

How Does Financial Resilience Enable Firms To Survive Periods Of Hardship?

Nguyen Ngoc Thuy Vy^{1*}, Dang Truc Giang² and Le Nguyen Anh Thu³

¹ Foreign Trade University, Ho Chi Minh City Campus, Ho Chi Minh City, Vietnam

² Foreign Trade University, Ho Chi Minh City Campus, Ho Chi Minh City, Vietnam

³ Foreign Trade University, Ho Chi Minh City Campus, Ho Chi Minh City, Vietnam

*Corresponding author: nguyenngocthuuyvy.cs2@ftu.edu.vn

Abstract

This study seeks to conduct a thorough investigation into the direct influence of financial resilience on firm survival, while also analysing the mediating role of innovation in this relationship. Firms have been confronted with a myriad of challenges during COVID-19, particularly in terms of financial viability. Scholars and stakeholders have increasingly recognized the paramount importance of financial resilience in ensuring firms' survival. In the contemporary era marked by incessant transformations, innovation has emerged as an equally critical determinant of firms' operational efficiency. Using a sample comprising 58,484 companies spanning 43 nations during the timeframe from 2020 to 2022, our results first show that financial resilience has a positive influence on firm survival. These results imply financial resilience should be prioritized by managers in constructing adaptable and resilient financial systems of a firm with effective risk management while regulators should adopt flexible credit policies and investors can consider integrating financial factors into their investment analysis strategies to anticipate business potential. Secondly, our research presents the findings related to the mediating role of innovation in the association between financial resilience and firm survival. Specifically, we observe that financial resilience contributes to increasing innovation activities, which, in turn, innovation impacts positively on firm survival. Therefore, it is also important to consider innovation factors in the process of building an enterprise's operational framework. Regulators should also prioritize the implementation of supportive policies that facilitate innovation for businesses. Moreover, investors can apply innovation metrics to evaluate the investment value of a company.

Research purpose:

This study seeks to conduct a thorough investigation into the direct influence of financial resilience on firm survival, while also analysing the mediating role of innovation in this relationship.

Research motivation:

Firms have been confronted with a myriad of challenges during COVID-19, particularly in terms of financial viability. Scholars and stakeholders have increasingly recognized the paramount importance of financial resilience in ensuring firms' survival. In the contemporary era marked by incessant transformations, innovation has emerged as an equally critical determinant of firms' operational efficiency.

Research design, approach, and method:

To investigate the impact of financial resilience on firm survival and the mediating role of innovation in this relationship, this research integrates data from two sources: the World Bank Enterprise Survey (WBES) and the World Bank COVID-19 Enterprise Follow-up Surveys (CEFS). The World Bank Enterprise Survey (WBES) provides comprehensive information on the business environment in the 2005-2023 period, while the COVID-19 Enterprise Follow-up Surveys (CEFS) focuses on the impact of the COVID-19 pandemic through 2020 to 2022. The research model was built according to Özşuca (2023), Khan et al. (2022).

Main findings:

Using a sample comprising 58,484 companies spanning 43 nations during the timeframe from 2020 to 2022, our results first show that financial resilience has a positive influence on firm survival. Secondly, our research presents the findings related to the mediating role of innovation in the association between financial resilience and firm survival. Specifically, we observe that financial resilience contributes to increasing innovation activities, which, in turn, innovation impacts positively on firm survival.

© The Author(s) 2025

D. Nguyen Van et al. (eds.), *Proceedings of the International Conference on Emerging Challenges: Sustainable Strategies in the Data-driven Economy (ICECH 2024)*, Advances in Economics, Business and Management Research 320,

https://doi.org/10.2991/978-94-6463-694-9_34

Practical/managerial implications:

These results imply financial resilience should be prioritized by managers in constructing adaptable and resilient financial systems of a firm with effective risk management while regulators should adopt flexible credit policies and investors can consider integrating financial factors into their investment analysis strategies to anticipate business potential. It is also important to consider innovation factors in the process of building an enterprise's operational framework. Regulators should also prioritize the implementation of supportive policies that facilitate innovation for businesses. Moreover, investors can apply innovation metrics to evaluate the investment value of a company.

Keywords: firm survival, financial resilience, innovation

1. INTRODUCTION

When an enterprise is established, trying to survive is the one aspect being prioritized. However, to stay competitive and thrive in the ever-evolving business landscape is not an easy thing to do (Silviano, 2008). Since firm survival is a complicated process that includes a variety of factors and strategies, firms must take into consideration economic challenges, namely fluctuations, preferences, or disruptions (Ibidunni et al., 2022). This is where financial resilience speaks its voice. Resilience can serve as a useful tool for shocks that are both short- and long-term (Berry et al., 2015). Moreover, businesses have been encouraged to strengthen their financial resilience, so they can handle unforeseen events (Cornaro, 2022), especially during the COVID-19 pandemic, which spread throughout the world at the end of 2019. This pandemic did not only cause a major health crisis, but it also had a detrimental effect on every aspect of the economy (Sheffi, 2015). The pandemic has set a new threshold for the obstacles since many businesses face more severe obstacles. Under this unfavorable situation, a financially resilient firm can better deal with economic fluctuations and downturns, so it plays a critical role in helping firms withstand challenging circumstances. By maintaining a healthy financial structure, enterprises will be able to effectively invest in new opportunities and continue their business (Matloub, 2022).

Moreover, with a high level of flexibility due to no financial distress, firms can innovate and increase their chances of surviving amid difficult times. Although considerable research has been done to quantify the impact that resilience has on a firm's likelihood of remaining open for business, the impact of financial resilience in COVID-19 triggers further investigation. In addition to financial factors, the consideration of innovation as a vital aspect is also imperative when assessing the impact on a firm's ability to sustain its presence in the market (Khan et al., 2022; Özşuca, 2023).

Given the importance of financial stability and innovation, it would be noteworthy to investigate closely the influence of them on the survivability of the firm given the harm caused by COVID-19. Whether they still play a pivotal role as it was when being exposed to this deadly pandemic is the motivation behind our choice of research topic. Thus, considering the critical importance of sustaining a firm, this research primarily aims at examining the profound impact of financial resilience on firm survival and the moderating role of innovation in shaping the relationship between financial resilience and firm survival. This points out two specific objectives including examining how financial resilience influences firm survival and evaluating the mediating effect of innovation, in the relationship between financial resilience and firm survival particularly within the challenging framework of COVID-19.

To estimate and test our models, ordered and binary logit regression is mainly used, except the adaptability element of business survival, which is examined using OLS regression. Besides, we used a combined data set of 58,484 observations from 43 countries, merged from World Bank Enterprise Survey (WBES) and Enterprise Follow-up Surveys (CEFS) to implement the test. Specifically, the data sample includes information on manufacturing and service companies, mainly operating in small and medium size, and mostly located in middle- and high-income economic regions from 2020 to 2022. To assure the robustness of our results, we measured financial resilience and firm survival on many different proxies. Financial resilience is indicated by three proxies including pre-pandemic credit access, liquidity, and arrears anticipation when survival is demonstrated by four proxies consisting of operation status, sales performance, adaptability, and workforce recovery expectation. Additionally, we measured innovation on many scales such as product and process introduction/improvement, and R&D investment.

As a result, the study finally demonstrates that financial resilience plays a crucial role in the survival of businesses during challenging times such as the COVID-19 pandemic. Ensuring access to financial resources and effectively managing financial factors such as liquidity has helped businesses overcome pandemic-related challenges more efficiently. Additionally, financial resilience also fosters innovation, serving as the foundation for the survival and future growth of businesses. The combination of financial resilience and innovation efforts can strengthen a business's ability to cope with disruptions and ensure sustainable development during these challenging times.

While there has been considerable interest in this topic, we acknowledge that our study has certain distinct features that set it apart from previous investigations. Firstly, in our research, we aim to address these limitations by reintroducing the concept of financial resilience and considering a combination of three widely adopted and proven significant channels. Our goal is to provide a more definitive perspective on the research question and deliver updated insights into how businesses can navigate the modern market setting to ensure their survival. Though many scholars have already conducted research, we believe previous studies may have had limitations in examining a comprehensive range of contributing factors to financial resilience.

Secondly, we recognize the importance of innovation as an asset contributing to firms' sustainable growth. While prior theoretical research and practical applications have highlighted this aspect (Khan et al., 2022; Özşuca, 2023), the role of innovation has not been fully explored in discussions on financial resilience and firm survival during

crises. Therefore, our study seeks to fill this gap by incorporating innovation as a mediating factor in the relationship between financial resilience and firms' survival.

Ultimately, our research seeks to explore how financial resilience correlates with firm survival and examine the mediating role of innovation in this relationship with the result that financial resilience has a direct positive impact on firm survival, and actively benefits innovation so that it further enhances firm survival. Compared to numerous analogous studies related to COVID-19 distress that examine financial resilience, innovation, and firm survival in isolation, concentrating solely on individual facets, our research puts effort into a further comprehensive analysis that integrates these elements to provide a more holistic understanding. Moreover, we expect that our findings will provide practical recommendations for firms to not overlook the importance of innovation and its linkage to financial resilience during challenging times.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Financial resilience and firm survival

The survival of a firm is known to indicate the level of a firm's hardiness in response to adverse changes in the operating business climate (Salunkhe et al., 2021). There are many variations in how firm survival has been defined and measured (Schwartz, 2012). Inspired by previous studies, this research has surviving firms denoted based on criteria including current firm status and firm performance (Siepel & Dejardin, 2020).

A firm's financial resilience is regarded as a capacity to anticipate, prepare for, react to, and adapt to both gradual change and sudden, unforeseen shocks by implementing sensible economic measures to reduce budget deficits (Soufi et al., 2022). Different determinants of resilience depend on the context and specific challenges (Southwick et al., 2014). Financial resilience can exert a significant impact on a company's ability to survive and expand in the market (Musso & Schiavo, 2007). According to Franco and Haase (2010), it is one of the major issues preventing businesses from surviving in their operational markets since it may hinder these firms from taking advantage of the available opportunities. Adhering rigidly to old ways and not evolving can lead to problems, such as losing market share (Bower & Christensen, 1995) so a financially resilient firm is better positioned to pursue investment and growth opportunities. Furthermore, Demircuc-Kunt and Maksimovic (1998) and Beck (2005) find that financial development reduces the barriers that businesses confront to accelerate their growth, which enhances macroeconomic performance. Furthermore, the COVID-19 crisis has caused many companies to experience fallen ratings due to reduced cash flows and increased debt levels. This phenomenon, referred to as "fallen angels" (Acharya, 2020), has led companies to increase their cash reserves and decrease their spending to strengthen their financial positions.

Regardless of the inconsistency in adopted measurements in previous research, streams of literature predominantly imply a positive relationship between financial resilience and firms' capability to survive market shocks. Audretsch & Lehmann (2005) voice that firms must grow resilient to survive in the contemporary business setting. This is because financially resilient firms with better financial stability, capacity for forecast, awareness, adaptability, and capacity for recovery, can thrive in an unpredictable marketplace and stimulate responses to financial shocks (Taylor, 2013). Dirman (2020) introduced liquidity as a key aspect of a firm's resilience while studying firms' performance in financial distress. Additionally, cash and liquid assets can be flexibly and urgently utilized as financial reserves to reduce losses even if a business function fails due to an unanticipated incident (Gittel et al., 2006). This leads to an increase in demand for liquidity from firms to steer off risks and continue their operations (Holmstrom & Tirole, 2000). Castaldo et al. (2023) utilized three different cohorts of Italy SMEs established between 2004 and 2006 to find out that bank financing exerts a positive influence on firm survival in both less and more innovative industries. These evidences provide us a basis to form our hypothesis as follows:

H1: Financial resilience is likely to have a positive impact on Firm survival.

2.2 Innovation as a mediator in the relationship between Financial resilience and Firm survival

Firm innovation can be defined as the overall capability of an organization to launch new products or expand into new markets (Wang & Ahmed, 2004). By investing in innovation, firms can achieve sustainable competitive advantages over their competitors (Dai et al., 2019) and even create a beneficial enhanced reputation, which will in turn attract new loyal customers, well-qualified employees, and business partners (Damanpour & Schneider, 2006). Moreover, offering new and unique products and services may assist the firm in acquiring additional market share, and in return, increasing revenue (Bartik et al., 2020). As it can provide a source of competitive advantage, drive growth and profitability, innovation has become increasingly important for assessing the positioning and progress of firms in today's competitive business environment.

2.2.1 Impact of Financial Resilience on Innovation

The early perception of finance as a crucial component of innovation processes was presented in the analysis by Schumpeter (1912). A robust financial system plays a vital role in adopting innovation by providing firms with resources in need (O'Sullivan, 2006). The ability of the management to secure flexible credits for implementing sustainable innovations is a key factor in a company's effectiveness (Aidoo, 2019). To pursue innovation, a company's working capital sources and financial structure need to be stable (Aidoo, 2019). When talking about liquidity, issues like insufficient cash are sure to make it difficult for new entrepreneurs to advance the development of their businesses as well as for potential entrepreneurs to launch their businesses (Evans & Jovanovic, 1989). To deal with this circumstance, firms often turn to related sources of finance to support their business operations by extension, development when faced with liquidity issues that could negatively impact innovation and growth rates (Cunat, 2007). In addition, other aspects of financial resilience such as high sales revenue may support expensive research and development and innovation operations, as well as setting positive expectations of demand which in turn diminish uncertainty about the benefits of R&D investment.

In harmony with that, empirical research shows that financially resilient firms possess both internal and external resources to allocate towards innovation initiatives. Such firms are more likely to invest in R&D activities and technology (Laosirihongthong et al., 2015), as well as establishing inter-organizational networks and partnerships (Wynstra et al., 2010), which enables them to foster innovation processes. This resource allocation allows firms to develop new technologies, create innovative products or services, and adapt to the changing market landscape. Nonetheless, the correlation between financial resilience and firm's innovativeness can be ambiguous. Laosirihongthong et al. (2015) found a mild relationship between external capital and firm's innovation while studying Thai manufacturing companies under the Resource-Based View (RBV). The result implies that the connection between two variables may vary in different cultures, where supply chain relationships are ephemeral. We build our hypotheses based on the prevalent notion that finance contributes greatly to innovation capabilities, therefore, we propose the following hypotheses:

H2a: Financial Resilience is likely to have a positive impact on Firm Innovation.

2.2.2 Impact of Innovation on Firm Survival

Empirical research indicated an ambiguous relationship between firm's level of innovation and their performance in crisis. On one hand, companies that embrace innovation are better positioned to adapt to rapidly changing market conditions and can thrive even in uncertain situations. This positive correlation has shown that innovation is a key indicator of a company's survival (Archibugi & Filippetti, 2013; Cefis, 2005). Floyd (2016) conducted a study that revealed that firms investing in R&D are more likely to survive than those that do not. In 2005, Cefis showed that the expected survival time of an innovative firm is approximately longer than that of a non-innovative firm. The impact not only results from the nature of the technology, which affects the general market conditions for firm survival (Agarwal & Audretsch, 2001) but also because of firm-specific capabilities to cope with outside changes (Christensen, 1997a). Firms with a history of innovation are better equipped to adapt and survive the crisis, as they can quickly advance their strategies, products, and services to meet evolving customer needs (Özsuca, 2023; Bartik et al., 2020). The likelihood of firm exit during the pandemic was significantly influenced by the disparities in productivity levels among organizations, owing to improvements in quality, cost-cutting measures, and operational efficiency (Muzi et al., 2021). This review emphasizes the importance of innovation gaps as a factor influencing the survival of businesses.

On the other hand, other empirical studies show that R&D investment hurts firm survival (Bottazzi et al., 2001) and consumers may not accept innovation rapidly in various areas (Hyytinen et al., 2015). Innovation is considered risky because it needs substantial resources to implement (Li et al., 2008) while not guaranteeing desirable outcomes (Rosenbusch et al., 2011). Additionally, innovation poses difficulties in acquiring finance (Schneider & Veugelers, 2010; Lee et al., 2015) as innovative firms run an uncertain business model (Hall & Lerner, 2010). To back up this argument, Lee et al. (2015) noticed that innovative firms are more likely to be turned down for finance than other firms, especially during crises.

The difference in results can be due to the transformation in the internal capabilities which produces higher earnings, establishing nearly permanent generic distinctions between it and non-innovative competitors (Nkundabanyanga, 2019). Additionally, some previous papers place their focus on technological innovation by manufacturing firms (de Vries, 2006; Toivonen & Tuominen, 2009), while largely ignoring innovation in service organizations, which consequently cause such diversity in results. Furthermore, the effect of innovation capability can be context-dependent and varied on differences in measures and levels of innovation (Rosenbusch et al., 2011). After considering past research's limitations as well as our database's characteristics, we decided to develop the hypothesis that innovation has a positive impact on firms' survival.

H2b: Firm Innovation is likely to have a positive impact on Firm Survival.

3. METHODOLOGY

3.1 Research model

3.1.1 Model to investigate the impact of Financial resilience on Firm survival

To test hypothesis H1 about the influence of finance on business survival, we build equation model inspired by research models of Özşuca (2023), Khan et al. (2022), Mulyantini et al. (2020), Hu et al. (2022), Dirman (2020), Salignac et al. (2019). Thus, this model has the following form:

$$SUV_{it} = \alpha_0 + \alpha_1 FIN_{it} + \alpha_2 F_{Controls_{it}} + \alpha_3 M_{Controls_{it}} + Country_FE_i + Year_FE_t + \varepsilon_{it} \quad (1)$$

Where SUV_{it} is the proxy for firm survival which comprises four variables including SUV_STS , SUV_SLS , SUV_APT , SUV_EWF to respectively represent current firm status, variations in firms' sales over one-year period, adaptation activities that firms undertake, and managerial expectation to workforce recovery after COVID-19 pandemic. FIN_{it} is the explanatory variable proxied for firms' financial resilience via three factors consisting of access to credit (FIN_CRE), liquidity (FIN_LIQ), and firm's anticipation to its capability of meeting outstanding debts (FIN_ARR). $F_Controls$ and $M_Controls$ represent firm characteristics and characteristics of managers, respectively. Besides, the model also controls for year and country fixed effects. In consistent with H1, we expect α_1 to be positive, implying a positive linkage between Firm survival and Financial resilience.

3.1.2 Model to investigate the mediating role of Innovation in the relationship between Financial resilience and Firm survival

In this study, we aimed to build model to investigate the mediating role of innovation. This is inspired by Baron et al.'s (1986) and King & Levine's (1993)'s models in which a specific set of third variable is engaged to examine the bilateral relationship between two former variables for more effective analysis. Innovation is constructed to show the impact on financial resilience and firm survival's linkage via two channels: through capturing the impact of firms' financial resilience on innovation; and innovation on firm survival itself. In addition, we incorporate variables inspired by Özşuca (2023), Khan et al. (2022), Mulyantini et al. (2020), Hu et al. (2022), Dirman (2020), Salignac et al. (2019), Lee et al. (2015), Miocevic & Srhoj (2023).

The model to investigate whether financial resilience have any effects on innovation is as follow:

$$INV_{it} = \beta_0 + \beta_1 FIN_{it} + \beta_2 F_{Controls_{it}} + \beta_3 M_{Controls_{it}} + Country_FE_i + Year_FE_t + \varepsilon_{it} \quad (2)$$

Similar with Model 1, we also utilize FIN_{it} in model 2, which comprises FIN_CRE , FIN_LIQ , FIN_APT , FIN_ARR to be the independent variable. INV_{it} is the dependent variable indicating innovation of firms which includes three aspects of innovation including R&D expenditure (INV_RD) and introduction of both novel products (INV_PROD) and processes (INV_PROC) within surveyed time.

The model to examine the effect of innovation on firm survival is as follow:

$$SUV_{it} = \gamma_0 + \gamma_1 INV_{it} + \gamma_2 F_{Controls_{it}} + \gamma_3 M_{Controls_{it}} + Country_FE_i + Year_FE_t + \varepsilon_{it} \quad (3)$$

Regarding Equation (3), SUV_{it} , which consists of SUV_STS , SUV_SLS , SUV_APT , SUV_EWF and INV_{it} , via INV_RD , INV_PROD and INV_PROC , are respectively adopted as the explained and explanatory variable. $\gamma_1, \gamma_2, \gamma_3, \gamma_4$ are regression intercept and coefficients of dependent variables and controls, respectively. We expect a positive result of γ_1 as consistent to hypothesis H2b.

Details of variable construction can be found in the appendix.

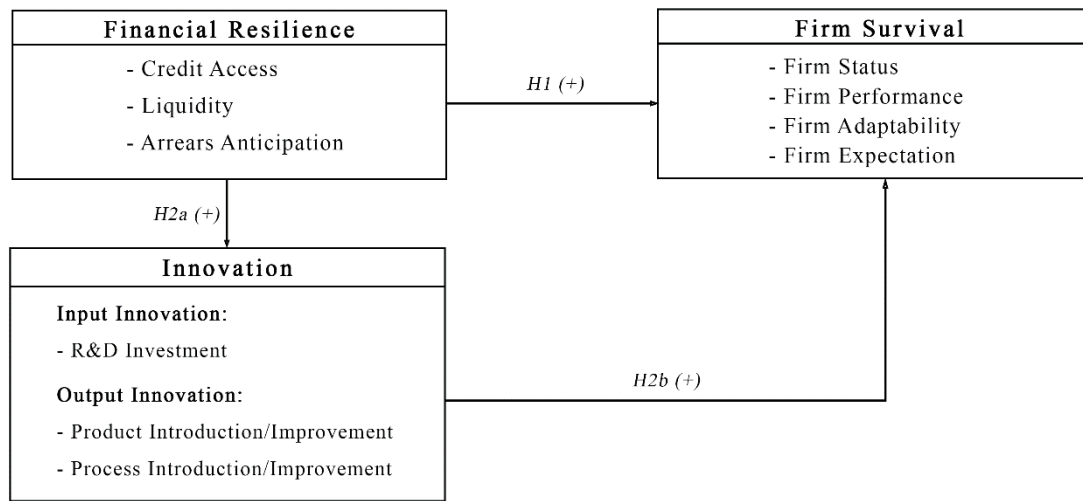


Fig. 1. Model to investigate the impact of Financial Resilience on firm survival, and the mediating role of innovation

3.2 Sample and Data

The research integrates data from two sources: the World Bank Enterprise Survey (WBES) and the World Bank COVID-19 Enterprise Follow-up Surveys (CEFS). The World Bank Enterprise Survey (WBES) provides comprehensive information on the business environment in the 2005-2023 period, while the COVID-19 Enterprise Follow-up Surveys (CEFS) focuses on the impact of the COVID-19 pandemic through 2020 to 2022. The combined dataset includes 58,484 observations from 43 countries across different regions, with a significant representation from Europe and Central Asia (69.92%). High-income economies make up the majority of the sample (44.69%), followed by upper-middle-income (30.9%) and lower-middle-income (22.38%) economies.

4. RESULTS AND DISCUSSION

4.1 Descriptive statistics

Table 1 shows the summary of descriptive statistics. Specifically, the operation status of most firms demonstrates they experienced temporary shutdowns and remained open more than being permanently closed. During COVID-19, There was a higher likelihood of either a decline or no change in sales. Meanwhile, firm adaptability index of 0.35 or about 1 out of 4 adaptation activities demonstrates that lack of actions in adapting was conducted. However, 83% of the firms anticipated a return to the normal workforce. Accordingly, in terms of financial resilience aspects, most firms either had no access to credit or only accessed to non-mainstream sources pre-pandemic and liquidity during COVID-19 experienced mostly volatility and falls. Furthermore, 69% of firms had the expectation of paying out arrears. Meanwhile, considering innovation, only a few firms innovated before the breakout of COVID-19, as evidenced by only 30% and 17% of firms developed new/improved products and processes respectively and only 13% invested in R&D.

Regarding control variables representing firm characteristics, small and medium-sized businesses (SMEs) make up the majority and the average operating time of sample firms is about 19 years, most of which are in the areas of 50,000 - 250,000 citizens. In addition, the manufacturing sector accounts for 52% of firms, whilst the service industry represents 48%. Moreover, only 22% are exporters, 10% is related to foreign ownership, 35% of the firms involve formal training for staff, and 27% of them hold globally recognized quality certifications. Relating to traits of managers, average senior management experience is 21 years while only 18% are female.

Table 1. Summary of descriptive statistics

VARIABLES	Obs.	Mean	SD	Min	Max
Dependent variables – Firm Survival					
SUV_STS	36,247	2.95	0.21	2.00	3.00
SUV_SLS	36,247	1.59	0.74	1.00	3.00
SUV_APT	36,247	0.35	0.31	0.00	1.00
SUV_EWF	36,247	0.83	0.37	0.00	1.00
Independent variables – Financial Resilience					
FIN_CRE	36,247	1.81	0.98	1.00	3.00

VARIABLES	Obs.	Mean	SD	Min	Max
FIN_LIQ	36,247	1.74	1.06	1.00	4.00
FIN_ARR	36,247	0.69	0.46	0.00	1.00
Mediating variables – Innovation					
INV_PROD	36,247	0.30	0.46	0.00	1.00
INV_PROC	36,247	0.17	0.38	0.00	1.00
INV_RD	36,247	0.13	0.33	0.00	1.00
Control variables – Firm Characteristics					
F_SIZE	36,247	1.74	0.77	1.00	3.00
F_SEC	36,247	0.52	0.50	0.00	1.00
F_OWN	36,247	0.10	0.30	0.00	1.00
F_EXPO	36,247	0.22	0.41	0.00	1.00
F_TRAI	36,247	0.35	0.48	0.00	1.00
F_QUAL	36,247	0.27	0.44	0.00	1.00
F_AGE	36,247	2.94	0.66	0.69	5.33
F_LOC	36,247	2.10	1.26	0.00	4.00
Control variables – Manager Characteristics					
M_FEM	36,247	0.18	0.38	0.00	1.00
M_EXP	36,247	21.02	11.76	1.00	70.00

Table 1 demonstrates descriptive statistics of dependent variables – Firm Survival consist of SUV_STS which is the firm status of operating whether open or temporarily close or permanent close, SUV_SLS which is the average change in monthly sales compared to 1 year ago, SUV_APT which is index for adapting activities responding to COVID-19, SUV_EWF which is whether firms expected to recover the same work force as before COVID-19; independent variables – Financial resilience include FIN_CRE which is the credit access of firms before COVID-19, FIN_LIQ which is liquidity movement during COVID-19, FIN_ARR which is whether firms expect not to fail arrears; mediating variable comprise INV_PROD, INV_PROC, INV_RD which are dummies respectively whether firms introduce new/improved products/services, process, spend money on R&D. For details of control variables, see Appendix A1 - Variable Construction.

4.2 Regression results

4.2.1 Firms with financial resilience are more likely to survive through COVID-19

Table 2 represents regression results of model 1 in twelve specific columns, which are marked from (1) to (12). Consistent with hypothesis H1, the results prove firms with financial resilience will be more likely to survive through COVID-19. Regarding access to credit, columns (1) to (4) indicate the impact of firm access to credit before COVID-19 has a statistically significant positive impact on 3 out of 4 survival proxies (1) SUV_STS representing firm status, (4) SUV_EWF representing firm expectation about workforce recovery with 90% confidence level, and (3) SUV_APT which is firm adaptability with 99% confidence level. However, it shows no effect to (2) SUV_SLS representing firm performance. Consistent to our results, the findings made by Musso and Schiavo (2008) also shows that firms' employment was positively impacted by having access to external financing and those of Castaldo et al. (2023), centering on start-up firms also demonstrated a higher sharing of bank financing in funding reduces the risk of firm failures during COVID-19. In general, these results show a statistically significant positive relationship showing that businesses with strong financial resilience are more likely to endure and survive COVID-19 difficulty, which is consistent with H1.

The COVID-19 pandemic's simultaneous supply and demand shock led to a sudden and sharp decline in business revenues, as well as diminishing cash flows and depleting working capital (Didier et al., 2021). Banks are hesitant to lend to borrowers with low credit quality and low asset values, which makes it more difficult for businesses that desperately need liquidity to receive credit. In accordance with theories of impaired access to bank credit, firms who did not have credit constraints prior to the crisis are probably going to have easier access to bank funding than those that did face credit rationing (Khan, 2022). Therefore, as firms were previously not subject to any credit constraints or better capability to credit access, they are less prone than unconstrained firms to likely exit during COVID-19 shocks (Khan et al., 2022). The reason is when a firm can access appropriate credit resources, this contributes to minimizing undesirable challenges, thereby ensuring the stability of cash flow, and fostering sustained funding relationships. By securing adequate credit, firms can effectively mitigate financial constraints and enhance their capacity to meet ongoing financial obligations. Moreover, bank-loan-accessible firms are much more likely to modify their operations to adapt to the COVID-19 pandemic (Khan, 2022). This, in turn, helps maintain a steady inflow of funds, enabling firms to sustain their operations and pursue growth opportunities (Cummins, 2010).

As shown in columns (5) to (8) demonstrating the impact of liquidity on the firm survival, there is positive significant sign of FIN_LIQ – firm liquidity availability to three firm survival indicators which are (5) SUV_STS, (6) SUV_SLS and (8) SUV_EWF with confidence level of 99%, apart from (7) SUV_APT. In a comparable manner, Fang et al., (2022) demonstrated the advantageous effect of stable liquidity on their survival and sales growth and Shaharuddin et al. (2021) discovered favourable influence of liquidity on businesses' performance during the COVID-19 pandemic. During this period of time, financial institution credit restrictions forced

numerous firms into a liquidity crunch. Distresses from reduced profit margins and uncertain revenue leading to the restriction to external credit grant and a rising demand for liquidity to continue obligations to suppliers, landlords, and staff put firms under financially difficult situation with a serious shortage of liquidity (Özşuca, 2023). Liquidity is an establishment's ability to conveniently pay off its short-term financial obligations. Therefore, having large amounts of cash on hand indicates that companies can pay their debts on time and avoid defaulting (Azhar, 2013). Firms may be greatly exposed to unforeseen costs or interruptions to their revenue sources during a period of COVID-19 and, thus, they need to be able to meet more than just their immediate financial obligations, such as paying employee salaries, covering rent, utilities, and other essential.

Finally, the last aspect of financial resilience – FIN_ARR demonstrates firm expectations of not falling in arrears appear with a strong positive sign to all firm survival proxies with confidence of 99% in model (9) to (12). Similarly, Earle and Sabirianova (2002) found the presence of arrears, notably wage arrears, exhibits a negative correlation with business performance while Sprenger (2014) indicate that arrears serve as a robust indicator of firm insolvency and liquidation. Moreover, it is observed that firms burdened with substantial tax arrears are more susceptible to bankruptcy (Lukason & Andresson, 2019; Kohv, 2020). Even though, arrears are "late payment" serve as a buffer for a company's liquidity issues in the event of financial trouble by replacing the prior pay-off arrears with mostly equal fresh inflow of arrears over a medium-term period because paying debts late has a lower cost than using alternative sources of financing. However, arrears are regarded as "bad debts" in the context of businesses experiencing severe financial difficulties as they are not able to be paid in whole or in the near future (Alfandari & Schaffer, 1996).

Table 2. Regression results: the impact of Financial resilience on Firm survival

VARIABLE	(1) SUV_ST S	(2) SUV_SL S	(3) SUV_AP T	(4) SUV_EW F	(5) SUV_ST S	(6) SUV_SL S	(7) SUV_AP T	(8) SUV_EW F	(9) SUV_ST S	(10) SUV_SL S	(11) SUV_AP T	(12) SUV_EW F
FIN_CRE	0.0382* [0.0195]	-0.0008 [0.0115]	0.0076*** [0.0014]	0.0190* [0.0105]								
FIN_LIQ					0.6817*** [0.0408]	1.0798** [0.0117]	-0.0006 [0.0015]	0.2826*** [0.0179]				
FIN_ARR									2.3507** [0.0448]	0.9401*** [0.0264]	0.1955*** [0.0025]	3.1876*** [0.0277]
F_SIZE	0.2992*** [0.0279]	0.1760*** [0.0160]	0.0306*** [0.0019]	-0.0460*** [0.0143]	0.2364*** [0.0411]	0.0956** [0.0172]	0.0529*** [0.0022]	-0.0259 [0.0250]	0.2488** [0.0287]	0.1577*** [0.0159]	0.0301*** [0.0017]	-0.1074*** [0.0174]
F_SEC	0.2003*** [0.0370]	-0.0332 [0.0237]	-0.0122** [0.0027]	0.0976*** [0.0209]	0.3236*** [0.0558]	0.0078 [0.0255]	-0.0291** [0.0033]	0.0115 [0.0359]	0.2277** [0.0384]	-0.0343 [0.0238]	-0.0152** [0.0026]	0.0822*** [0.0255]
F_OWN	-0.1274** [0.0645]	0.1086*** [0.0372]	0.0107** [0.0044]	-0.0314 [0.0337]	-0.1482* [0.0894]	0.0343 [0.0400]	0.0214*** [0.0052]	0.1770*** [0.0600]	-0.2823** [0.0664]	0.0690* [0.0369]	0.0033 [0.0041]	-0.1250*** [0.0410]
F_EXPO	0.1045* [0.0547]	0.1286*** [0.0285]	0.0017 [0.0034]	0.0164 [0.0266]	-0.0172 [0.0779]	0.0806** [0.0307]	0.0050 [0.0041]	0.0079 [0.0474]	0.0832 [0.0558]	0.1176*** [0.0285]	0.0013 [0.0032]	0.0050 [0.0321]
F_TRAI	0.2614*** [0.0420]	0.0583** [0.0240]	0.0373*** [0.0028]	0.1200*** [0.0220]	0.0813 [0.0595]	0.0071 [0.0258]	0.0418*** [0.0034]	0.0731* [0.0385]	0.2473** [0.0431]	0.0641*** [0.0240]	0.0339*** [0.0027]	0.1019*** [0.0267]
F_QUAL	0.3846*** [0.0571]	0.1411*** [0.0280]	-0.0001 [0.0034]	0.0285 [0.0262]	0.3991*** [0.0835]	0.0508* [0.0303]	0.0027 [0.0040]	0.0867* [0.0493]	0.2688** [0.0577]	0.1187*** [0.0280]	-0.0031 [0.0032]	-0.0240 [0.0316]
F_AGE	0.2620*** [0.0308]	-0.0095 [0.0198]	0.0047** [0.0023]	0.1001*** [0.0176]	0.1456*** [0.0456]	-0.0361* [0.0214]	-0.0053* [0.0027]	0.0006 [0.0309]	0.2475** [0.0317]	-0.0178 [0.0199]	-0.0000 [0.0021]	0.0305 [0.0213]
F_LOC	-0.0251 [0.0179]	-0.0389** [0.0117]	0.0120*** [0.0013]	-0.0245** [0.0102]	0.0094 [0.0258]	-0.0128 [0.0126]	0.0192*** [0.0016]	0.0097 [0.0177]	-0.0200 [0.0186]	-0.0391** [0.0117]	0.0127*** [0.0013]	-0.0127 [0.0123]
M_FEM	-0.2585*** [0.0428]	-0.0502* [0.0281]	0.0070** [0.0033]	-0.0863*** [0.0247]	-0.2902*** [0.0609]	0.0013 [0.0303]	0.0165*** [0.0040]	-0.1074*** [0.0423]	-0.1843*** [0.0449]	-0.0160 [0.0282]	0.0129*** [0.0031]	-0.0078 [0.0304]
M_EXP	0.0034* [0.0019]	-0.0007 [0.0011]	-0.0003** [0.0001]	0.0047*** [0.0010]	0.0026 [0.0027]	-0.0019 [0.0012]	-0.0010** [0.0002]	-0.0025 [0.0017]	0.0025 [0.0019]	-0.0011 [0.0011]	-0.0005** [0.0001]	0.0027** [0.0012]
Constant												
Observations	40,613	36,895	55,194	55,194	37,349	36,969	37,369	37,268	41,433	37,643	56,308	56,308
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared			0.0996				0.1539				0.1894	

Table 2 shows the regression results of model $SUV_i = \alpha_0 + \alpha_1 FIN_i + \alpha_2 F_{Controls_i} + \alpha_3 M_{Controls_i} + Country_FE_i + Year_FE_t + \varepsilon_i$. In which, SUV_STS is the firm status of operating whether open or temporarily close or permanent close; SUV_SLS is the average change in monthly sales compared to 1 year ago; SUV_APT is index for adapting activities responding to COVID-19; SUV_EWF is whether firms expected to recover the same work force as before COVID-19; FIN_CRE is the credit access of firms before COVID-19, FIN_LIQ is liquidity movement during COVID-19, FIN_ARR is whether firms expect not to fail arrears; others are control variables divide into 2 categories: Firm characteristics noted by $F_Controls$ includes F_SIZE based on the number of employees, F_SEC comprised 2 sectors manufacturing and service, F_OWN is whether the firm is foreign-owned, F_EXPO is whether the firm export, F_TRAIN is whether the firm has training program for employees, F_QUAL is whether the firm has internationally recognized quality certification, F_LOC is the population of where the firm is located, F_AGE equals $\ln(\text{firm's operation years})$; $M_Controls$ represents manager characteristics following by M_FEM is whether the firm has female managers and M_EXP is the number of sector-related experience years of top manager. Standard errors in square brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ corresponds a 99% confidence, a 95% confidence, and a 90% confidence respectively.

4.2.2 Mediating role of innovation in the relationship between financial resilience and firm survival

4.2.2.1 Firms with financial resilience are more likely to conduct innovation activities

Table 3 presents the results of bivariate logit regression analysis, examining the relationship between financial resilience and innovation and consistent with H2a. The coefficients of FIN_CRE in Columns (1) to (3), with a 99% confidence level, are statistically significant with positive sign in all INV_PROD, INV_PROC, and INV_RD. They demonstrate that when businesses have access to credit—especially formal external credit—they are more likely to carry out their innovation. The works of Giannakas and Fulton (2005) and Bertschek (1995) are also in line with our research, which reiterates the importance of access to credit to advancement of firms' process innovation. Finance is an essential part of innovation processes (Schumpeter, 1912). Moreover, financial restrictions often lead to companies pursuing more conservative projects, as evidenced by the work of Nanda & Nicholas, 2014 while innovative activities are renowned for being highly volatile and risky, and they don't necessarily pay off right away (Brown et al., 2012). Therefore, it seems sense that businesses might steer clear of high-risk or high-investment projects like research and development unless they have a reliable, official source of funding. That is the reason for businesses, having access to finance can act as a safety net, enabling them to take calculated risks without worrying about facing dire financial repercussions right away. This financial freedom to try new things pushes businesses to validate cutting-edge ideas and embark on innovative projects that may provide innovations and competitive benefits. Additionally, credit can help businesses pay for the upfront expenses of implementing new technology and modernizing their current infrastructure. The money being invested can be used in R&D, recruit highly qualified personnel, acquire advanced equipment, and carry out trials. These can help increase the level of innovation. In short, external credit availability raises the quantity and quality of firms' innovations (Liu et al., 2022).

Columns (4) to (5) in Table 3 indicates that the positive impact of liquidity on all proxies of innovative activities is statistically significant at a 99% confidence level. The results align closely with H2a. Similarly, Pham et al (2018) demonstrated a positive relationship between cash holdings and innovation. Having the availability of sufficient financial resources grants businesses the flexibility to make substantial investments in innovation-related projects, including talent development, technology acquisition, and research and development (R&D) (Schumpeter, 1912). Companies that boast strong asset liquidity can allocate substantial funds to these innovation activities, even during periods of uncertainty or adversity. This not only enhances their capacity to implement innovative products, or procedures but also significantly increases their chances of not only surviving but thriving in the face of ever-changing market conditions (Pham et al., 2018). With financial looseness, organizations can remain agile and innovative, positioning themselves to capitalize on opportunities that may arise amid financial shocks. Thus, one way to make sure adequate resources is to maintain financial confidence in liquidity (Brealey et al., 2014). Otherwise, firm development when faced with liquidity issues could negatively impact innovation and growth rates (Cunat, 2007).

Subsequently, the final three columns of Table 3 show the statistically significant positive impact of debt arrears on innovation in two aspects of product innovation and R&D investment with the confidence level of 99%. In general, not much study has examined the direct correlation between innovation and the capacity to settle debt arrears. A McKinsey & Company survey indicates that many businesses are deprioritizing innovation in favor of other strategies in favor of four strategies of reinforcing their core business, pursuing recognized opportunity spaces, preserving capital and lowering risk, and delaying innovation (Am et al., 2020). It may seem hasty to spend money on something that could not yield immediate returns while firms still owe money. This suggests that if businesses do not expect to get behind on their existing debts, they will have a positive outlook on their financial situation and expect to turn strategy to innovation. Therefore, when a business is trying to minimize expenditures, innovation is sometimes one of the first areas to be sacrificed (Yovchev, 2020). Because of this, they could have to reduce their spending on research and development (R&D), which might result in a decline in innovation, when they are having trouble repaying their debts.

Table 3. Regression results: the impact of Financial resilience on Innovation

VARIABLES	(1) INV_PROD	(2) INV_PROC	(3) INV_RD	(4) INV_PROD	(5) INV_PROC	(6) INV_RD	(7) INV_PROD	(8) INV_PROC	(9) INV_RD
FIN_CRE	0.1796*** [0.0111]	0.2696*** [0.0135]	0.2718*** [0.0153]						
FIN_LIQ				0.0310*** [0.0118]	0.0414*** [0.0142]	0.0445*** [0.0158]			
FIN_ARR							0.1006*** [0.0215]	0.0416 [0.0262]	0.1254*** [0.0296]
F_SIZE	0.0735*** [0.0154]	0.1415*** [0.0187]	0.3538*** [0.0209]	0.0794*** [0.0182]	0.1816*** [0.0221]	0.3739*** [0.0246]	0.0929*** [0.0151]	0.1922*** [0.0182]	0.3806*** [0.0204]
F_SEC	0.3817*** [0.0230]	0.4519*** [0.0283]	0.3357*** [0.0323]	0.3540*** [0.0273]	0.4712*** [0.0338]	0.3528*** [0.0383]	0.3763*** [0.0227]	0.4375*** [0.0279]	0.3188*** [0.0319]
F_OWN	0.1022*** [0.0341]	0.0882** [0.0394]	0.0220 [0.0423]	0.0187 [0.0408]	-0.0042 [0.0474]	-0.0242 [0.0498]	0.0430 [0.0335]	-0.0077 [0.0386]	-0.0410 [0.0413]
F_EXPO	0.2255*** [0.0273]	0.1438*** [0.0324]	0.4857*** [0.0345]	0.2444*** [0.0321]	0.1093*** [0.0383]	0.5078*** [0.0405]	0.2424*** [0.0269]	0.1712*** [0.0319]	0.5106*** [0.0340]

VARIABLES	(1) INV_PROD	(2) INV_PROC	(3) INV_RD	(4) INV_PROD	(5) INV_PROC	(6) INV_RD	(7) INV_PROD	(8) INV_PROC	(9) INV_RD
F_TRAI	0.6777*** [0.0226]	0.8609*** [0.0271]	1.1708*** [0.0309]	0.6590*** [0.0266]	0.8112*** [0.0322]	1.1357*** [0.0364]	0.6942*** [0.0223]	0.8833*** [0.0268]	1.2020*** [0.0306]
F_QUAL	0.2941*** [0.0271]	0.3430*** [0.0317]	0.5246*** [0.0346]	0.3125*** [0.0319]	0.3885*** [0.0376]	0.4881*** [0.0408]	0.3257*** [0.0267]	0.3608*** [0.0313]	0.5468*** [0.0340]
F_AGE	0.0360* [0.0191]	-0.0878*** [0.0234]	-0.0826*** [0.0256]	-0.0031 [0.0226]	-0.0777*** [0.0278]	-0.1217*** [0.0302]	0.0438** [0.0188]	-0.0678*** [0.0230]	-0.0622** [0.0252]
F_LOC	0.0283** [0.0113]	-0.0083 [0.0136]	0.0398** [0.0156]	0.0335** [0.0135]	-0.0228 [0.0163]	0.0630*** [0.0184]	0.0234** [0.0112]	-0.0121 [0.0134]	0.0357** [0.0153]
M_FEM	0.1217*** [0.0266]	0.0094 [0.0330]	-0.1451*** [0.0404]	0.1155*** [0.0318]	-0.0174 [0.0397]	-0.1559*** [0.0480]	0.1087*** [0.0263]	-0.0087 [0.0326]	-0.1573*** [0.0400]
M_EXP	0.0049*** [0.0010]	0.0071*** [0.0013]	0.0023 [0.0014]	0.0056*** [0.0012]	0.0079*** [0.0015]	0.0034** [0.0017]	0.0042*** [0.0010]	0.0066*** [0.0012]	0.0013 [0.0014]
Constant	-1.8084*** [0.1247]	-2.6085*** [0.1459]	-5.3263*** [0.2569]	-1.4657*** [0.1333]	-2.1916*** [0.1554]	-4.8177*** [0.2720]	-1.5535*** [0.1221]	-2.2186*** [0.1417]	-4.8173*** [0.2439]
Observations	55,194	55,194	55,194	37,369	37,369	37,369	56,308	56,308	56,308
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3 shows the regression results of the model

$$INV_i = \beta_0 + \beta_1 FIN_i + \beta_2 F_Controls_i + \beta_3 M_Controls_i + Country_FE_i + Year_FE_t + \varepsilon_i. \text{ In which,}$$

FIN_CRE is the credit access of firms before COVID-19, FIN_LIQ is liquidity movement during COVID-19, FIN_ARR is whether firms expect not to fail arrears; INV_PROD , INV_PROC , INV_RD which are dummies respectively whether firms introduce new/improved products/services, process, spend money on R&D; others are control variables divide into 2 categories: Firm characteristics noted by $F_Controls$ includes F_SIZE based on the number of employees, F_SEC comprised 2 sectors manufacturing and service, F_OWN is whether the firm is foreign-owned, F_EXPO is whether the firm export, F_TRAIN is whether the firm has training program for employees, F_QUAL is whether the firm has internationally recognized quality certification, F_LOC is the population of where the firm is located, F_AGE equals $\ln(\text{firm's operation years})$; $M_Controls$ represents manager characteristics following by M_FEM is whether the firm has female managers and M_EXP is the number of sector-related experience years of top manager. Standard errors in square brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ corresponds a 99% confidence, a 95% confidence, and a 90% confidence respectively.

4.2.2.2 Innovative firms are more likely to survive through COVID-19 distress

Table 4 reports the regression results of innovation's impact on firms' survival capability. Overall, the outcomes suggest that the existence of innovation has a significant and positive effect on firm survival, in accordance with H2b. The results show any product introduction or improvement has a highly statistically significant influence (1) opening status, (2) adaptation, and (4) their expectation on their ability to return to normal workforce with confidence level of 99% while it is 90% for (3) sales performance.

Regarding process innovation, it also demonstrates its positively significant relationship to (7) adaptation, (8) workforce recovery expectation with confidence level of 99% and to (5) operation status at significance level of 95%. Yet, there is no impact on sales performance. Despite this, our finding overall is coherent with our proposed hypothesis and unsurprisingly in harmony with previous studies of Lee et al. (2015) and Miocevic and Shroj (2023). This signifies the importance of external innovations in steering businesses in financially difficult times such as the post-global financial crisis of 2009 and COVID-19 induced crisis.

In contrast, R&D investment has a positive influence on all aspects significantly. These results align with previous studies by Lilischkis (2011), Floyd (2016), Chen et al. (2019), Özşuca (2023), and Khan et al. (2022), which have established a positive relationship between R&D investment as innovation input and firms' survival. The findings emphasize the importance of ongoing innovation efforts and strategic investments in R&D for firms aiming to thrive in challenging economic conditions.

In the similar vein, some research is consistent with our findings such as Lee et al. (2014), Miocevic and Shroj (2023). Innovators run a higher chance of sustaining themselves as they can prosper even in unsettling circumstances and are better equipped to adjust to quickly shifting market conditions. In detail, they can quickly develop their products, services, and strategies to satisfy changing demands from customers (Özşuca, 2023; Bartik et al., 2020). They also can experience extra cost reductions while being able to reach higher efficiency in operations (Muzi et al., 2021). Therefore, their ability to bounce back from unfavorable times could offer an edge over rivals and help them pull through economic shocks (Dai et al., 2019; Baumöhl & Kočenda, 2022).

There are also some findings of negative innovation-survival relationships in start-ups and SMEs (Li et al., 2008; Schneider & Veugelers, 2010; Rosenbusch et al., 2011; Lee et al., 2015). Yet, smaller-in-size, younger-in-age businesses are already at a financial disadvantage in the market (Dirman, 2020) as they already have more difficulties in paying off debts' obligations, planning and remaining in business, and lack of support to innovate and survive through financial distress. Therefore, maintaining financial sustainability is crucial to a cushion for those distress. By achieving financial sustainability, firms can gain access to external financing sources, such as banks, while concurrently maintaining robust internal financial capabilities, such as sufficient cash flow availability. This, in turn, empowers firms to allocate resources towards investment and risk-taking in the realm of innovation. Consequently, through sustained innovation efforts, businesses can enhance their adaptability in a comprehensive and effective manner, ultimately bolstering their ability to establish a strong foothold in the market.

Table 4. Regression results: the impact of Innovation on Firm survival

VARIABLE	(1) SUV_ST S	(2) SUV_SL S	(3) SUV_AP T	(4) SUV_EW F	(5) SUV_ST S	(6) SUV_SL S	(7) SUV_AP T	(8) SUV_EW F	(9) SUV_ST S	(10) SUV_SL S	(11) SUV_AP T	(12) SUV_EW F
INV_PROD	0.2764*** [0.0434]	0.0412* [0.0243]	0.0632*** [0.0029]	0.1626*** [0.0225]								
INV_PROG					0.1294** [0.0542]	0.0177 [0.0298]	0.0416*** [0.0035]	0.0992*** [0.0273]				
INV_RD									0.1721** *	0.1025***	0.0386***	0.0936***
F_SIZE	0.2985*** [0.0273]	0.1743*** [0.0157]	0.0314*** [0.0018]	-0.0449*** [0.0141]	0.2992*** [0.0273]	0.1743** *	0.0315*** [0.0018]	-0.0447*** [0.0141]	0.2968*** [0.0273]	0.1707*** [0.0158]	0.0311*** [0.0018]	-0.0459*** [0.0141]
F_SEC	0.1996*** [0.0367]	-0.0357 [0.0235]	-0.0162** [0.0027]	0.0895*** [0.0208]	0.2083*** [0.0367]	-0.0340 [0.0235]	-0.0143** [0.0027]	0.0950*** [0.0207]	0.2127*** [0.0366]	-0.0371 [0.0235]	-0.0133** [0.0027]	0.0970*** [0.0207]
F_OWN	-0.1454** [0.0631]	0.1076*** [0.0365]	0.0058 [0.0043]	-0.0399 [0.0331]	-0.1429** [0.0630]	0.1078** [0.0365]	0.0064 [0.0043]	-0.0384 [0.0331]	-0.1458** [0.0630]	0.1076*** [0.0365]	0.0064 [0.0043]	-0.0385 [0.0331]
F_EXPO	0.0903* [0.0537]	0.1200*** [0.0282]	-0.0010 [0.0034]	0.0004 [0.0262]	0.1015* [0.0537]	0.1216** [0.0282]	0.0008 [0.0034]	0.0051 [0.0262]	0.0951* [0.0537]	0.1152*** [0.0282]	-0.0006 [0.0034]	0.0020 [0.0263]
F_TRAI	0.2214*** [0.0416]	0.0649*** [0.0239]	0.0300*** [0.0028]	0.1049*** [0.0219]	0.2453*** [0.0416]	0.0682** [0.0239]	0.0336*** [0.0028]	0.1152*** [0.0219]	0.2369*** [0.0419]	0.0579** [0.0240]	0.0336*** [0.0029]	0.1155*** [0.0220]
F_QUAL	0.3382*** [0.0559]	0.1362*** [0.0278]	-0.0031 [0.0033]	0.0270 [0.0259]	0.3505*** [0.0558]	0.1377** [0.0278]	-0.0013 [0.0033]	0.0319 [0.0259]	0.3474*** [0.0558]	0.1313*** [0.0278]	-0.0017 [0.0033]	0.0309 [0.0259]
F_AGE	0.2711*** [0.0304]	-0.0060 [0.0196]	0.0050** [0.0022]	0.0966*** [0.0174]	0.2708*** [0.0304]	-0.0058 [0.0196]	0.0058** [0.0022]	0.0985*** [0.0174]	0.2719*** [0.0304]	-0.0049 [0.0196]	0.0055** [0.0023]	0.0980*** [0.0174]
F_LOC	-0.0253 [0.0177]	-0.0390** [0.0116]	0.0114*** [0.0013]	-0.0234** [0.0100]	-0.0238 [0.0177]	-0.0386** [0.0116]	0.0118*** [0.0013]	-0.0227** [0.0100]	-0.0248 [0.0177]	-0.0394** [0.0116]	0.0116*** [0.0013]	-0.0231** [0.0100]
M_FEM	-0.2605** *	-0.0447 *	0.0061* *	-0.0872*** *	-0.2555** *	-0.0438 *	0.0074** *	-0.0836*** *	-0.2522** *	-0.0423 *	0.0078** *	-0.0825*** *
M_EXP	0.0426 0.0021	0.0279 -0.0009	0.0032 -0.0004**	0.0246 0.0045***	0.0425 0.0024	0.0278 -0.0009	0.0032 -0.0004**	0.0246 0.0046***	0.0425 0.0025	0.0279 -0.0009	0.0032 -0.0003**	0.0246 0.0046***
Constant	[0.0018]	[0.0011]	0.1705*** [0.0161]	0.7874*** [0.1296]	[0.0018]	[0.0011]	0.1782*** [0.0162]	0.8083*** [0.1295]	[0.0018]	[0.0011]	0.1876*** [0.0162]	0.8297*** [0.1295]
Observations	41,433	37,643	56,308	56,308	41,433	37,643	56,308	56,308	41,433	37,643	56,308	56,308
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared			0.1063				0.1010				0.1003	

Table 4 shows the regression results of model: SUV_STS is the firm status of operating whether open or temporarily close or permanent close; SUV_SL is the average change in monthly sales compared to 1 year ago; SUV_APT is index for adapting activities responding to COVID-19; SUV_EWF is whether firms expected to recover the same work force as before COVID-19; INV_PROD, INV_PROG, INV_RD which are dummies respectively whether firms introduce new/improved products/services, process, spend money on R&D; others are control variables divide into 2 categories: Firm characteristics noted by F_Controls includes F_SIZE based on the number of employees, F_SEC comprised 2 sectors manufacturing and service, F_OWN is whether the firm is foreign-owned, F_EXPO is whether the firm export, F_TRAIN is whether the firm has training program for employees, F_QUAL is whether the firm has internationally recognized quality certification, F_LOC is the population of where the firm is located, F_AGE equals ln(firm's operation years); M_Controls represents manager characteristics following by M_FEM is whether the firm has female managers and M_EXP is the number of sector-related experience years of top manager. Standard errors in square brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ corresponds a 99% confidence, a 95% confidence, and a 90% confidence respectively.

5. CONCLUSION

This paper investigates the impact of financial resilience on firm survival, especially via the channel of innovation. By applying the combination of ordered, bivariate logit and pooled OLS regression, the findings demonstrate a positive correlation between financial resilience and firm survival. Specifically, firms that possess the ability to access official financial resources, such as banks providing external financing, and effectively manage internal financial factors, such as liquidity and arrears, exhibit a greater capacity to overcome challenges stemming from the shocks like COVID-19. Besides, the empirical results also underscore the mediating function of innovation within the nexus of financial resilience and firm survival. This elucidates that enterprises are poised to undertake innovation initiatives when endowed with resilient financial frameworks, thereby fortifying their capacity to endure distress and shocks such as those precipitated by the Covid-19 pandemic. In accordance with the findings indicating that financial resilience plays a crucial role in the endurance of firms, while innovative investments act as a significant mediator, this research can provide some guidance to businesses and relevant stakeholders, including regulators and investors, who impact firm performance.

Based on the findings, the paper's results could have broader implications for firms. First, managers should put effort into building a flexible, yet robust financial system (Stephen et al., 2019). Moreover, appropriate management of liquidity is also undeniably essential to ensure enough resources and stability withstanding economic downturns. However, only a sound financial system is not enough to help maintain a presence in the market, so it is better for firms to continuously engage in innovating their operations and explore various means of accessing credit from banks or financial institutions to foster innovation and growth.

For stakeholders like regulators, they can show help during crisis by prioritizing the policies that streamline access to official financial resources for businesses, including simplifying the processes for obtaining external financing

from banks. Collaborative efforts between the government and central/commercial banks, therefore, should be made to refinance debt and restructure (Huang et al., 2023). This enables firms to effectively manage liquidity, address arrears, and make critical investments such as innovation. Moreover, regulators should encourage innovation-specific policies, like R&D tax incentives or funding programs, to empower businesses to adapt and survive by fostering an innovation-friendly environment.

Regarding investors, the findings suggest the imperative consideration of a firm's financial robustness alongside its innovation capabilities when evaluating investment opportunities. This recommendation stems from the understanding that heightened financial resilience augments a firm's capacity for sustained operations, with innovation serving as a mediating conduit in the relationship between financial resilience and organizational survival.

6. REFERENCES

- Acharya, S. S. (2020), "The Risk of Being a Fallen Angel and the Corporate Dash for Cash in the Midst of COVID", *The Review of Corporate Finance Studies*, Vol.9, pp. 430 – 471.
- Aidoo, A. (2019), "The impact of access to credit on process innovation", Vol.1, pp. 48 – 63.
- Alfandari, G., and Schaffer., E.M., (1996), "Enterprise Restructuring and Economic Policy in Russia", *Enterprise Restructuring and Economic Policy in Russia*, pp.87–139
- Am, J. B., Furstenthal, L., Jorge, F., & Roth, E., (2020), "Innovation in a crisis: Why it is more critical than ever".
- Ang, J.S., (1992), "On the Theory of Finance for Privately Held Firms", *The Journal of Entrepreneurial Finance*, Vol.1(3), pp. 185-203, <https://doi.org/10.57229/2373-1761.1121>
- Archibugi, D., & Filippetti, A. (2013), "Innovation and economic crisis: Lessons and prospects from the economic downturn", Routledge.
- Audretsch, D. B., & Lehmann, E. E. (2005), "Does the Knowledge Spillover Theory of Entrepreneurship hold for regions?", *Research Policy*, Vol.34(8), pp. 1191–1202.
- Azhar, S., (2013), "Management Efficiency on Profitability: A Empirical Study of Selected Power Distribution Utilities in India", *Journal of Entrepreneurship*, Vol.3(1), pp.31–49.
- Baron, J. N., Davis-Blake, A., & Bielby, W. T. (1986), "The Structure of Opportunity: How Promotion Ladders Vary Within and Among Organizations", *Administrative Science Quarterly*, Vol.31(2), pp.248-273, <https://doi.org/10.2307/2392790>
- Bartik, A., Bertrand, M., Cullen, Z., Glaeser, E. L., Luca, M., & Stanton, C., (2020), "How are Small Businesses Adjusting to COVID-19? Early Evidence from a Survey", SSRN Electronic Journal.
- Baumöhl, E., & Kočenda, E., (2022), "How Firms Survive in European Emerging Markets: A Survey", *Eastern European Economics*, Vol. 60, pp. 1–25.
- Beck, T., Demirgüç-Kunt, A., & Maksimovic, V. (2005), "Financial and legal constraints to growth: Does firm size matter?", In *Journal of Finance*, Vol.60(1), pp.137-177.
- Berry, C., Ryan-Collins, J., & Greenham, T., (2015), "Financial system resilience index building a strong financial system".
- Bertschek, I., (1995), "Product and process innovation as a response to increasing imports and foreign direct investment", *The Journal of Industrial Economics*, Vol.43(4), pp. 341, doi:10.2307/2950548
- Bottazzi, G., Dosi, G., Lippi, M., Pammolli, F., & Riccaboni, M. (2001), "Innovation and corporate growth in the evolution of the drug industry", *International Journal of Industrial Organization*, Vol.19(7), pp.1161-118.
- Bower, J. L., & Christensen, M. (1995), "Disruptive technologies: Catching the wave". *Harvard Business Review*, Vol.73, pp. 43 – 53.
- Brealey, R.A., Myers, S.C. and Allen, F., (2014), *Principles of Corporate Finance*, 11th Edition, McGraw-Hill, Irwin, New York
- Brown, J. R., Martinsson, G., & Petersen, B. C. (2012), "Do financing constraints matter for R&D?", *European Economic Review*, Vol 56, pp. 1512-1529.

- Castaldo, A., Pittiglio, R., Reganati, F., & Sarno, D., (2023), "Access to Bank Financing and Start-up Resilience: A Survival Analysis across Business Sectors in a Time of Crisis", *Manchester School*, Vol. 91(3), pp.141–70.
- Cefis, E. (2005). A matter of life and death: Innovation and firm survival. *Industrial and Corporate Change*, Vol.14(6), pp.1167–1192.
- Chen, G., Zhang, J.J., & Pifer, N.D., (2019), "Corporate governance structure, financial capability, and the R&D intensity in Chinese sports sector: Evidence from listed sports companies", *Sustainability (Switzerland)*, Vol.11(23).
- Christensen, C. M. (1997a), "The Innovator's Dilemma When New Technologies Cause Great Firms to Fail How Can Great Firms Fail? Insights from the Hard Disk Drive" Harvard Business School Press.
- Cornaro, A., (2022), "Financial resilience of insurance network during Covid-19 pandemic", *Quality and Quantity*.
- Cummins, R. A. (2010), "Subjective wellbeing, homeostatically protected mood and depression: A synthesis. *Journal of Happiness Studies*", Vol11, pp. 1 – 17.
- Cunat, (2007), "Trade Credit: Suppliers as Debt Collectors and Insurance Providers", *Review of Financial Studies*.
- Dai, M., Liu, H., & Lin, L. (2019), "How innovation impacts firms' export survival: Does export mode matter?", *The World Economy*, Vol. 43(1), pp. 81–113.
- Damanpour, F., & Schneider, M., (2006), "Phases of the adoption of innovation in organizations: Effects of environment, organization and top managers", *British Journal of Management*, Vol.17(3), pp. 215–236.
- De Vries, E. J. (2006), "Innovation in services in networks of organizations and in the distribution of services", *Research Policy*, Vol.35(7), pp.1037-1051.
- Demirgüç-Kunt, A., & Maksimovic, V. (1998), "Law, finance, and firm growth", *The journal of finance*, Vol53, pp. 2107 - 2137.
- Didier, T., Huneus, F., Larrain, M., & Schmukler, S. L., (2020), "Financing Firms in Hibernation during the COVID-19 Pandemic", World Bank Group.
- Dirman, A. (2020), "Financial distress: the impacts of profitability, liquidity, leverage, firm size, and free cash flow", *International Journal of Business, Economics and Law*, Vol.22.
- Earle, J. S., & Sabirianova, K. Z. (2002), "How Late to Pay? Understanding Wage Arrears in Russia", *Journal of Labor Economics*, Vol. 20(3), pp.661–707. University of Chicago Press.
- Evans, D. S., & Jovanovic, B., (1989), "An estimated model of entrepreneurial choice under liquidity constraints", *Journal of Political Economy*, Vol.97(4), pp. 808–827.
- Floyd, J. (2016), "Innovation and Firm Survival in Start-Ups", University of Ottawa, Canada.
- Franco, M., & Haase, H. (2010), "Failure factors in small and medium-sized enterprises: Qualitative study from an attributional perspective", *International Entrepreneurship and Management Journal*, Vol6, pp. 503 – 521.
- Giannakas, K., & Fulton, M. (2005), "Process innovation activity in a mixed oligopoly: The role of Cooperatives", *American Journal of Agricultural Economics*, Vol.87(2), pp.406–422.
- Gittell, J.H., Cameron, K., Lim, S., & Rivas, V. (2006), "Relationships, Layoffs, and organizational resilience: Airline industry responses to September 11", *Journal of Applied Behavioral Science*, Vol.42(3), pp.300-329.
- Hall, B. H., & Lerner, J. (2010), "The financing of R&D and innovation", *Handbook of the Economics of Innovation*, Vol.1(1C), pp.609-639.
- Holmstrom, B., & Tirole, J. (2000), "Liquidity and Risk Management", *Journal of Money, Credit and Banking*, Vol.32(3), pp.295-319.
- Hu, C., Yun, H., Su, Z., & Xi, C., (2022), "Effective Crisis Management during Adversity: Organizing Resilience Capabilities of Firms and Sustainable Performance during COVID-19", *Sustainability (Switzerland)*, Vol.14(20).
- Huang, J., Kombate, B., Li, Y., Kouadio, K. R., & Xie, P. (2023), "Effective risk management in the shadow of COVID-19 pandemic: The evidence of Indonesian listed corporations", *Heliyon*, Vol.9(5), e15744.
- Hyttinen, A., Pajarinen, M., & Rouvinen, P. (2015), "Does innovativeness reduce startup survival rates?", *Journal of Business Venturing*, Vol.30(4), pp.564-581,

- Ibidunni, A. S., Ayeni, A. W. A., Ogundana, O. M., Otokiti, B., & Mohalajeng, L. (2022), "Survival during Times of Disruptions: Rethinking Strategies for Enabling Business Viability, in the Developing Economy", *Sustainability, Switzerland*, Vol.14.
- Khan, K., Liu, S., Xiong, B., Zhang, L., & Li, C., (2022), "Innovation to Immune: Empirical Evidence From COVID-19 Focused Enterprise Surveys", *Frontiers in Psychology*, Vol.13.
- Khan, S.U., (2022), "Financing Constraints and Firm-Level Responses to the COVID-19 Pandemic: International Evidence", *Research in International Business and Finance*, Vol.59.
- King, R.G., and Levine., R., (1993), "Finance, Entrepreneurship and Growth", *Journal of Monetary Economics*, Vol.32(3).
- Kohv, K., (2020), "Prediction of bank loan defaults with financial ratios, tax arrears and annual report delays", master's thesis, University of Tartu, Estonia, <http://hdl.handle.net/10062/69389>
- Laosirihongthong, T., Prajogo, D. I., & Adebajo, D. (2015). Erratum: The relationships between firm's strategy, resources and innovation performance: resources-based view perspective (Production Planning and Control (2013)). In *Production Planning and Control* (Vol. 26, Issue 3).
- Lee, N., Sameen, H., & Cowling, M. (2015), "Access to finance for innovative SMEs since the financial crisis", *Research Policy*, Vol.44(2), pp.370–380.
- Li, Y., Zhao, Y., Tan, J., & Liu, Y. (2008), "Moderating effects of entrepreneurial orientation on market orientation-performance linkage: Evidence from Chinese small firms", *Journal of Small Business Management*, Vol.46(1), pp.113-133.
- Liu, T., Wang, J., Rathnayake, D. & Louembé, J. (2022), "The Impact of Commercial Credit on Firm Innovation: Evidence from Chinese A-Share Listed Companies", *Sustainability*, Vol.14, pp. 1481.
- Lukason, O., & Andresson., A., (2019), "Tax Arrears Versus Financial Ratios in Bankruptcy Prediction", *Journal of Risk and Financial Management*, Vol.12(4), pp.187.
- Matloub, H. & Avraam, P. (2022), "Organizational readiness for digital financial innovation and financial resilience", *International journal of production economics*, Vol.243, pp. 108326.
- Miocevic, D., & Srhoj, S., (2023), "How do governmental wage subsidies enhance SME resilience in the COVID-19 pandemic?", *International Journal of Operations and Production Management*, Vol.43(13).
- Mulyantini, S., Jubaedah, S., (2020), "Strengthening Financial Resilience in the Development of Digital Technology Case Study: Small and Medium Enterprises in Jakarta", *IOSR Journal of Business and Management*, Vol. 22(6), pp.7-20.
- Musso, P., & Schiavo, S., (2008), "The impact of financial constraints on firm survival and growth", *Journal of Evolutionary Economics*, Vol.18(2), pp.135–149.
- Muzi, S., Jolevski, F., Ueda, K., & Viganola, D., (2023), "Productivity and firm exit during the COVID-19 crisis: cross-country evidence", *Small Business Economics*, Vol.60(4).
- Nanda, R., & Nicholas, T., (2014), "Did bank distress stifle innovation during the Great Depression?", Working Paper No.20392, National Bureau of Economic research, Available at: <http://www.nber.org/papers/w20392>
- Nkundabanyanga, S. K., Mugumya, E., Nalukenge, I., Muhwezi, M., & Najjemba, G. M., (2019), "Firm characteristics, innovation, financial resilience and survival of financial institutions", *Journal of Accounting in Emerging Economies*, Vol.10(1), pp. 48–73.
- O'Sullivan, M., (2006). "Finance and innovation", Oxford Handbooks Online.
- Özsuca, E.A., (2023), "Firm Survival in Times of Crisis: Do Innovation and Financing Constraints Matter? Insights from the COVID-19 Pandemic", *Eastern European Economics*, Vol.61(5), pp. 421–56.
- Pham, L. T. M., Vo, L. V., Le, H. T. T., & Le, D. V. (2018), "Asset liquidity and firm innovation", *International Review of Financial Analysis*, Vol.58, pp.225–234.
- Rosenbusch, N., Brinckmann, J., & Bausch, A. (2011), "Is innovation always beneficial? A meta-analysis of the relationship between innovation and performance in SMEs", *Journal of Business Venturing*, Vol.26(4), pp.441-457.
- Salignac, F., Marjolin, A., Reeve, R., and Muir., K., (2019), "Conceptualizing and Measuring Financial Resilience: A Multidimensional Framework", *Social Indicators Research*, Vol.145(1), pp.17–38.

- Salunkhe, U., Rajan, B., & Kumar, V. (2021), "Understanding firm survival in a global crisis", *International Marketing Review*.
- Schneider, C., & Veugelers, R. (2010), "On young highly innovative companies: Why they matter and how (not) to policy support them", *Industrial and Corporate Change*, Vol.19(4), pp.969-1007.
- Schumpeter, J.A. (1912), *Theory of Economic Development*. Routledge", London.
- Schwartz, M., (2012), "A control group study of incubators' impact to promote firm survival", *The Journal of Technology Transfer*, Vol.38(3), pp.302-331.
- Shaharuddin, S. N. H., Mahmud, R., Mohd Azhari, N. K., & Perwitasari, W. (2021), "Company Performance during Covid-19: Impact of Leverage, Liquidity and Cash Flows", *Environment-Behaviour Proceedings Journal*, Vol.6(17), pp.11-16.
- Sheffi, Y. (2015), *THE POWER OF RESILIENCE How the best companies manage the unexpected*", mit Press.
- Siepel, J., & Dejardin, M., (2020), "How do we measure firm performance? A review of issues facing entrepreneurship researchers", *Handbook of Quantitative Research Methods in Entrepreneurship*.
- Soufi, H., Esfahanipour, A., & Shirazi, M. (2022), "A quantitative approach for analysis of macroeconomic resilience due to socio-economic shocks", *Socio-Economic Planning Sciences*, Vol.79.
- Southwick, S., Bonanno, G., Masten, A., Panter-Brick, C. & Yehuda, R. (2014), "Resilience definitions, theory, and challenges: interdisciplinary perspectives", *European Journal of Psychotraumatology*, Vol.5, pp. 253-38.
- Sprenger, C. (2014), "Privatization and survival - evidence from a Russian firm survey", *Economic Annals*, Vol.59 (200), pp.43-60.
- Stephen, N., Mugumya, E. & Nalukenge, I. (2019), *Firm characteristics, innovation, financial resilience and survival of financial institutions*".
- Sufi, A. (2009), "Bank lines of credit in corporate finance: An empirical analysis. *Review of Financial Studies*", Vol.22, pp. 1057 – 1088.
- Taylor, S., (2013), "Australian Society of Rehabilitation Counsellors (ASORC)", Retrieved from <https://www.asorc.org.au/>
- Toivonen, M., & Tuominen, T. (2009). Emergence of innovations in services. *Service Industries Journal*, 29(7).
- Tuominen, M., Rajala, A., & Möller, K., (2004), "How does adaptability drive firm innovativeness?", *Journal of Business Research*, Vol.57(5), pp. 495-506.
- Wang, C. L., & Ahmed, P. K., (2004), "The development and validation of the organizational innovativeness construct using confirmatory factor analysis", *European Journal of Innovation Management*, Vol.7(4), pp. 303-313.
- Wynstra, F., Von Corswant, F., & Wetzels, M., (2010), "In chains? An empirical study of antecedents of supplier product development activity in the automotive industry", *Journal of Product Innovation Management*, Vol.27(5).
- Yovchev, M.E., (1998), "Do Firms in Transition Economies Have Soft Budget Constraints? A Reconsideration of Concepts and Evidence", *Journal of Comparative Economics*, Elsevier, Vol. 26(1), pp. 80-103.

APPENDIX – VARIABLE CONSTRUCTION

Variables	Preference	Notation	Description
<i>Firm Survival (SUV)</i>			
Firm Status	Khan et al. (2022) Özşuca (2023)	SUV_STS	Current firm status: Open (=3); Temporarily close (=2); Permanently close (=1)
Firm Performance	Khan et al. (2022) Heredia et al. (2022)	SUV_SLS	Change in monthly sales compared to one year ago: Increased (=3); No change (=2); Decreased (=1)
Firm Adaptability	Özşuca (2023)	SUV_APT	Adaptability Index (Increasing delivery of goods, services, or carry-out, adjusting or converting their production or services, starting or increasing online business activity, and starting or increasing remote work)
Workforce Expectation	Khan et al. (2022)	SUV_EWF	Firm expects to return to normal level of workforce (=1); otherwise (=0)
<i>Financial Resilience (FIN)</i>			
Credit access	Salignac et al. (2019)	FIN_CRE	Firm has a line of credit or loan: No credit access (=1); Non-mainstream credit (Non-bank financial institution & other) (=2); Mainstream credit (Commercial bank, State-owned banks/Government agency) (=3)
Liquidity	Dirman (2020) Hu et al. (2022)	FIN_LIQ	Firm ever have experienced liquidity or cash flow availability since COVID-19 began: Decreased (=1); Fluctuated (=2); No change (=3); Increased (=4)
Arrears Anticipation	Mulyantini and Jubaedah (2020)	FIN_ARR	Firm that anticipates falling in arrears on outstanding liabilities (=1); otherwise (=0)
<i>Innovation (INV)</i>			
Product innovation	Khan et al. (2022) Özşuca (2023)	INV_PRO D	During last 3 years, firm introduced new/significantly Improved Product (=1); otherwise (=0)
Process innovation	Khan et al. (2022) Özşuca (2023)	INV_PRO C	During last 3 years, firm introduced new/significantly Improved Process (=1); otherwise (=0)
R&D	Özşuca (2023)	INV_RD	During the Fiscal Year, firms spent on R&D, excluding market research (=1); otherwise (=0)
<i>Firm Characteristics (F_Controls)</i>			
Firm size	Khan et al. (2022)	F_SIZE	Number of employees: Large (> 100) (= 3); Medium (20-99) (=2); Small (<20) (= 1)
Firm sector	Özşuca (2023)	F_SEC	Firm belongs to manufacturing sector (=1); service sector (=0)
Foreign ownership	Khan et al. (2022) Özşuca (2023)	F_OWN	Firm is owned by foreign individuals, companies, or organizations (=1); otherwise (=0)
Exporter	Khan et al. (2022) Özşuca (2023)	F_EXPO	Firm exports, (=1); otherwise (=0)
Training (Employee quality)	Khan et al. (2022)	F_TRAIN	Formal training programs for permanent, full-time employees in last fiscal year (= 1); otherwise (=0)
Firm quality	Khan et al. (2022)	F_QUAL	Firms specify the internationally recognized quality Certifications (=1); otherwise (=0)
Location	Sidorkin and Srholec (2014) Özşuca (2023)	F_LOC	Located in location with population: > 1 million (= 4); 250.000 - 1 million (= 3); 50.000 -250.000 (= 2); < 50.000 (= 1)
Firm age	Sidorkin and Srholec (2014) Khan et al. (2022)	F_AGE	Natural logarithm of the number of operation years of the firm
<i>Manager Characteristics (M_Controls)</i>			
Female top manager	Khan et al. (2022)	M_FEM	At least 1 top manager is female (=1); otherwise (=0)

Variables	Preference	Notation	Description
	Özşuca (2023)		
Managerial experience	Khan et al. (2022) Özşuca (2023)	M_EXP	Number of years of experience top managers have working in this sector
<i>Other factors</i>			
Countries	Sidorkin and Srholec (2014)	C_Controls	43 countries
Year		Y_Controls	Year 2020, 2021, 2022

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

