relationship resources but lacked the market environment and government intervention, with all four conditions being core conditions. Configuration H5 was a combination of the core conditions of relational resources, government intervention, lack of innovation capability, and lack of a market environment. Configuration H6 was a combination of relational resources, managerial ability, innovation capability, and the absence of government intervention, where government intervention was a peripheral condition and the others core conditions.

Combining the core conditions and their explanatory meaning, this study identified three types of driving paths for high resilience among high-tech SMEs. The first path was the "resource–capability" driving path, which consisted of Configurations H1 and H2. The core or peripheral conditions of these two configurations covered both resources and capabilities. The second type was "resource–capability–environment" driven, which included Configurations H3, H5, and H6. The core or peripheral conditions of these three configurations covered the above three levels, so they were named as such. The third type was "resource–environment" driven. This drive path included Configuration H4, a configuration with core conditions that covered resource- and environment-level factors; therefore, it was called the "resource–environment".

4.2.2. Sufficiency Analysis of Non-High Resilience

Unlike regression analysis, fsQCA is able to explore the asymmetry of causal conditions, namely, whether the combination of causal conditions associated with the high resilience of high-tech SMEs is different from that of conditions associated with non-high resilience. The sufficiency analysis of non-high resilience is presented in Table 4, the findings of which highlighted the asymmetry of causality; that is, the combination of conditions that generated high resilience among high-tech SMEs was asymmetric to that of conditions that generated non-high resilience. There were two configurations of non-high resilience: NH1 and NH2. The overall consistency showed a high level of 0.903. Solution coverage was 0.482, indicating that these two configurations explained 48.2% of the cases. Configuration NH1 was a combination of a lack of financial resources, relationship resources, and managerial ability as core conditions. Configuration NH2 had something in common with Configuration NH1 in that both financial and relational resources were missing as core conditions; the difference is that Configuration NH2 emphasized the absence of a market environment and government intervention as core conditions.

Combining the core conditions and their explanatory implications, there were two types of non-high resilient driving paths for high-tech SMEs. The first path was the "resource–capability" inhibition type. The core condition of Configuration NH1 covered both resources and capabilities, and so it was named as such. The second path was "resource–environment" inhibition. The core condition of Configuration NH2 covered both resources and the environment, and so it was named as such.

4.3. Robustness Analysis

The results were robust if the findings of necessity and sufficiency resulting from different robustness testing methods were adequately similar and if there was no substantial difference between consistency and coverage [88]. This study chose to vary the consistency and frequency thresholds to perform the robustness test (Tables 5 and 6).

Table 5. Robustness test (consistency threshold changed from 0.8 to 0.89).

Causal Condition	High Resilience					Non-High Resilience	
	H1	**H2**	**H3**	**H4**	**H5**	**NH1**	**NH2**
Financial resource	●	●				⊗	⊗
Relationship resource	●	●	●	●	●	⊗	⊗
Managerial ability		●	●		●	⊗	
Innovation capability	⊗			⊗	●		●
Market environment			●	⊗			⊗
Government intervention				●	⊗		⊗
Consistency	0.884	0.898	0.904	0.891	0.919	0.908	0.896
Raw coverage	0.328	0.385	0.356	0.165	0.202	0.422	0.256
Unique coverage	0.045	0.018	0.074	0.029	0.014	0.289	0.047
Solution consistency			0.883			0.906	
Solution coverage			0.600			0.435	

Table 6. Robustness test (frequency threshold changed from 3 to 4).

Causal Condition	High Resilience						Non-High Resilience	
	H1	**H2**	**H3**	**H4**	**H5**	**H6**	**NH1**	**NH2**
Financial resource	●	●		●		⊗	⊗	⊗
Relationship resource	●	●	●	●	●	●	⊗	⊗
Managerial ability		●	●	⊗		●	⊗	
Innovation capability	⊗				⊗	●		
Market environment			●	⊗	⊗			⊗
Government intervention	⊗	●		⊗	●	⊗		⊗
Consistency	0.891	0.908	0.904	0.876	0.891	0.894	0.908	0.896
Raw coverage	0.237	0.253	0.356	0.136	0.165	0.128	0.422	0.256
Unique coverage	0.048	0.016	0.098	0.022	0.035	0.014	0.226	0.060
Solution consistency			0.884				0.903	
Solution coverage			0.595				0.482	

First, this work used different consistency thresholds for robustness testing [109]. By raising the consistency threshold from 0.8 to 0.85, the solution consistency and coverage remained unchanged for high and non-high resilience. By raising the consistency threshold from 0.80 to 0.89, the solution consistency of high resilience was raised from 0.875 to 0.883, and coverage was reduced from 0.623 to 0.600, with no substantial changes. From these configurations, only the original Configuration H4 configuration disappeared, and the rest of the configurations did not undergo any changes. The solution consistency of non-high resilience was raised from 0.903 to 0.906, and solution coverage was reduced from 0.482 to

0.435, without substantial changes. Configuration NH1 was not changed, and the newly generated Configuration NH2 was a subset of original Configuration NH2. Therefore, the conclusions of this paper remained robust after increasing the consistency threshold.

Second, this study used a different frequency threshold for robustness testing [103]. By increasing the frequency threshold from 3 to 4, the solution consistency of high resilience increased from 0.875 to 0.884, and coverage decreased from 0.623 to 0.595, with only a slight change. Only the peripheral conditions changed for the high-resilience configurations, the core conditions remained unchanged, and the newly generated configurations were a subset of the original configurations, and the interpretation of the results did not substantially change. The non-high resilience configurations did not change. The above robustness test results were not substantially different from the original results, indicating that the findings of this paper were very robust.

5. Conclusions and Discussion

5.1. Conclusions

Faced with an increasingly complex global business environment, high-tech SMEs are facing various crises and challenges, and "resilience first" has become an important development strategy for enterprises. Although studies have explored the influencing factors of high-tech SME resilience, the analysis is mostly focused on the "net effect" at the variable level and ignores the "joint effect" among multiple variables that jointly determine the outcome. In view of this, based on the "resource–capability–environment" perspective, this study explores the configuration effect of six antecedents (financial resources, relationship resources, managerial ability, innovation capability, the market environment, and government intervention) on the resilience of high-tech SMEs and explores the formation mechanism of the high-tech SME resilience and its inherent complex causal relationships. Based on fsQCA, this study finds that (1) the influence of individual conditions on organizational resilience is weak, and thus synergy among the conditions is needed; in other words, the organizational resilience of high-tech SMEs is the result of multiple factors. (2) There are six configurations that can generate high resilience among high-tech SMEs, which are classified into three types, namely, "resource–capability", "resource–capability–environment", and "resource–environment" driven, by combining their core conditions and the explanatory meaning behind them; two types of non-high resilience driving paths are identified, namely, "resource–capability" and "resource–environment" inhibition. (3) The causal combination of high resilience is different from that of non-high resilience, i.e., the paths that lead to high resilience are asymmetric to those that lead to non-high resilience.

(1) "Resource–capability" driven. This driving path consists of Configurations H1 and H2. The actual meaning of Configuration H1 is that for high-tech SMEs with low innovation capability, strong resilience can be generated by higher financial resources and better relationship resources. Abundant financial resources can help firms withstand adversity before a crisis hits [25], and firms can use their idle financial resources to invest in various areas, such as innovative activities to enhance their core competencies [110] and CSR to gain political legitimacy [111]. Relational resources can provide stability and flexibility to high-tech SMEs to navigate even in the face of crises [20,59]. Moreover, firms that perform well in this area also face lower capital constraints [112], a good mutual reinforcement that fully reflects the interaction between financial and relational resources. Given the interaction between financial and relational resources, even less innovative high-tech SMEs can maintain a high level of resilience.

A typical example of this configuration is Senba Sensing Technology Co., Ltd., Nanyang, China (Senba), which had CNY 387 million in cash in the bank and on hand in 2021, and its bank deposits at any time for payment reached CNY 310 million. Senba pays excellent attention to the utilization of financial resources. The company often manages its existing idle funds in cash and purchases medium- and low-risk financial products with high levels of safety and liquidity. This behavior ensures the adequacy of corporate funds and largely avoids the excessive idleness of funds. At the same time, the company establishes

a sound modern enterprise system and continuously improves its corporate governance. Senba commits to building long-term trust and win–win relationships with investors, protecting investors' legitimate rights and interests, especially those of small and medium-sized investors, and builds win–win partnerships with its partners. However, Senba's R&D investment is low. The amount of R&D investment of Senba in 2021 was only CNY 13 million, accounting for 4.21% of its revenue, thus affecting the expansion of its R&D team and the output of its R&D results.

Configuration H2 indicates that high resilience can be achieved by high-tech SMEs with better financial and relational resources and stronger managerial ability. Since high-tech SMEs lack significant resources and administrative systems, they rely more on managerial ability to ensure their performance [113,114]. The dynamic capabilities of managers help identify, create, and integrate key resources for SME survival and growth [115]. By establishing a good network of formal or informal relationships with customers, partners, the government, financial institutions, etc., managers can bring a large amount of information resources to the company and, thus, effectively promote its development. Financial resources are more conducive for managers when making decisions and allocating resources to long-term investments that maintain the competitiveness of the company, rather than focusing only on short-term profits. Therefore, highly competent managers need to have good financial and relationship resources to stimulate the high resilience of high-tech SMEs.

A typical example of this configuration is Chengdu Galaxy Magnet Co., Ltd., Chengdu, China (Galaxy Magnet), which had CNY 610 million in cash in the bank and on hand at the end of 2021, accounting for 41.02% of total assets, and cash and cash equivalents of CNY 600 million, with abundant cash flow reserves, doubling the company's sustainable operation. Galaxy Magnet actively maintains investor relations, uses the funds raised prudently to ensure the safety of the company's capital, and continuously provides employee rights protection to strengthen its good ties with employees. Moreover, the company's executive team is highly specialized and diversified, with both professional and technical personnel, as well as efficient management-oriented personnel and mixed technical–management personnel. The company had 50 managers in 2021, accounting for 3.79% of all employees of the company. The company's management staffing is considered appropriate, and the expense ratio is well controlled, making it a pragmatic and efficient team.

(2) "Resource–capability–environment" driven. This path includes Configurations H3, H5, and H6. H3 indicates that for high-tech SMEs, good relational resources, high managerial ability, and a highly competitive market environment can lead to high resilience. Moreover, Sadeghi [116] stated that policies and regulations, technological factors, and entrepreneur characteristics are the most important factors for the success of high-tech SMEs. Corporate relationship resources provide managers with more useful information, and competent managers have a better understanding of industry trends and the environment and thus can more accurately predict product demand and use resources effectively. In addition, the managerial ability of high-tech SMEs can be influenced by the external business environment, especially the market environment. A highly competitive market environment drives small firms to engage in technological innovation to enhance competitiveness [117]. Thus, the combination of a highly competitive market environment, competent managers, and good relationship resources is conducive to stimulating high organizational resilience.

A typical case of configuration H3 is Beijing Strong Biotechnologies, Inc., Beijing, China (BSBE). This company maintains relationships with shareholders and investors and pays particular attention to social health. BSBE not only undertakes national projects but also focuses on industry, academia, research, and application and actively cooperates with hospitals and related associations in research. The company's senior management team is highly qualified and experienced. The company's chairperson, Mr. Zou, also one of the founders of BSBE, was the deputy director of the Key Open Laboratory for Young Scientists of the Chinese Academy of Sciences, and has solid professional skills. He focuses on the company's innovative R&D and responds to market changes while considering customer

needs. Finally, the company is registered in Zhongguancun, Beijing, with a good business environment. Beijing has been committed to optimizing the business environment for enterprises and creating a more convenient market environment, thus causing its market environment level to be at the forefront of Chinese provinces and cities.

Configuration H5 shows that companies with low innovation capability and a market environment can still achieve high resilience through good relationship resources and stronger government intervention. Government intervention can not only facilitate financing for firms but also bring about a range of policy benefits that help firms better recover from a crisis. By interacting with good relational resources, firms can shape high resilience, even if they are not successful at innovation.

The typical case of configuration H5 is Qinhuangdao Tianqin Equipment Manufacturing Co., Ltd., Qinhuangdao, China (Tianqin Equipment). Tianqin Equipment has ramped up its research efforts in military products after being listed. The company has been in close contact with research institutions and research talent and has established close cooperation with core customers, domestic military customers, and raw material suppliers. The R&D investment of Tianqin Equipment in 2021 was CYN 10.22 million, accounting for 4.24% of revenue, which was 4.63% in 2020 and 4.91% in 2019. During 2019–2021, the ratio of R&D investment to revenue decreased yearly. Tianqin Equipment has recently received government subsidies, such as a development fund and a special fund for transformation and upgrading. In response to the difficulties brought about by COVID-19, Qinhuangdao city has issued a series of support documents to increase enterprise support.

Configuration H6 shows that good relationship resources, competent managers, and innovative capabilities can give rise to high resilience among high-tech SMEs when the peripheral condition of government intervention is absent. Innovation helps SMEs not only respond flexibly to environmental changes but also exploit their technological resources and use them to obtain a competitive advantage [118]. Innovation capabilities can facilitate the development of new products and services and reduce the impact of crisis events on firms. However, the innovation process has long investment cycles and high uncertainty and risk; therefore, high-tech SMEs need better resources, capabilities, and policy support in the innovation process.

A typical case of H6 is Nanhua Instruments Co., Ltd., Foshan, China (Nanhua). Nanhua focuses on standardized governance and relationship maintenance. The company establishes good connections with communities, residents, and public groups. The management of Nanhua consists of employees from the company's start-up period, basically professional, technical, and sales staff. Nanhua cooperates with training institutions and universities by setting up annual training programs to enrich the management composition and improve the management level. Nanhua pays attention to the cultivation of independent innovation capability according to the development dynamics of the industry and customer requirements and constantly conducts R&D according to the industry and customer requirements. In 2021, Nanhua had a high R&D investment totaling CYN 18.42 million, accounting for 10.11% of its revenue. Nanhua is located in Foshan city, Guangdong Province. Guangdong Province has committed to optimizing the business environment for enterprises. The "doing business" report of Guangdong Province shows that Foshan city, where Nanhua is located, was in second place in 2021, indicating that Nanhua is in a city with a good business environment where companies are subject to less government intervention and thus can develop smoothly.

(3) "Resource–environment" driven. This path includes Configuration H4, which indicates that good financial and relationship resources can generate high resilience in a poor market environment with little government regulation. Reduced market competition facilitates firms' access to financial support; more importantly, the stability and predictability of interfirm competitive behavior reduces innovation costs and uncertainties [119]. Government intervention is considered a double-edged sword, both supporting and inhibiting businesses. The inhibiting effect of government interventions can increase the cost of doing business and put a more significant burden

on business, while reducing such interventions can allow the company to run better. Companies can rely on their strong financial and relationship resources to effectively mitigate the difficulties they face.

A typical case of this configuration is Weihai Guangwei Composites Co., Ltd., Weihai, China (GW COMPOS), which at the end of 2021 had CYN 1.949 billion in cash in the bank and on hand. In August 2021, GW COMPOS launched a revenue factoring business to obtain liquidity support and accelerate working capital. The company has signed long-term framework agreements and established mutual trust and stable cooperative relationships with major suppliers. GW COMPOS is registered in Weihai city, Shandong Province, and its market environment is relatively poor compared to those of first-tier cities such as Beijing, Shanghai, and Guangzhou. In June 2021, China's State Council issued a notice to carry out the "separation of licenses" reform to reduce the degree of government intervention in the business process, promoting the healthy and rapid development of China's defense equipment-supporting industry.

(4) "Resource–capability" inhibition. This path contains Configuration NH1, which indicates that non-high financial resources, relational resources, and managerial ability can lead to the occurrence of non-high resilience in high-tech SMEs. Since high-tech SMEs often invest too much and have long R&D activity cycles, they face serious financing constraints [120], and the lack of financial resources is often one of the key factors inhibiting their growth [121]. Companies that lack relationship resources are at a disadvantage in terms of access to external information and resources. Managers are one of the most important parts of high-tech SMEs, and firms with less capable managers are at a disadvantage in terms of resource allocation. Thus, firms are inhibited by these three antecedent conditions in terms of generating non-high resilience.

A typical case of configuration NH1 is Blivex Energy Technology, Xi'an, China (Blivex). As the price of raw materials rose much higher than that of products, the enterprise's relatively low-capability utilization rate led to high production costs. In 2021, the book value of Blivex's cash in the bank and on hand was CYN 58,255,100, and in the case of insufficient funds, Blivex still chose to make expansion investments in new projects. Regarding relationship resources, Blivex had 809 employees on board in 2020 and only 304 employees in 2021. The significant layoffs during the COVID-19 crisis could have been more conducive to maintaining relationship resources. Regarding managerial competencies, Blivex completed its board reorganization in June 2020, substantially changing the configuration of the company's board of directors.

(5) "Resource–environment" inhibition. This path contains Configuration NH2, which indicates that high-tech SMEs with poor financial and relational resources are non-highly resilient in a poor market environment and with little government intervention. Correa and Ornaghi [122] stated that stronger market competition can promote firm innovation, while Kang and Park [81] argued that government R&D subsidies to SMEs have a significant impact on firm innovation. A poorer market environment inhibits firms' innovation and knowledge renewal, and the lack of government intervention diminishes government help and support to a certain extent. Thus, the lack of financial resources, relational resources, a market environment, and government intervention inhibits the organizational resilience of high-tech SMEs.

A typical case of this grouping is Jin Tong Ling Technology Group Co., Ltd., Nantong, China (JTL). From the perspective of its financial resources, JTL's cash in the bank and on hand is CNY 523.9 million, short-term liabilities are CNY 835.2 million, and net cash flow from operating activities is CNY −260.9 million; thus, the company has large short-term debts and faces tremendous pressure in the capital chain. The corporate annual report shows that JTL focuses more on maintaining social and employee relations and less on maintaining relationships with investors, customers, and suppliers. JTL is located in Nantong city, Jiangsu Province, one of the first 14 coastal cities opened to the outside world in China, with many enterprises and fierce competition among enterprises. Moreover,

compared with Nanjing, Suzhou, and Wuxi in Jiangsu Province, there are still some gaps in Nantong, and thus the market environment in which JTL is located is relatively weak. However, the city has been committed to improving the business environment, accelerating the construction of the financial service system, simplifying financing procedures, improving government effectiveness, and reducing government intervention.

5.2. Contributions

Most existing studies have focused on the "net effect" relationship between single antecedent conditions and organizational resilience, such as financial resources [26] and innovation capability [31], on high-tech SMEs; thus, they cannot explain complex causal relationships such as the interdependence between antecedent conditions. This study, on the other hand, adopts the fsQCA approach and integrates the six factors at the three levels of resources, capabilities, and environment of high-tech SMEs and explores the relationship between the six antecedent conditions and organizational resilience from the configuration perspective. In this study, we not only provide a new perspective and new thinking to understand the effect of the problem of causal complexity on the organizational resilience of high-tech SMEs but also responds to the call for a multifactor coupling study of such firms with many characteristics [25,36].

In addition, this study integrates resource, capability, and environment perspectives to explore how to improve the organizational resilience of high-tech SMEs. This study attempts to identify the key conditions affecting the resilience of high-tech SMEs based on the "resource–capability–environment" theoretical analysis framework and explains the path to improving the resilience of high-tech SMEs in the VUCA context. The multiple configuration paths of high-tech SME resilience suggest that no single perspective can adequately explain the formation mechanism of high-tech SME resilience, emphasizing that whether it is a resource perspective, a capability perspective, or an environmental perspective, different perspectives must be considered together to provide a reasonable and convincing answer. This study not only complements the studies by Zhang et al. [95] and Zhang and Le [123] from different research perspectives and antecedent conditions, but it also responds to the call for multiple perspectives on organizational resilience research advocated by Linnenluecke [36] and Williams et al. [10] and provides theoretical support and a reference for research on high-tech SMEs and organizational resilience.

Finally, this study identifies the linkage of resource, capability, and environment in enhancing the resilience of high-tech SMEs; identifies three types of high resilience drivers and two types of non-high resilience drivers in high-tech SMEs; and finds that the configurations leading to high and non-high resilience are not symmetrical. Therefore, this study can better explain the reasons for the differences in organizational resilience of different high-tech SMEs. At the same time, this study provides reference and guidance for managers to optimize and improve the combination of various conditions by combining the strengths of their own resources, capabilities, and environments and selecting a suitable resilience enhancement path for their own companies.

5.3. Management and Policy Recommendations

This study provides useful insights for managers of high-tech SMEs and policy makers. First, high-tech SMEs should pay attention to the maintenance of resources and relationship reserves. The results of this study demonstrate the importance of resources to high-tech SMEs. In the six high-resilience configurations, relationship resources appear either as a core condition or as a peripheral condition. Financial resources also appear in three of the high resilience configurations. In the non-high resilience configurations, both financial and relational resources are missing as core conditions. Therefore, it is essential for high-tech SMEs to improve their financial resources and relationship reserves to cope with unexpected crises.

Second, high-tech SMEs should enhance their own capabilities. Crisis is a test not only of the enterprise but also of managerial ability. Competent managers can plan ahead, save the day, and lead the enterprise to become invincible during a crisis. Innovation ability is the source of the core competitiveness of high-tech SMEs. Therefore, high-tech SMEs should strive to improve their own capabilities, select capable managers, and seek innovation to successfully cope with crises.

Finally, government departments should create a good external business environment for enterprises. Although the competitive market environment can improve the innovation ability of enterprises, it also increases the competition and operating costs of enterprises. Government intervention can have an impact on the business decisions of enterprises, not only promoting their development through government subsidies and tax incentives but also inhibiting their development through government domination and control. The government would do well to play the role of a "helping hand" to create a good market environment for enterprises through economic, legal, and policy means to help them develop. However, due to the inconsistent goals of the government and enterprises, government intervention should also be moderate, fully respecting the laws of market operations, formulating government functions scientifically and rationally, clarifying the scope and mode of government interventions, finding its function in economic development, and achieving the optimal allocation of resources. Therefore, the government should coordinate its relationship with the market and promote the healthy growth of enterprises by creating a favorable business environment.

5.4. Research Limitations and Future Outlook

The limitation of the study is that it mainly examines the resilience of high-tech SMEs after being subjected to shocks. The analysis was carried out using cross-sectional data after being subjected to shocks, and the panel data will be continuously followed up to obtain panel data in the future to dynamically examine the impact of each antecedent condition on organizational resilience.

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Appendix A

Table A1. Truth table of the sufficiency analysis of high resilience.

FR	RR	MA	IC	ME	GI	Number	OR	Raw Consist	PRI Consist
1	1	1	1	1	1	23	1	0.925	0.861
1	1	1	1	0	0	3	1	0.941	0.852
1	1	1	1	1	0	14	1	0.925	0.850
1	1	1	0	0	0	19	1	0.918	0.842
1	1	1	0	1	1	11	1	0.923	0.841
1	1	1	1	0	1	6	1	0.927	0.827
1	1	1	0	0	1	14	1	0.912	0.819
1	1	1	0	1	0	10	1	0.903	0.813
0	1	1	1	1	0	12	1	0.904	0.802
1	1	0	0	0	0	8	1	0.908	0.795
1	1	0	0	0	1	4	1	0.919	0.792
0	1	1	1	1	1	12	1	0.892	0.785
0	1	1	0	1	0	9	1	0.900	0.780
1	1	0	0	1	1	3	1	0.910	0.771
0	1	1	0	0	1	9	1	0.902	0.768
0	1	1	0	1	1	12	1	0.890	0.758
0	1	0	0	0	1	7	1	0.904	0.764
1	1	0	1	0	0	12	1	0.890	0.758
1	1	0	0	1	1	8	1	0.901	0.758
0	1	1	1	0	0	6	1	0.895	0.755
0	1	1	0	0	0	11	0	0.874	0.739
1	1	0	1	1	0	7	0	0.883	0.729
1	1	0	1	1	1	17	0	0.864	0.701
1	1	0	1	0	1	19	0	0.846	0.695
0	1	0	0	0	0	9	0	0.852	0.674
0	1	0	0	1	1	6	0	0.867	0.659
0	1	0	1	0	0	5	0	0.851	0.648
0	1	0	1	1	0	8	0	0.840	0.629
0	1	0	0	1	0	3	0	0.870	0.624
0	1	0	1	0	1	3	0	0.841	0.608
1	0	1	1	1	0	10	0	0.824	0.555
0	1	0	1	1	1	6	0	0.797	0.541
1	0	1	1	1	1	4	0	0.805	0.501
1	0	1	0	1	0	11	0	0.759	0.496
1	0	1	1	1	1	4	0	0.805	0.501
1	0	1	0	1	1	6	0	0.767	0.467
1	0	1	0	0	1	9	0	0.722	0.429
1	0	1	0	0	0	9	0	0.729	0.427
1	0	0	0	1	1	5	0	0.758	0.420
1	0	0	0	0	0	4	0	0.735	0.381
1	0	0	0	0	1	5	0	0.717	0.346
1	0	0	1	1	1	15	0	0.689	0.332
1	0	0	1	0	0	9	0	0.706	0.311
0	0	1	0	1	0	15	0	0.665	0.309
1	0	0	1	1	0	14	0	0.692	0.309
0	0	1	1	1	0	6	0	0.720	0.304
0	0	1	0	1	1	8	0	0.681	0.283
1	0	0	1	0	1	10	0	0.694	0.278
0	0	1	1	1	1	3	0	0.674	0.265
0	0	1	0	0	1	17	0	0.585	0.257
0	0	1	1	0	0	4	0	0.684	0.245
0	0	0	0	1	0	5	0	0.672	0.223
0	0	0	0	1	1	9	0	0.614	0.206
0	0	0	0	0	1	11	0	0.557	0.195
0	0	1	0	0	0	14	0	0.534	0.190
0	0	0	1	1	0	11	0	0.620	0.174
0	0	0	0	0	0	19	0	0.535	0.173
0	0	0	1	0	1	17	0	0.490	0.137
0	0	0	1	1	1	19	0	0.488	0.132
0	0	0	1	0	0	16	0	0.501	0.131

Notes: The consistency threshold is 0.8, and the frequency threshold is 3. FR is financial resources, RR is relational resources, MA is management ability, IC is innovation capability, ME is market environment, GI is government intervention, number is the number of cases covered, and OR is organizational resilience.

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