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Prepared and Flexible? Swedish SME Resilience During the COVID-19 Crisis

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Master's Thesis in Finance

Graduate School

Spring Term 2025

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Abstract

This study investigates how pre-pandemic firm characteristics shaped SME resilience during the COVID-19 crisis. Using a unique dataset combining nationwide survey responses with financial data for 1,000 Swedish SMEs (2018–2022), we examine how financial flexibility and operational preparedness influenced profitability and financial distress across three time horizons using cross-sectional regressions. We find that having a crisis management team or continuity plan was associated with stronger outcomes among larger firms severely affected by the pandemic. In contrast, financial flexibility showed limited effects. The impact of these characteristics varied by firm size and disruption severity, highlighting the importance of organizational context in determining the relevance of resilience traits. This study contributes to the crisis literature by integrating financial and operational dimensions, encouraging policymakers, investors, auditors, and lenders to look beyond static financial metrics when assessing firm vulnerability and preparedness in the face of systemic shocks.

Keywords

SMEs, COVID-19, Financial Flexibility, Operational Preparedness, Firm Size, Profitability, Distress, Exposure.

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1 Introduction

The COVID-19 pandemic constituted one of the most significant global economic disruptions in recent history (Beland et al., 2022). While fundamentally a health crisis, its economic impact rippled through business systems, revealing strong differences in how firms withstood the shock. Demand plummeted across sectors, supply chains were destabilized, and restrictions on mobility and interaction forced companies to adjust or halt operations altogether (Brodeur et al., 2020). In Sweden, GDP contracted by 2.4 percent in 2020, its sharpest fall since the early 1990s, while quarterly turnover for many service industries collapsed by more than a third (SCB, 2021). Even though policy responses differed between countries, the crisis acted uniformly and exposed the vulnerabilities and strengths of firms across all sizes and industries (McKibbin & Fernando, 2023).

In this environment, firm resilience became a critical determinant of survival. Some firms were able to adapt quickly, restructure operations, preserve liquidity, and even grow despite the challenges. Others, however, faced losses or permanent shutdowns. Understanding what separated the two has become a central question in the post-pandemic economic literature. Early empirical work has concentrated on large, publicly listed firms and relied mainly on market-based indicators, cumulative abnormal returns or CDS spread changes to proxy resilience (Fahlenbrach et al., 2021; Almeida et al., 2012; Li et al., 2020). A Scopus keyword scan (January 2024) shows that out of 312 COVID-finance articles, only 26 (≈ 8%) examine small and medium-sized enterprises (SMEs), and fewer than a handful employ accounting profitability as the outcome variables. This leaves two gaps:

One, the SME sector, which in Sweden accounts for about 99% of all firms and 65% of private employment (Tillväxtverket, 2020, p.2). Two, realized operational performance, which can deviate substantially from investor expectations embedded in stock prices, especially when firms are privately held.

To address these gaps, this study examines how pre-pandemic characteristics of Swedish SMEs influenced resilience during the COVID-19 crisis, using Return on Assets (ROA) and Z-scores as performance and distress indicators for a nationwide panel of Swedish SMEs. In doing so, the study seeks to answer the central question:

Which pre-COVID firm traits were most important for SME resilience during and after the pandemic?

Motivated by earlier research on how pre-crisis firm characteristics influence resilience during economic shocks, this study focuses on two central dimensions identified in the literature: financial flexibility and operational preparedness. Financial flexibility refers to a firm's ability to access and deploy financial resources when needed, typically through a combination of strong liquidity and manageable leverage (Gamba & Triantis, 2008). Operational preparedness, meanwhile, encompasses strategic planning and readiness, such as having a documented crisis response plan and a designated crisis management team (Björk et al., 2024). These two attributes are examined among Swedish SMEs to evaluate their role in shaping firm-level outcomes during the COVID-19 crisis.

Accordingly, we test the following hypotheses:

- **H1**: Higher pre-pandemic financial flexibility is associated with superior resilience during and after COVID-19, particularly for firms highly affected by the crisis.
- **H2**: Operationally prepared firms are associated with superior resilience during and after COVID-19, particularly for firms highly affected by the crisis.

By shifting attention from listed-firm stock reactions to realized performance among Swedish SMEs, this study makes several contributions. First, it integrates financial and operational dimensions of crisis resilience, which are often analyzed separately in the literature. By testing theoretically grounded hypotheses using matched survey and financial data, the study provides rare empirical insight into how these traits influence real firm outcomes in the SME segment during the pandemic. Second, it extends the predominantly short-term focus of existing crisis research by evaluating firm performance over multiple years, thereby capturing broader, longer-term effects of firm resilience. Third, the study explores the heterogeneous impact of resilience factors across firm sizes in the SME segment, showing that the effectiveness of financial and operational characteristics is highly contingent on organizational scale.

While the pandemic had wide-reaching macroeconomic effects, including contractions in GDP and shifts in labor markets, this study adopts a firm-level perspective. Our focus is on how individual SMEs experienced and responded to the crisis based on their internal characteristics. By isolating resilience at the organizational level, the analysis avoids conflating firm-specific

outcomes with broader societal trends and contributes to a more granular understanding of crisis performance.

The remainder of the thesis is structured as follows. Section 2 reviews the relevant literature on financial flexibility, operational preparedness, and firm resilience during crises. Section 3 introduces the theoretical framework, drawing on crisis-induced market valuation models and firm-level mechanisms to motivate the expected relationship between pre-crisis firm characteristics and performance outcomes. Section 4 describes the dataset, sample construction, model design, and overall empirical methodology. Section 5 presents the main results and discusses the findings in light of theoretical expectations. Finally, Section 6 concludes by summarizing the key insights and outlining implications for research and practice.

2 Literature Review

2.1 Introduction to Resilience

The COVID-19 pandemic brought renewed attention to the importance of risk management and adaptability in determining firm outcomes (Beland et al., 2022). Firms that demonstrated resilience during the crisis often shared structural traits such as high liquidity, low leverage, and proactive strategic planning, while others struggled to survive under financial and operational stress (Chang et al., 2020). Prior research emphasizes that resilience is not merely a reactive stance but a pre-existing firm attribute, developed over time to withstand financial constraints and uncertainty (Campello et al., 2010). Empirical evidence shows that firms with robust balance sheets, including lower debt levels and higher cash holdings, were better equipped to absorb the shock (Fahlenbrach et al., 2021), while well-structured boards supported faster and more effective responses (Fasth et al., 2024).

This chapter reviews the literature on firm resilience before, during, and after the COVID-19 crisis, with a focus on the role of financial flexibility and operational preparedness. The structure follows a chronological logic: pre-crisis conditions, firm performance during the shock, and post-crisis recovery.

2.2 Before COVID-19: Foundations of Resilience

The years preceding the COVID-19 pandemic were marked by economic stability, low interest rates, and favourable credit conditions. Baker et al. (2020) note that many firms expanded operations during this period by increasing leverage, often at the expense of maintaining liquidity. These financial strategies reflected an implicit assumption of continued growth and stability.

However, earlier crises such as the 2008 financial crash and the 2010 European debt crisis highlighted the role of financial flexibility in resilience. Research by Campello et al. (2010), Almeida et al. (2012), and Fahlenbrach et al. (2021) shows that firms with higher cash holdings, lower short-term debt, and diversified funding sources fared better during downturns. Nonetheless, many firms failed to internalize these lessons, entering the pandemic underprepared. Pagano et al. (2020) emphasize that while some large firms, particularly in tech and finance, maintained strong liquidity and digital capabilities, most SMEs remained financially constrained and vulnerable.

2.2.1 Financial Flexibility

2.2.1.1 Liquidity and Cash Holdings

Liquidity served as a critical buffer when COVID-19 disrupted revenue flows. Firms with stronger cash positions were more likely to sustain operations, retain staff, and avoid distressed asset sales. During the 2008 financial crisis, Campello et al. (2010) and Denis & McKeon (2012) found that firms with greater liquidity could continue investing and weather the storm. Fahlenbrach et al. (2021) confirmed similar patterns during COVID-19, observing smaller stock price declines among firms with higher pre-pandemic cash levels.

For SMEs, the role of liquidity is even more pronounced. Limited access to external financing, weaker banking relationships, and thin collateral profiles often leave SMEs dependent on internal cash flows (Ivashina & Scharfstein, 2010). In such settings, cash holdings are not just a cushion, they are the firm's survival line.

2.2.1.2 Leverage and Debt Structure

The level and structure of debt significantly influence how firms respond to crisis conditions. Almeida et al. (2012) demonstrate that high leverage increases vulnerability during downturns, as fixed debt payments persist even when revenues collapse. A key distinction lies in the maturity structure: short-term debt amplifies refinancing risk during crises, while long-term debt offers more stable repayment schedules (Ellul et al., 2020).

Firms that entered the pandemic with high short-term debt were especially exposed. Baker et al. (2020) report that these firms experienced severe liquidity stress, made worse by frozen credit markets and falling demand. This highlights the importance of not just how much debt a firm holds, but the terms under which it is structured.

2.2.2 Operational Preparedness

2.2.2.1 Crisis Planning and Governance

Beyond financial buffers, organizational preparedness plays a vital role in determining how firms manage crisis situations. Albuquerque et al. (2020) show that firms with documented crisis plans and structured response teams adapted more effectively during the early phase of the pandemic. Similarly, Pagano et al. (2020) find that firms with pre-existing contingency strategies like supply chain redundancy or flexible cost structures were quicker to adjust.

Among SMEs, governance mechanisms also matter. Fasth et al. (2024) highlight that SMEs with less diverse, more tightly structured boards were able to act more decisively during the crisis, enabling faster implementation of response strategies. These findings suggest that preparedness goes beyond planning, it requires embedded decision-making structures that function under pressure.

2.2.2.2 Cost Flexibility

Firms with rigid cost structures characterized by high SG&A expenses or significant fixed overhead are more vulnerable during downturns. Papanikolaou & Schmidt (2022) argue that firms with leaner cost bases and higher operational adaptability were better positioned to navigate the revenue shocks brought on by COVID-19. This includes the ability to scale down production, adjust staffing, and defer discretionary expenditures quickly.

While beyond the scope of this study, cost flexibility represents an important background condition that amplifies or mitigates the effect of financial and strategic preparedness.

2.3 Performance During the COVID-19 Shock

Sweden's response to the pandemic provides a distinctive setting for evaluating firm-level resilience. Unlike many countries that imposed strict lockdowns, Sweden adopted voluntary guidelines with limited legal restrictions (Bricco et al., 2020; Winblad et al., 2022). While intended to preserve economic activity, this strategy shifted more of the adjustment burden onto individual firms.

SMEs in particular faced severe challenges as consumer demand fell, supply chains fractured, and uncertainty spiked. Public support mechanisms such as tax deferrals and wage subsidies provided temporary relief (Waldenström & Angelov, 2023), but the survival of many firms depended heavily on pre-crisis characteristics, especially liquidity and preparedness.

2.4 Post-COVID Performance and Persistent Effects

As the crisis evolved into a protracted recovery, a growing body of literature examined whether the same traits that predicted short-term survival also influenced long-term performance. Some studies affirm that financially flexible firms were able to invest in recovery opportunities early and gain market share (Fahlenbrach et al., 2021). Others suggest that excessively conservative

strategies such as holding too much cash or maintaining underused credit lines may lower long-run returns (Almeida et al., 2012; Denis & McKeon, 2012).

Sectoral context also moderates the value of flexibility. In volatile sectors like hospitality, liquidity remained crucial well into the recovery, while tech-oriented firms often recovered through innovation and scalability (Ivashina & Scharfstein, 2010; Li et al., 2020). However, across most SME-focused studies, internal buffers and structured responses remained reliable predictors of performance beyond the initial shock.

2.5 Summary

The literature consistently points to two central mechanisms driving firm resilience during crisis: financial flexibility, particularly cash holdings and leverage structure; and operational preparedness, including crisis planning and governance design. These factors not only influenced immediate firm survival but also shaped recovery trajectories over time.

In the following chapter, we formalize these relationships using a theoretical framework based on crisis-state pricing and firm-level value loss under temporary revenue stops. These models provide a conceptual basis for our empirical tests and clarifies why pre-crisis traits matter both during and after economic shocks.

3 Theoretical Framework

3.1 Crisis Price Drop Under Efficient Markets

Fahlenbrach et al. (2021) found a significant and persistent difference in stock price drops among firms during the COVID-19 crisis. The key factor explaining this difference was financial flexibility, meaning firms with higher liquidity and lower leverage suffered smaller declines. This suggests that market participants anticipated that firms with weaker balance sheets would struggle more in a crisis. Similar results were also observed in the stock market for factors influencing operational flexibility (Papanikolaou & Schmidt, 2022). To explore what these differences in price drops reveal about actual firm performance, we first introduce a simple model demonstrating how the stock price drops under perfect markets depends on a firm's expected performance in a crisis. This sets the stage for a state pricing framework, which will explain the relation between crisis probability, risk aversion, expected performance during crisis and price drops.

3.1.1 Crisis-Induced Price Drops: Simple Model

Under the assumption of perfect markets, the stock price before a crisis, V_0 , represents the expected firm value across possible states. If a crisis occurs, the stock price adjusts to V_C , reflecting the firm's expected value under crisis conditions. Let X_N and X_C be the present values of expected cash flows in a normal (no crisis) and crisis states, respectively, with π_C as the markets expected probability of a crisis occurring. The stock price before and after a crisis can then be expressed as:

$$V_0 = \pi_C X_C + (1 - \pi_C) X_N ,$$

$$V_C = X_C .$$

Thus, the stock price drop when a crisis occurs is:

$$\Delta V = V_0 - V_C = (X_N - X_C)(1 - \pi_C).$$

For a stock price drop to occur, two conditions must be met: (1) an expectation of worsened company performance in a crisis and (2) a perceived crisis probability below certainty. The more unexpected the crisis, the greater the price drop. Comparing two identical companies that differ only in their expected crisis performance (X_C) , the firm with worst expected performance will experience a larger price drop of $\Delta X_C(1 - \pi_C)$, where ΔX_C represents the performance gap between them. Historically, crises such as the 2008 financial crash and COVID-19 have followed

the dynamics outlined in this model. In both cases, empirical findings suggest that certain pre-crisis characteristics can improve X_C, leading to smaller stock price declines compared to otherwise similar firms.

An interesting question is whether the market anticipated these differences before the crisis or only realized them afterward. If markets priced in weaker crisis resilience before the event, the price drop occurred gradually. However, if it was only recognized post-crisis, the price drop difference would be even greater. Regardless, the assumption that firms with better crisis resilience experience smaller stock price drops holds, validating earlier market-based findings on the importance of pre-crisis characteristics.

3.1.2 Crisis-Induced Price Drops: State Pricing and Risk Aversion

To more accurately reflect investor behavior, we introduce a risk-adjusted pricing framework using state claims, building on the foundational state pricing theory developed by Arrow and Debreu (1954). This offers valuable intuition and a reasonable approximation of how equilibrium prices adjust during crises.

The price of a stock in state j can be expressed using state claims:

$$\rho_j = \pi_j \frac{du\prime(C_j)}{u(C_0)} \ , \ PPC_j = \frac{\rho_j}{\pi_j},$$

where $u'(C_j)$, $u'(C_0)$ represent marginal utilities based on state consumption, and d is a discount factor. Applying this to our two-state crisis framework:

$$V_0 = \sum_j \rho_j X_j = \rho_C X_C + \rho_N X_N$$

$$V_C = X_C \ ,$$

$$\Delta V = V_0 - V_C = \rho_N X_N + (\rho_C - 1) X_C \ .$$

Then the derivative of ΔV with respect to X_C is simply:

$$\frac{\partial \Delta V}{\partial X_C} = (\rho_C - 1).$$

Following the logic from the simple model, for the price drop to be smaller when expected crisis performance improves, the derivative must be negative. Thus:

$$\pi_C \frac{du\prime(C_{Crisis})}{u\prime(C_0)} < 1 \ .$$

The extent of price drops during a crisis depends on the expected probability of a crisis and the market's risk aversion at equilibrium before the crisis occurs. A higher level of risk aversion increases the marginal utility of consumption in the crisis state, making crisis-resilient assets more

valuable and driving demand for safer assets. As a result, firms expected to perform well during a crisis are already priced at a premium, while firms vulnerable to downturns face a discount even before the crisis. This pre-crisis pricing adjustment reduces the differential price drop during the crisis, as much of the risk is already priced in. Conversely, the inequality highlights that with a low perceived probability of a crisis, a market with low risk aversion underestimates crisis risks, leading to inflated valuations across the board. Consequently, when a crisis unfolds, the price drop is more pronounced for firms that perform poorly in crisis conditions compared to those that perform well, as these risks were not fully accounted for pre-crisis

Additionally, a sudden spike in risk aversion during the crisis can amplify systematic overreactions (e.g., flight-to-safety effects), causing temporary price swings that exceed what fundamental differences in firm performance justify. This variation in risk preferences can distort perceived performance, especially in market-based measures like stock price drops.

3.2 Challenges in Interpreting Crisis Price Drops and the Need for Performance Measures

While the theoretical framework provides insights into how firms' pre-crisis characteristics influence their crisis price drops under the assumption of efficient markets, several factors may complicate this relationship. These complexities highlight the need for a deeper examination of actual performance metrics during the crisis to validate whether market expectations align with realized firm outcomes.

3.2.1 The Cost of Crisis Resilience: Does improved Crisis Performance Come at a Cost?

One crucial issue is whether pre-crisis characteristics that enhance performance during a crisis negatively impact firm performance in normal non-crisis times. If firms adopt policies that make them more resilient during downturns (e.g., maintaining high cash buffers, reducing leverage), these strategies might reduce efficiency and profitability in normal times, leading to a lower pre-crisis firm valuation. Fahlenbrach et al. (2021) briefly acknowledged this limitation, as their study primarily focused on the positive effects of financial flexibility without considering potential negative consequences in normal times.

In the theoretical model, this would mean that an increase in X_C (better expected crisis performance) could come at the expense of a lower X_N(normal state expected performance). As a result, the total price drop at the onset of the crisis might still be smaller, but this would not fully capture the trade-offs firms face. Instead, the actual cost of maintaining resilience would manifest as a pre-crisis discount on firm value, rather than only influencing price reactions at the time of the crisis. By using the simple model, the pre-crisis stock valuation weighs X_C by π_C, while X_N is weighted by $(1 - \pi_C)$. Since most crises are unexpected, the expected probability of a crisis occurring is typically very low. This implies that the positive effect on expected crisis performance would need to be substantially larger to offset any potential negative effect on expected performance in the normal state to avoid a reduction in stock-price.

3.2.2 Is Market Anticipation of Crisis Performance Accurate?

Another challenge is whether the market's expectations about firm resilience accurately reflect actual firm performance during the crisis. In addition to risk preferences distorting crisis-induced price movements, misjudgments about firms' actual performance can further distort observed resilience. If investors miscalculate which firms will perform well, price drops may not fully align with fundamental crisis performance metrics. Fahlenbrach et al. (2021) also acknowledged this as a potential caveat, suggesting that idiosyncratic risk misjudgments or market misconceptions could distort their findings. This highlights the need to validate whether expected crisis resilience translates into measurable operational and financial performance improvements.

3.2.3 Are the Benefits of Crisis Resilience Only Short-Term or Also Long-Term?

A related question is whether firms that demonstrated stronger performance during the crisis continued to outperform in the long term or if their advantages were only temporary. If the benefits of crisis-resilient pre-characteristics are short-lived, then the long-term firm value implications may differ from the short-term price reactions.

Most literature that discusses these effects tends to focus only on the immediate short-term impact, often analyzing stock price movements in the days or months following a crisis event. However, the broader, more long-term effects of crisis resilience remain less explored.

3.3 Financial Flexibility and Operational Preparedness During Crises: Firm-Level Mechanisms

Having explored what empirical differences in market price drops suggest about firm performance during crises, and how these market-based signals can be distorted, we now shift focus to firm-level mechanisms. Building on the theoretical framework and reasoning by Fahlenbrach et al. (2021), this section examines the internal mechanisms within firms, particularly in terms of liquidity and cost management, to explain why firms with greater financial flexibility and operational preparedness may be better positioned to maintain stability and recover during sudden temporary revenue shocks.

3.3.1 Sudden Revenue Stops: Perfect Markets

Consider an all-equity firm with monthly net operating cash flow X_t , defined as revenue R_t minus costs C_t. Assuming no investment expenses, all costs are fixed, and that cash flows are discounted using $D(t)$, the firm's fundamental value at time zero is:

$$V_0 = \sum_{t=1}^{\infty} D(t)E_0(R_t - C_t),$$

Where $E_0(\ldots)$ represents expectations at time zero.

If the firm experiences a sudden revenue stop for *n* months before returning to expected levels, and discount factors remain unchanged, its new value (V_0^{STOP}) becomes:

$$V_0^{STOP} = \sum_{t=1}^{n} D(t)E_0(-C_t) + \sum_{t=n+1}^{\infty} D(t)E_0(R_t - C_t).$$

The loss in firm value due to the revenue stop is therefore:

$$V_0 - V_0^{STOP} = \sum_{t=1}^{n} D(t)E_0(R_t).$$

Since costs remain fixed, the firm must cover expenses for *n* months without revenue, making the value loss equal to the present value of lost revenue. In a frictionless market, firms can borrow against future expected cash flows if their present value of future cash flows after the revenue stop exceeds the present value of the short-term cost burden. If this condition is not met, the firm holds no value and is forced into liquidation. The firm's ability to withstand a revenue stop therefore depends on the duration of the shock and its profitability. If future cash flows are expected to

recover, the firm can borrow against them to cover short-term costs. However, two additional factors can further reduce firm value. First, as outlined in the state pricing model, a crisis-induced surge in risk aversion raises the risk premium, lowering the present value of future cash flows. Second, firm value may decline if post-crisis cash flows are expected to fall. Together, these factors increase the likelihood of financial distress, even in a frictionless market.

If we now look at the other extreme case where all costs are variable, a sudden revenue stop results only in the loss of the discounted expected cash flows over *n* months, and the firm does not face immediate financial distress. Its value under a revenue stop is:

$$V_0^{STOP} = \sum_{t=n+1}^{\infty} D(t)E_0(R_t - C_t).$$

In this scenario, the firm effectively "pauses" operations and resumes once revenue returns. Therefore, the extent of the loss depends on how well the firm can reduce costs when not producing. If we now also assume the firm has debt and owes a constant debt payment each month, these payments correspond to an increase in fixed costs in perfect markets. Since debt obligations reduce collateral (the value of future cash flows available for borrowing), higher leverage raises the probability of liquidation.

The impact of leverage and cost flexibility depends on the severity of revenue loss, where a partial loss in revenue may lead to the firm still being profitable. During crises like COVID-19, industries reliant on social interaction faced greater sensitivity to these factors due to both demand and supply-side disruptions.

3.3.2 Sudden Revenue Stops: Imperfect Markets

In imperfect markets, financial frictions can constrain firms' access to external funding, increasing the risk of liquidation. Unlike in perfect markets, a financially constrained firm may be forced to liquidate, even if it is fundamentally valuable, due to the lack of available external financing. If the firm must sell assets during a crisis, it may face fire-sale discounts (Shleifer & Vishny, 2011), making it an expensive and inefficient source of funding. To mitigate this risk, firms may accumulate cash buffers to cover fixed costs during a revenue stop. If sufficient, this buffer allows the firm to survive until market conditions stabilize, reducing the need for asset sales or inefficient cost-cutting. However, many firms can access external funding, but they often face significant friction in doing so. Barriers such as agency costs and information asymmetries make financing

more expensive, particularly for firms with higher leverage, urgent liquidity needs, or limited collateral. As a result, raising external funds during a crisis can be costly and inefficient. In such cases, cash reserves remain the most reliable and cost-effective option, reinforcing the importance of liquidity management in crisis resilience.

3.3.3 Operational Preparedness as a Strategic Investment

Recall the all-equity firm operating with fixed costs under perfect markets. In this setting, a firm's value loss during a sudden revenue stop is driven by two key factors: the severity of revenue decline and the inability to cover fixed operating costs during the disruption period. Operational preparedness, encompassing strategic planning, team coordination, and pre-established response protocols, can mitigate these losses through several channels (Doern, 2016). It can limit the extent of revenue loss by enabling faster operational adjustments, reduce the persistence of fixed costs by facilitating timely cost-cutting, and prevent disorganization or delays that exacerbate financial stress. Collectively, these mechanisms can help reduce the magnitude or duration of crisis-induced value loss, even if they do not enhance performance during normal times.

To capture this effect, we introduce a preparedness effort level θ, which requires an upfront cost of $\Psi(\theta)$, increasing in θ, reflecting investment in strategic readiness. If preparedness reduces the revenue loss during a disruption year by a factor $\lambda_t(\theta)$, where $0 < \lambda_t(\theta) < 1$, then the resulting firm value loss becomes:

$$V_0 - V_0^{STOP,\theta} = \sum_{t=1}^{n} D(t) E_0[\,\lambda_t(\theta) R_t]$$

However, since preparedness is costly, firms will only invest if the discounted expected reduction in crisis-related value loss exceeds the upfront cost. Accounting for the probability p_C of a crisis, investment occurs if:

$$\Psi(\theta) \leq\ p_C \sum_{t=1}^{n} D(t)[E_0(R_t) - E_0(\lambda_t(\theta) R_t)].$$

This formulation highlights preparedness as a form of insurance, justified only if its risk-adjusted benefits outweigh its costs. A similar decision dynamic applies to financial flexibility, although the trade-off is more complex, as the costs of maintaining flexibility must be weighed against the opportunity costs during normal times. The decision relies not only on preparedness effectiveness but also on the firm's perceived likelihood of crisis. While this is modeled under risk neutrality,

risk-averse firms may still invest even when expected value gains are modest, as crisis-induced losses carry disproportionate disutility.

Beyond mitigating direct financial losses, preparedness can reduce friction costs by improving communication with creditors and lowering information asymmetries (Gamba & Triantis, 2008). It may also complement financial flexibility; prepared firms may be more likely to maintain cash buffers or secure long-term financing. Though difficult to capture in static equations, these dynamics enhance resilience by supporting faster recovery and limiting the secondary costs of disruption. Financial flexibility absorbs shocks; preparedness enables effective response.

4 Data and Methodology

4.1 Data and Sample Selection

This study examines the financial resilience of Swedish micro, small and medium-sized enterprises (SMEs) during the COVID-19 crisis, utilizing a comprehensive dataset that combines survey responses with financial statement data. The methods employed in this study are closely aligned with prior research on stock performance, while being tailored to fit the unique focus of our research on firm profitability (ROA) and financial distress (Z-score). The decision to use ROA as the primary measure of financial resilience is motivated by both the nature of our sample and the objective of this study. Since the dataset consists of privately held Swedish SMEs, stock market-based measures of resilience, such as stock returns, are not applicable. Moreover, as outlined in the theoretical framework, stock price movements reflect market expectations and investor sentiment, which may deviate significantly from a firm's actual operational and financial performance. By focusing on ROA, we capture realized profitability, providing a direct measure of how effectively firms navigated the COVID-19 crisis. This approach allows us to assess actual financial performance rather than implied market valuations. In addition to ROA, we include the Altman Z-score, adapted for SMEs as a secondary indicator of financial distress risk, allowing for a complementary view of solvency during the pandemic period (Altman & Sabato, 2007).

The survey was originally designed by Fasth et al. (2024), who developed the instrument based on prior literature on SME crisis management and refined it through a pilot study involving 26 semi-structured interviews with SME leaders in May 2020. Input was also gathered from ALMI, a government-owned organization supporting SMEs, to enhance the relevance of the survey instrument. ALMI additionally provided funding to access contact lists from UC, Sweden's leading business and credit reference agency. The data collection was conducted by the professional survey firm Origo Group through structured telephone interviews between June 4 and June 25, 2020. The survey targeted SME business leaders and gathered detailed information on firms' crisis preparedness, perceived turnover impact, remote work capabilities, and strategic responses to the COVID-19 pandemic.

Therefore, the resulting sample includes firms from all Swedish regions and a wide range of industries and firm sizes within SMEs. According to Fasth et al. (2024), the sample characteristics

align well with official statistics and industry reports, supporting its representativeness. While the survey was based on voluntary participation and self-reported answers, the data collection process was designed to minimize bias through pilot testing, standardized training of interviewers, and clear operationalization of key constructs. These factors support the generalizability of the sample to the broader population of Swedish SMEs, within the limitations of survey-based research.

For this study, access to the survey was granted by the authors of Fasth et al. (2024), enabling us to combine the survey data with financial statement data collected from Retriever business for the period 2018-2022.

The initial dataset contains 1,000 SMEs operating in Sweden. In accordance with the European Union's official SME definition (European Union, 2016), firms included in this study are those that either employ fewer than 250 people or meet the financial thresholds of an annual turnover not exceeding €50 million or a total balance sheet below €43 million. To further examine resilience dynamics across firm sizes, we classify SMEs into micro, small, and medium-sized categories based on 2019 total assets in SEK, converted from euros using an exchange rate of 11.5. This classification where; micro: < SEK 23 million, small: SEK 23–115 million, medium: > SEK 115 million, is also in accordance with the EU's financial thresholds for firm size. To ensure comparability and data consistency, firms were further filtered based on the following criteria:

1. **Data completeness**: Firms with missing financial data for key variables prior to the crisis were excluded from the analysis. However, the extent of missing data was negligible, with only 7 to 8 missing observations on most 2019 financial measures. Additionally, survey responses marked as *"vet ej"* (don't know) were treated as missing values. These primarily appeared in subjective survey questions and had limited impact on the overall sample size.
2. **Operational status**: Rather than excluding firms that lacked performance data during the COVID-19 period, we retained them in the sample if they had complete pre-crisis financial data. Firms that lacked outcome data during the pandemic period, typically due to closure, were assigned performance values at the lower tail (1st percentile) of the ROA and Z-score distributions. This approach allows us to include likely firm exits as adverse outcomes in the analysis, reducing survivorship bias and enabling us to examine how pre-crisis characteristics are associated with both firm performance and survival.

3. **Outlier management**: To prevent extreme values from disproportionately influencing the results, we winsorized the dependent variables at the 1st and 99th percentiles. This approach preserves all observations while reducing the weight of outliers that may result from extraordinary pandemic-related events, accounting irregularities, or data anomalies. In the context of our analysis, winsorization improves the robustness of the regression estimates and ensures that the observed relationships between firm characteristics and performance are not driven by a few extreme cases.

All data cleaning, transformation, and regression analysis were conducted in Stata 18.

4.2 Variable Construction

4.2.1 Dependent Variables

ROA is used as the primary dependent variable to capture firms' operating profitability relative to their asset base. We use EBITDA rather than EBIT in constructing ROA to ensure a cleaner measure of firms' core operating profitability. This choice minimizes the influence of accounting policy differences related to depreciation and amortization, which can vary significantly across firms. By excluding these non-cash charges, EBITDA-based ROA better reflects firms' operational cash-generating ability during the crisis period. Additionally, this approach is consistent with our empirical design, where we separately control for asset intensity using the depreciation-to-assets ratio. This separation allows us to isolate profitability from structural capital intensity effects and focus on the firm's operating performance more directly. We use lagged total assets, measured at the end of the previous fiscal year, to avoid distortion from asset adjustments made during or after the onset of the pandemic. This follows the approach used by Fahlenbrach et al. (2021) to ensure that asset levels reflect pre-crisis conditions.

$$ROA = \frac{EBITDA}{Lagged\ Assets}$$

To complement our primary outcome variable and provide a more direct assessment of financial distress, we incorporate the Altman Z-score tailored for privately held SMEs. Unlike the original version, which relies on market-based equity values, the Z-Score substitutes book equity, making

it appropriate for non-listed SMEs. This approach follows established methodologies for SME distress prediction (Altman & Sabato, 2007; Olausson & Nilsson, 2024).

$$ZScore = 0.717 \times \frac{Working\ Capital}{Total\ Assets} + 0.847 \times \frac{Retained\ Earnings}{Total\ Assets} + 3.107 \times \frac{EBIT}{Total\ Assets} + 0.420 \times \frac{Book\ Value\ of\ Equity}{Total\ Liabilities} + 0.998 \times \frac{Sales}{Total\ Assets}$$

4.2.2 Independent Variables

All financial ratios were measured using 2019 data to reflect firm conditions prior to the pandemic:

Independent Variables of interest

- **Liquidity**: Measured as the cash-to-assets ratio. Captures financial flexibility.
- **Leverage**: Including both short-term debt-to-assets and long-term debt-to-asset ratio. Captures financial flexibility.
- **High impact COVID:** coded 1 if survey response was that COVID-19 affected revenue negatively by 20% or more AND the firm experienced an actual revenue decline of 20% or more in 2020. It allows us to identify firms most exposed to the crisis shock, and through interaction terms, test whether financial and operational characteristics matter more when stress is severe. While this definition is more restrictive than using either condition alone, it allows us to isolate firms that were both financially distressed and explicitly affected by the pandemic. This mitigates the risk of including firms with poor performance unrelated to COVID-19 or firms that were not fully exposed to the external shock, thereby improving the internal validity of the interaction tests.
- **Crisis Preparedness:** Captured through a dummy variable equal to 1 if the firm had a crisis continuity plan OR/AND a crisis management team prior to COVID-19. This variable captures organizational readiness.

Control Variables

- **Cost Flexibility**: Measured as the gross profit margin (gross profit over revenue), this variable captures a firm's ability to adjust variable costs in response to revenue shocks. Firms with higher cost flexibility are typically better equipped to absorb declines in demand without sharp drops in profitability, making it a relevant control in crisis contexts where fixed cost burdens can amplify losses.

- **Pre-COVID profitability:** Lagged ROA (2019) is included to control for baseline performance prior to the crisis. This helps account for the fact that stronger firm's pre-crisis may perform better during the crisis regardless of other characteristics. Including this variable also controls for persistence in profitability over time.
- **Historical Revenue Growth:** Calculated using revenue data from 2018 and 2019, this variable reflects a firm's growth trajectory before the pandemic. High pre-crisis growth may signal expansion strategies or dynamic business models, which could influence both resilience and risk exposure. This control helps distinguish crisis-related effects from existing trends.
- **Firm Size:** Categorized into micro, small, and medium-sized firms using EU classification thresholds (adjusted to SEK), this variable accounts for differences in resource availability, organizational complexity, and market power across firm sizes. Size is known to affect both crisis preparedness and access to external finance, which may influence resilience (OECD, 2020).
- **Industry:** Grouped into four main categories to reduce dimensionality; (Services), (Agriculture, Raw Materials, Manufacturing), (Trade), and (Other). As the severity and timing of COVID-19 impacts varied sharply across industries, controlling for industry prevents omitted variable bias that could otherwise confound the effects of firm-specific traits.
- **Metro:** A dummy variable indicating whether the firm is located in a metropolitan region (Stockholm, Gothenburg, or Malmö). Urban firms may have been subject to stricter public health measures or faced different labor market dynamics. Including this control adjusts for location-based policy and economic differences unrelated to firm-level traits.
- **Early Responders:** A binary indicator for firms that recognized COVID-19 impacts before March 2020. Early awareness may influence response strategies and preparedness, thus affecting performance. This variable accounts for timing heterogeneity in shock perception.
- **Survival Moderate:** Based on firms' own assessment of survival prospects. Coded as 1 if the firm reported it could survive at most one year under current circumstances. This variable proxies for ex-ante distress and managerial sentiment, which could independently shape performance outcomes and bias the effect of structural firm traits.

- **Depreciation intensity:** Measured as depreciation-to-assets ratio. Included as a proxy for capital intensity. Firms with higher depreciation levels tend to have more fixed-cost-heavy operations, which may reduce ROA during downturns. Including this control helps isolate capital structure effects from those attributed to financial flexibility or liquidity.

All categorical variables were constructed based on specific survey questions, ensuring alignment with the ALMI coding and crisis context. For a full summary of variable refinement see Appendix A.

4.3 Data Description

To provide an overview of the dataset, we present summary statistics and a correlation matrix for the key variables used. These tables summarize the key financial characteristics of the firms in the sample, including liquidity, leverage, profitability, and crisis-related factors. For full variable definitions, see Appendix B.

Table 1 shows substantial heterogeneity in firm performance. The average Return on Assets (ROA) in 2020 was 18%, with a standard deviation of 20 percentage points. Firms in the lowest quartile reported near-zero profitability, while those in the 99th percentile achieved ROA levels above 81%, highlighting that some firms remained highly profitable despite the economic downturn. Leverage levels exhibit considerable dispersion. Notably, the median short-term debt-to-assets ratio is close to zero. This pattern is primarily driven by the large share of micro firms in the sample (80.1%, see Table 2), many of which operate without debt. Approximately 50% of these micro firms report zero debt. Long-term debt patterns are similar but less pronounced. Liquidity also varies widely. The average cash-to-assets ratio is 22%, with a median of 16%. Many SMEs operate with limited cash buffers, while the top 1% hold liquidity buffers close to 99%. The variable for historical revenue growth between 2018 and 2019 indicates extreme variation as well, with firms in the top percentile showing revenue growth rates above 770%, while others experienced revenue declines.

Table 2 provides the distribution of categorical variables. A significant share of firms (54.1%) is located in metropolitan areas. Regarding crisis responsiveness, 28.7% of firms are classified as early responders, based on their reported reaction to the COVID-19 situation. Furthermore, 22.3% of firms are categorized as having a survival-moderate expectation, reflecting limited confidence

in long-term survival. The crisis preparedness variable captures whether firms had either a formal crisis plan or a designated crisis management team before the pandemic. Only 43.9% of SMEs had such preparations in place, indicating limited structured contingency planning among Swedish SMEs. Finally, 13.1% of firms experienced a high impact from COVID-19, as defined by significant revenue losses. This subgroup represents firms most severely affected by the pandemic economic shock.

Table 1: Numerical Variables

Variable	N	Mean	SD	p1	p25	Median	p75	p99	Min	Max
Dependent Variables										
ROA 2020	993	0.178	0.204	-0.267	0.054	0.151	0.295	0.817	-0.267	0.817
ROA Medium	989	0.177	0.196	-0.317	0.067	0.165	0.284	0.764	-0.317	0.764
ROA Long	985	0.176	0.174	-0.182	0.071	0.162	0.269	0.689	-0.182	0.689
Z-score 2020	993	3.787	2.179	0.027	2.429	3.653	4.851	12.98	0.027	12.98
Z-score 2021	993	3.781	2.349	-0.228	2.432	3.692	4.747	16.12	-0.228	16.12
Z-score 2022	993	3.777	2.345	-0.206	2.478	3.698	4.867	14.42	-0.206	14.42
Independent and Other Variables										
ST debt-to-assets 2019	992	0.064	0.117	0.000	0.000	0.004	0.074	0.625	0.000	0.625
LT debt-to-assets 2019	992	0.103	0.184	0.000	0.000	0.144	0.816	0.816	0.000	0.816
Cash-to-assets 2019	992	0.222	0.214	-0.286	0.039	0.161	0.346	0.995	-0.286	0.995
Gross Profit Margin 2019	993	0.588	0.277	-0.343	0.382	0.563	0.824	1.000	-0.343	1.000
Depreciation/Assets 2019	988	0.032	0.048	0.000	0.002	0.012	0.039	0.214	0.000	0.530
ROA 2019	988	0.177	0.449	-0.333	0.051	0.138	0.262	0.904	-2.076	12.13
Historical Revenue Growth 19–18	999	0.973	24.565	-0.404	-0.016	0.053	0.154	2.002	-0.743	773.3

This table presents summary statistics for key financial variables. ROA and Z-scores measure profitability and stability. Independent variables include profitability, liquidity, and leverage.

Table 2: Distribution of categorical independent Variables

Variable	Frequency	Percent
Industry		
Agriculture, Raw Materials, Manufacturing	349	34.9%
Other	10	1.0%
Services	352	35.2%
Trade	289	28.9%
Firm Size		
Micro (1)	801	80.1%
Small (2)	134	13.4%
Medium (3)	65	6.5%
Metro (1 = Metro area)	541	54.1%
Early Responders (1 = Yes)	287	28.7%
High Impact COVID (1 = Yes)	131	13.1%
Survival Moderate (1 = Yes)	223	22.3%
Crisis Prepared (1 = Yes)	439	43.9%

Table 3 presents the correlation matrix, summarizing the relationships between key variables used in the empirical analysis. Since our main concern is potential multicollinearity, we primarily focus on the correlations among independent variables. Overall, the matrix reveals modest correlations between most independent variables, suggesting limited multicollinearity concerns. Leverage measures are negatively correlated with liquidity (short-term debt-to-assets ratio and cash-to-assets ratio correlation of -0.18), indicating that more leveraged firms tend to hold smaller cash buffers. Additionally, firm size is positively correlated with long-term debt (0.18) and negatively correlated with the survival-moderate variable (-0.09), implying that larger firms tend to express weaker survival expectations. Crisis preparedness is moderately correlated with firm size (0.24), suggesting that larger firms were more likely to have crisis management structures in place prior to the pandemic. The High Impact COVID variable displays limited correlation with other predictors, reducing the risk of multicollinearity when included in the regression models. Historical revenue growth and early response indicators also show weak correlations with other variables. Importantly, profitability measures (ROA and Z-scores) are analyzed separately in distinct regression specifications and therefore their internal correlations are not a concern for multicollinearity within the models.

Table 3: Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(1) ROA2020	1.00																			
(2) ROAMedium	0.81	1.00																		
(3) ROALong	0.74	0.91	1.00																	
(4) Z2020	0.40	0.40	0.34	1.00																
(5) Z2021	0.22	0.36	0.32	0.69	1.00															
(6) Z2022	0.18	0.27	0.32	0.66	0.74	1.00														
(7) STDebtAssets2019	-0.04	-0.06	-0.04	-0.18	-0.16	-0.13	1.00													
(8) LTDebtAssets2019	-0.14	-0.14	-0.13	-0.37	-0.34	-0.35	0.00	1.00												
(9) CashAssets2019	0.12	0.15	0.16	0.20	0.25	0.21	-0.18	-0.36	1.00											
(10) HighImpactCOVID	-0.31	-0.22	-0.20	-0.10	-0.03	0.00	-0.03	-0.02	0.05	1.00										
(11) GrossProfitMargin2019	0.10	0.08	0.09	-0.18	-0.11	-0.12	-0.12	0.06	0.17	0.00	1.00									
(12) ROA2019	0.25	0.26	0.27	0.11	0.11	0.11	-0.02	-0.09	0.17	-0.02	0.04	1.00								
(13) DepreciationAssets2019	0.10	0.09	0.14	-0.19	-0.14	-0.14	0.07	0.21	-0.15	-0.01	0.14	0.04	1.00							
(14) FirmSize	-0.11	-0.12	-0.12	-0.19	-0.14	-0.16	0.20	0.18	-0.17	-0.03	-0.03	-0.04	-0.05	1.00						
(15) Metro	-0.02	-0.01	-0.03	0.05	0.07	0.04	-0.02	-0.12	0.06	0.05	0.04	-0.04	0.08	0.03	1.00					
(16) Industry	-0.01	0.01	0.02	-0.06	-0.02	-0.02	-0.07	0.06	0.15	0.16	0.39	0.00	0.02	0.01	0.09	1.00				
(17) CrisisPreparedness	-0.01	-0.05	-0.04	-0.03	-0.03	-0.06	0.18	-0.02	-0.07	0.02	0.08	-0.03	-0.03	0.24	-0.02	0.05	1.00			
(18) HistoricalRevenueGrowth	-0.05	-0.05	-0.06	-0.05	-0.05	-0.05	-0.02	0.03	-0.03	0.08	0.04	0.05	-0.02	-0.02	-0.04	-0.04	-0.03	1.00		
(19) EarlyResponders	-0.06	-0.05	-0.05	0.00	-0.02	-0.01	0.03	-0.03	0.03	-0.03	0.01	0.01	-0.07	0.10	0.02	0.05	0.10	0.05	1.00	
(20) SurvivalModerate	-0.21	-0.15	-0.13	-0.06	0.03	0.04	-0.04	-0.04	0.05	0.38	0.01	-0.06	-0.02	-0.09	0.00	0.12	0.01	0.06	0.01	1.00

The table displays pairwise Pearson correlation coefficients for all dependent and independent variables used in the analysis.

4.4 Empirical Model

To get an understanding for the subsequent regression analysis in section 5, we now introduce the empirical model used to assess how pre-pandemic firm characteristics influenced financial performance and distress during and after the COVID-19 crisis. The primary analytical framework is a linear regression model, where return on assets (ROA) serves as the dependent variable. The baseline specifications are as follows:

$$\begin{aligned} ROA_{i,t} = \ & \beta_0 + \beta_1 Liquidity_{i,2019} + \beta_2 Leverage_{i,2019} + \beta_3 Crisis\ Preparedness_{i,2019} \\ & + \beta_4 \left(Liquidity_{i,2019} \times HighImpactCOVID_{\ i2020}\right) \\ & + \beta_5 \left(Leverage_{i,2019} \times HighImpactCOVID_{i2020}\right) \\ & + \beta_6 \left(Crisis\ Preparedness_{i,2019} \times HighImpactCOVID_{i2020}\right) \\ & + \beta_7 HighImpactCOVID_{i2020} + \delta FirmControls_i + \epsilon_{i,t} \end{aligned}$$

Where i represents an individual firm and t denotes the time. To evaluate how financial flexibility and operational preparedness shaped firm performance during and after COVID-19, we separate Return on Assets (ROA) into three cross-sectional regressions: the immediate shock year (2020), a medium-term window (2020–2021), and a long-term frame (2020–2022). Pre-crisis independent variables are measured as of 2019 and held constantly across. The primary variables of interest are liquidity, leverage, and crisis preparedness, all interacted with a binary high impact COVID variable.

Additionally, we employed the Z-score as a complementary dependent variable to assess financial distress beyond ROA as mentioned earlier. Lastly, all regressions performed are robust. For a full overview of robustness checks see Appendix C.

5 Results and Discussion

This section presents and interprets empirical results on Swedish SME firm-level resilience during the COVID-19 pandemic, focusing on the role of pre-crisis financial and operational characteristics. The analysis proceeds in two stages. First, we examine the general sample to assess how variables such as leverage, liquidity, and crisis preparedness influenced profitability and financial distress across all firms. We then disaggregate the analysis by firm size, motivated by the heterogeneous structure of SMEs and the observation that the explanatory framework appears to better capture performance dynamics among larger firms.

The results highlight three main findings. First, crisis preparedness shows a statistically significant and positive association with performance among small and medium-sized firms facing severe disruption. Second, pre-pandemic long-term debt is positively associated with profitability among highly affected micro firms, while no corresponding negative effect is observed among larger firms, suggesting a reduced refinancing risk and potential firm quality signal. Third, prior short-term debt and liquidity do not exhibit significant effects across the sample, which may be attributed to the low overall exposure to short-term debt, crisis-response measures taken by highly affected Swedish SMEs , and the limited capacity of annual accounting data to capture short-term effects.

5.1 Resilience Throughout COVID-19: General Sample

Table 4: Regression results for ROA

	(1) ROA2020	(2) ROAMedium	(3) ROALong
ST debt / assets	-0.06 (-0.99)	-0.05 (-0.73)	-0.00 (-0.07)
LT debt / assets	-0.17 (-4.81)***	-0.15 (-4.10)***	-0.12 (-4.04)***
Cash / assets	0.07 (1.55)	0.07 (1.58)	0.08 (2.06)**
Crisis Preparedness	-0.02 (-1.28)	-0.00 (-0.06)	0.00 (0.37)
High Impact COVID	-0.16 (-5.18)***	-0.13 (-3.77)***	-0.10 (-3.11)***
ST debt × High Impact COVID	-0.05 (-0.48)	-0.13 (-1.05)	-0.21 (-1.63)
LT debt × High Impact COVID	0.36 (2.23)**	0.33 (2.96)***	0.22 (2.64)***
Cash × High Impact COVID	-0.13 (-1.86)*	0.02 (0.23)	0.03 (0.36)
CrisisPrep × High Impact COVID	-0.01 (-0.25)	-0.02 (-0.49)	-0.02 (-0.76)
Gross Profit Margin	0.07 (2.63)***	0.04 (1.52)	0.03 (1.31)
ROA 2019	0.09 (1.82)*	0.09 (1.71)*	0.09 (1.74)*
Depreciation / assets	0.46 (3.46)***	0.44 (3.33)***	0.56 (3.85)***
Firm size	-0.03 (-3.40)***	-0.03 (-2.56)**	-0.02 (-2.63)***
Metro	-0.00 (-0.08)	0.00 (0.24)	-0.00 (-0.42)
Industry 2	0.03 (2.08)**	0.03 (1.78)*	0.02 (1.52)
Industry 3	0.00 (0.15)	0.01 (0.50)	0.01 (0.80)
Industry 4	-0.01 (-0.44)	-0.01 (-0.46)	-0.02 (-0.73)
Historical Revenue Growth	-0.00 (-2.81)***	-0.00 (-2.79)***	-0.00 (-3.69)***
Early Responders	-0.03 (-2.19)**	-0.02 (-1.65)*	-0.02 (-1.35)
Survival Moderate	-0.06 (-3.80)***	-0.04 (-2.90)***	-0.02 (-1.81)*
Observations	967	963	959
R-squared	0.237	0.183	0.186

The table reports results from cross-sectional OLS regressions of return on assets (ROA) on pre-pandemic firm characteristics across three time horizons. The models represent performance in 2020, 2020–2021, and 2020–2022. Interaction terms with High Impact COVID test whether financial flexibility and crisis preparedness matter more for firms most affected by the pandemic. Industry fixed effects are included; Industry 1 (agriculture, raw materials, and manufacturing) is the omitted reference group. Industry 2 includes services, Industry 3 includes trade, and Industry 4 includes other sectors. Dependent Variables are winsorized at the 1st and 99th percentiles. Robust t-statistics in parentheses. $^{*}p < .1$, $^{**}p < .05$, $^{***}p < .01$.

5.1.1 The Role of Leverage During the Crisis

Leverage played a varied role in shaping firm performance during the COVID-19 crisis. Although the short-term debt coefficients in Table 4 are not statistically significant, their consistently negative signs, for both the baseline and interaction terms, are directionally consistent with expectations. Firms that rely on short-term debt are typically more exposed to refinancing risk during crises, particularly when credit markets become uncertain and rollover becomes costly or inaccessible (Ivashina & Scharfstein, 2010). However, the absence of significant effects may be explained by the sample's generally low exposure to short-term debt. The average short-term debt-to-assets ratio was 6.5% for less affected firms and even lower, at 5.6%, for those highly affected.

At such modest levels, short-term obligations were unlikely to pose a major liquidity risk. Moreover, as seen in Figure 2, most firms actively reduced their short-term debt during the crisis, with highly affected firms exhibiting the largest average reductions. This may indicate a deliberate effort to limit refinancing exposure in response to emerging uncertainty. Taken together, these findings suggest that while short-term debt exposure was directionally harmful, its practical relevance during COVID-19 was limited, both by low initial debt levels and by SMEs proactive deleveraging during the crisis, particularly among those most affected.

By contrast, long-term debt played a more complex and perhaps counter-intuitive role. Across all three-time horizons presented in Table 4, the interaction between long-term debt and the High Impact COVID variable is positive and statistically significant. This indicates that pre-crisis long-term debt was less detrimental to ROA performance for firms that were more severely affected by COVID-19. A similar, albeit statistically insignificant, pattern is observed in the Z-score regressions reported in Appendix D. These findings challenge the conventional expectation that higher debt burdens exacerbate vulnerability during crises due to reduced financial flexibility. Instead, they suggest that long-term debt with maturities extending beyond the crisis period may have provided firms with greater stability, shielding them from refinancing risk during the pandemic (Almeida et al., 2011).

Several other mechanisms may also help explain this unexpected outcome. One possibility is that government support programs during the pandemic were directed toward firms exhibiting clear financial distress, such as those with substantial revenue losses and high debt burdens. However, according to Waldenström and Angelov (2020, p. 7), Swedish support schemes were primarily designed to assist firms deemed fundamentally viable before the crisis, and high debt levels particularly short-term debt could in some cases limit eligibility. The structure and implementation of these programs may also have unintentionally favored larger firms with greater resources and administrative capacity to successfully apply for support. As larger firms are also more likely to hold long-term debt, this may have softened the negative effects of leverage, particularly for those most affected by the pandemic.

A second potential explanation relates to a disciplinary effect. Firms with high leverage, particularly those severely affected by COVID-19, may have faced a heightened perceived risk of default, which in turn could have prompted more immediate and decisive crisis responses. These firms may have reacted quickly by cutting costs, suspending discretionary expenditures, or

restructuring operations in an effort to maintain solvency. In some cases, creditor-induced restructuring may also have occurred, where external pressure from lenders compelled firms to adopt leaner and more flexible business models. In this way, financial stress induced by leverage may have accelerated crisis recognition and operational adjustments, ultimately mitigating losses among the most vulnerable firms.

Finally, a firm quality explanation cannot be ruled out. In certain capital-intensive industries such as manufacturing or agriculture, only high-performing firms are typically able to sustain long-term debt due to high capital requirements and stringent repayment obligations. This aligns with the notion that lenders assess a firm's financial health and operational stability before extending long-term credit, favoring firms with strong asset bases, stable cash flows, and competent management (Guedes & Opler, 1996). In this context, leverage may act as a proxy for underlying firm strength, such as market power, brand equity, or operational competence rather than as a straightforward indicator of financial fragility. The observed positive interaction effect between long-term debt and COVID-19 impact may therefore reflect a form of selection bias, where only more robust firms enter the high-leverage category.

It is also worth considering the potential influence of firm size on this relationship. A substantial portion of micro firms in the sample report no debt at all (see Figure 1), and among those that do, leverage may signal access to external financing or the pursuit of deliberate growth strategies, attributes less common among more vulnerable peers. Given that micro firms constitute the majority of the sample, the positive debt x COVID effect may be disproportionately driven by a small subset of capital-intensive, high-performing micro firms. This aspect will be revisited in the firm-size analysis in section 5.2.

5.1.2 The Limited Role of Liquidity and Crisis Preparedness

Contrary to the theory on financial flexibility, the cash-to-assets ratio does not emerge as a statistically significant predictor of either profitability or financial distress throughout the COVID-19 period (see Table 4 and Appendix D). One possible explanation lies in the temporal resolution of the accounting data. In theory, when firms experience sudden revenue stops, cash reserves serve as a critical buffer, allowing them to absorb immediate shocks and delay the need for costly external financing. By smoothing operations during periods of uncertainty, liquidity can help firms

avoid fire-sale asset liquidation or adverse selection problems in capital markets. However, such liquidity effects are typically expected to manifest in the short term, particularly during the initial months of a crisis. In contrast, the impact of leverage tends to emerge over a longer horizon as debt repayments persist and refinancing risks accumulate.

Given that the analysis in this study relies on annual ROA, short-lived advantages provided by liquidity may have dissipated by the time end-of-year results were reported, making them difficult to detect. Fahlenbrach et al. (2021) similarly note that the stock market may anticipate the protective value of cash buffers and price this into equity valuations, even if those benefits do not immediately materialize in accounting performance. Alternatively, markets may initially overestimate the costs of liquidity shortfalls, with these effects diminishing as the crisis unfolds and uncertainty is resolved. This may be particularly relevant given that, as illustrated in Figure 2, highly affected firms appear to have proactively strengthened their liquidity buffers during the crisis, potentially weakening the observable relationship between cash holdings and performance outcomes. While part of the increase in the cash-to-assets ratio could be mechanically driven by asset base reductions from debt repayments, this effect would likely be offset if repayments were made using cash. The continued rise in the ratio despite deleveraging therefore highlights that many firms actively increased their cash holdings during the crisis. These dynamics suggest that liquidity advantages, while theoretically important, may be difficult to capture using annual profitability metrics alone, especially when combined with deliberate liquidity management strategies undertaken by firms during the crisis.

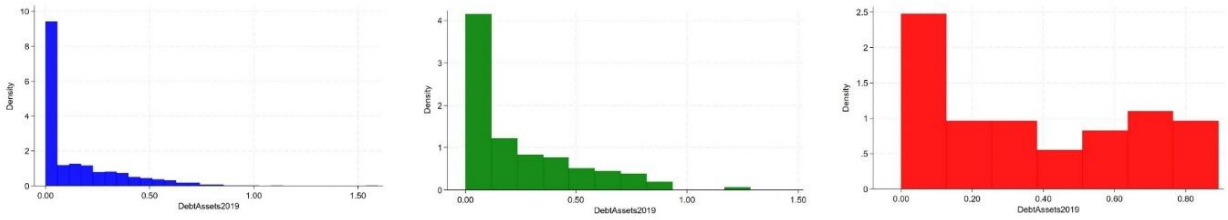
The presence of a pre-existing crisis plan, or a designated crisis management team, does not exhibit a statistically significant effect on profitability or financial distress in the general sample (see Table 4 and Appendix D). This lack of significance may, in part, reflect measurement limitations. The preparedness variable is captured using a binary indicator, which does not account for the quality, specificity, or practical implementation of the plans during the pandemic. Moreover, some firms may have had informal preparedness mechanisms or ad hoc strategies in place that were not captured by the survey design. However, the most plausible explanation for this result lies in the composition of the sample. A substantial portion of the sample, approximately 50 percent, consists of firms employing fewer than seven individuals. For these firms, formal crisis teams and plans may be less common and impactful relative to more structured organizations.

Given this, we proceed by disaggregating the analysis, conducting ROA and Z-score regressions separately for two firm size categories: (1) micro firms and (2) small and medium-sized firms.

5.2 Resilience Throughout COVID-19: Firm-Size Stratified Analysis

In the general sample regressions, firm size consistently demonstrated a negative coefficient, suggesting that smaller firms tended to perform better compared to their larger counterparts during the crisis. This finding is consistent with prior research indicating that micro firms, despite their limited resources, often possess greater operational flexibility, face fewer bureaucratic constraints, and can adapt more rapidly under stress (Bartz & Winkler, 2016; Eggers, 2020). However, while smaller firms may be more agile, they also exhibit greater variability in financial measures, raising concerns about sensitivity to noise and measurement volatility (Altman & Sabato, 2007).

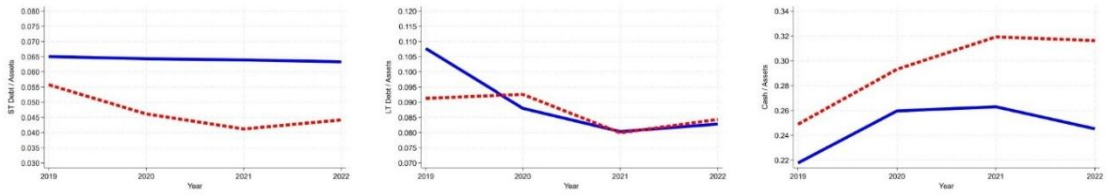
Figure 1: Debt Structure by Firm Size



(a) Micro Firms **(b)** Small Firms **(c)** Medium Firms

*D*ebt distribution across firm sizes. Each plot shows the density of the debt-to-assets ratio in 2019. Micro and small firms exhibit heavily right-skewed distributions, while medium firms show a flatter, more uniform distribution.

Figure 2: Financial Trajectories of High vs. Low COVID-19 Impact Firms



(a) Short-Term Debt-to-Assets

(b) Long-Term Debt-to-Assets

(c) Cash-to-Assets

Low COVID-19 Impact High COVID-19 Impact

*T*his figure displays the yearly average for three financial ratios, Cash-to-Assets, Short-Term Debt-to-Assets, and Long-Term Debt-to-Assets—across the period 2019–2022. The results are separated by firms with high versus low COVID-19 impact.

Table 5: Regression results for ROA in terms of firm size

	(1) Micro firms		(2) Small, Medium firms	
	ROA2020	ROAMedium	ROA2020	ROAMedium
ST debt / assets	-0.10 (-1.18)	-0.10 (-1.03)	-0.04 (-0.65)	-0.44 (-0.59)
LT debt / assets	-0.20 (4.02)***	-0.16 (-3.19)***	-0.04 (-1.32)	-0.04 (-1.05)
Cash / assets	0.07 (1.55)	0.08 (1.77)*	-0.03 (-0.32)	-0.04 (-0.41)
Crisis Preparedness	0.01 (0.66)	-0.01 (-0.64)	0.02 (0.99)	0.00 (0.20)
High Impact COVID	-0.18 (-4.78)***	-0.15 (-3.66)***	-0.19 (-3.13)***	-0.18 (-2.70)***
ST debt × High Impact COVID	-0.06 (-0.39)	-0.18 (-1.09)	0.08 (0.31)	0.09 (0.37)
LT debt × High Impact COVID	0.48 (2.04)**	0.43 (2.76)***	-0.09 (-0.73)	-0.08 (-0.68)
Cash × High Impact COVID	-0.11 (-1.49)	0.04 (0.41)	-0.41 (-1.90)*	-0.35 (-1.65)
CrisisPrep × High Impact COVID	0.00 (0.06)	-0.01 (-0.26)	0.24 (2.77)***	0.26 (2.88)***
Gross Profit Margin	0.09 (2.86)***	0.07 (2.11)**	0.02 (0.53)	-0.00 (-0.09)
ROA 2019	0.08 (1.86)*	0.08 (1.73)*	0.47 (4.84)***	0.45 (4.34)***
Depreciation / assets	0.49 (3.33)***	0.46 (3.08)***	0.35 (1.36)	0.35 (1.43)
Metro	0.00 (0.19)	0.01 (0.66)	-0.01 (-0.45)	-0.01 (-0.65)
Industry 2	0.03 (1.72)*	0.02 (1.24)	0.04 (1.87)*	0.07 (2.49)**
Industry 3	0.01 (0.37)	-0.01 (0.66)	-0.03 (-0.83)	-0.03 (-0.91)
Industry 4	0.01 (0.49)	-0.01 (-0.32)	-0.10 (-1.82)*	-0.07 (-1.39)
Historical Revenue Growth	-0.00 (-3.04)***	-0.00 (-3.14)***	-0.01 (-0.72)	-0.01 (-0.74)
Early Responders	-0.03 (-2.23)**	-0.02 (-1.41)	-0.01 (-0.51)	-0.02 (-0.98)
Survival Moderate	-0.05 (-3.03)***	-0.02 (-2.31)**	-0.06 (-2.14)**	-0.05 (-1.54)
Observations	781	779	186	184
R-squared	0.231	0.182	0.479	0.407

The table reports results from cross-sectional OLS regressions of return on assets (ROA) on pre-pandemic firm characteristics across firm size. The models represent performance in 2020 and 2020–2021. Interaction terms with High Impact COVID test whether financial flexibility and crisis preparedness matter more for firms most affected by the pandemic. Industry fixed effects are included; Industry 1 (agriculture, raw materials, and manufacturing) is the omitted reference group. Industry 2 includes services, Industry 3 includes trade, and Industry 4 includes other sectors. Dependent Variables are winsorized at the 1st and 99th percentiles. Robust t-statistics in parentheses. $^{*}p < .1$, $^{**}p < .05$, $^{***}p < .01$.

5.2.1 The Explanatory Framework Is Better Suited for Larger Firms

The R-squared values reported in Table 5 reveal a clear distinction in explanatory power between firm size categories. For small and medium-sized firms, the ROA regressions explain 47.9% and 40.7% of the variation in performance, respectively, whereas the corresponding values for micro firms are notably lower, at 23.1% and 29.1%. A similar contrast is observed in the firm-size-specific Z-score regressions presented in Appendix D. This contrast supports the idea that the theoretical variables of interest, along with the selected controls, are more systematically reflected in the financial outcomes of larger firms. In micro firms, performance appears more idiosyncratic and less directly linked to pre-crisis characteristics. The lower explanatory power in this group is likely driven by the heightened sensitivity of financial metrics, which are affected by smaller asset bases and greater volatility in revenues and costs. As a result, while financial and organizational traits emerge as meaningful predictors for small and medium-sized firms, they account for a significantly smaller share of outcome variation among micro firms, where operational flexibility, random shocks, and unobserved heterogeneity appear to dominate.

5.2.2 The Role of Crisis Preparedness in Larger Firms

One of the most notable findings from the stratified analysis is the role of crisis preparedness among small and medium-sized firms. The interaction between having a pre-existing crisis plan or/and a designated crisis management team and being highly affected by COVID-19 is positive and statistically significant in both the short- and medium-term ROA regressions presented in Table 5. Additionally, it is significant in the 2021 Z-score regression in Appendix D. While operational readiness does not appear to influence outcomes for less affected firms, it is strongly associated with improved profitability and medium-term financial stability among firms that experienced severe disruption during the pandemic.

These results are both intuitive and consistent with the view that qualitative factors, such as planning, governance, and strategic awareness, play a particularly important role in shaping crisis outcomes for SMEs (Kurschus et al., 2017). For crisis preparedness to yield a measurable positive effect, the firm typically needs to fall outside the micro category and be substantially affected by the crisis. Formal crisis preparedness measures, such as having a structured plan and crisis management team, are likely more impactful in organizations with greater operational complexity, where coordination across multiple functions is essential during disruptions. In small and medium-

sized firms, these mechanisms may not only support immediate crisis responses but also contribute to sustained recovery and post-crisis stabilization. Notably, the increasing strength of the crisis preparedness coefficient in the medium term aligns with expectations about the delayed nature of strategic interventions. As Fahlenbrach et al. (2021) argue, while financial buffers can offer immediate protection, the full benefits of operational measures emerge more gradually. Preparedness actions, such as reorganizing supply chains, implementing remote work strategies, or navigating government support systems, may require time to implement and translate into measurable effects on profitability and financial distress outcomes.

5.2.3 Long-Term Debt Effects on Micro Firms: A Signal of Firm Quality and Reduced Refinancing Risk

Among micro firms, the interaction term between long-term debt and being highly affected by COVID-19 remains positive and statistically significant across all ROA regressions. The corresponding interaction term for small and medium-sized firms is negative across all ROA and Z-score regressions, although these effects do not reach statistical significance. The insignificance of long-term debt among larger firms, combined with the positive effect observed among micro firms, challenges prior literature on the negative role of leverage for financial flexibility. Instead, it supports the notion that firms with debt maturing after the crisis experienced less disruption to investment and performance compared to firms forced to refinance in a stressed market during the pandemic (Almeida et al., 2011). This interpretation is further reinforced by our finding that firms which significantly increased their debt levels during 2020 showed weaker ROA performance (using lagged assets), while firms with higher pre-COVID debt were less likely to increase borrowing during the pandemic.

Nevertheless, several of the conventional explanations mentioned earlier appear insufficient to account for the positive long-term debt effect observed exclusively in micro firms. It is unlikely that government aid programs disproportionately favor micro firms with debt, nor is there reason to believe that debt-induced disciplinary effects, such as creditor pressure, would uniquely affect firms at this size. On the contrary, the nature of the debt held by micro firms suggests a different dynamic. While long-term financing is less common in this group, those that do obtain it are often required to secure loans with collateral. According to the OECD (2020), micro-enterprises are more frequently subject to collateral requirements than larger SMEs, with fewer alternatives to

secure debt. If long-term loans in micro firms were primarily asset-backed, this may have reduced the likelihood of aggressive creditor intervention during the pandemic. Lenders with secured claims may have been more tolerant of short-term underperformance, knowing their positions were protected, thereby easing financial pressure on borrowers and offering greater operational flexibility than theory might otherwise suggest.

Taken together, the most likely interpretation is that the positive effect reflects a firm quality signal combined with a reduced refinancing risk. As shown in Figure 1, a large share of micro firms operate without any debt, and among those that do, long-term leverage may indicate higher pre-crisis creditworthiness, growth ambition, or better banking relationships. This interpretation is further supported by evidence that micro-enterprises generally face greater barriers to accessing appropriate sources of external finance (OECD, 2020), suggesting that firms which successfully obtain long-term debt likely represent a positively selected subset with above-average resilience characteristics.

6 Conclusions and Prospects

6.1 Conclusion

This thesis set out to explore why some Swedish SMEs were more resilient than others during the COVID-19 crisis by analyzing how pre-pandemic characteristics, particularly financial structure and operational preparedness, shaped realized profitability and solvency outcomes. Three key insights emerged:

First, formal crisis preparedness, defined as having a crisis plan, a designated crisis team, or both, was linked to higher profitability and stronger solvency outcomes, but only for firms that were both severely affected by the pandemic and large enough to require internal coordination. This highlights that crisis plans are most effective when disruption is substantial and internal complexity creates a need for coordination (Williams et al., 2017; Fasth et al., 2024). Among micro firms, where decision-making tends to be centralized and firms often benefit from greater operational flexibility (Bartz & Winkler, 2016; Eggers, 2020), such preparedness did not appear to add value, suggesting that formal planning is most beneficial when organizational agility is insufficient to manage crisis complexity.

Second, pre-crisis long-term debt turned out to be a signal of strength rather than weakness, especially among highly affected micro firms. While conventional wisdom holds that leverage increases vulnerability, our results show that micro enterprises with higher pre-pandemic long-term debt were less negatively affected when severely impacted by the crisis. This likely reflects that only robust firms secure such financing ex ante, as banks are more selective with smaller borrowers. In larger SMEs, long-term debt had no significant negative impact, indicating that longer maturities may have reduced refinancing risk during the crisis. These results echo findings from the 2008 crisis, where maturity timing, not cash, was key to avoiding disruption (Almeida et al., 2012).

Third, short-term debt and liquidity levels prior to the pandemic did not show significant associations with resilience outcomes. This is surprising, as theory and market-based studies (e.g. Fahlenbrach et al., 2021) suggest that cash buffers and low refinancing risk should enhance resilience. This may reflect the fact that many Swedish SMEs, especially those highly affected, entered 2020 with already low short-term debt, and appeared to engage in early crisis-response measures such as deleveraging and liquidity buffering. These behaviors likely limited variation in

outcomes and diluted the observable effects in annual data. This further highlights the importance of operational excellence: not only does preparedness matter but so does swift and decisive action during the crisis. As Fasth et al. (2024) emphasize, SMEs with tightly structured boards were better equipped to act decisively under pressure, reinforcing the idea that resilience is driven by both planning and execution capacity.

Overall, these findings confirm that operational preparedness played a positive role in enhancing crisis resilience, while pre-pandemic financial flexibility showed more limited effects. Sweden's comparatively less restrictive containment strategy, which relied on voluntary guidelines rather than mandatory lockdowns, placed greater responsibility on firms to manage disruption internally. This may have amplified the importance of internal readiness while reducing the observable effects of financial buffers. Importantly, the impact of these characteristics was not uniform but depended strongly on firm size and the degree of disruption experienced within the SME segment.

6.2 Limitations and Suggestions for Further Research

While our findings offer novel insights into SME resilience, several limitations warrant consideration.

First, our reliance on annual accounting data prevents us from capturing intra-year disruptions such as short-term cash shortages, missed interest payments, or the exact timing of policy interventions. Future studies should consider using higher frequency sources, like monthly ledgers or bank transaction data to better assess how liquidity and funding pressures evolve during a crisis (Campello et al., 2010; Fahlenbrach et al., 2021).

Second, our binary indicator for crisis preparedness does not reflect the quality, relevance, or implementation of contingency plans. As a result, we cannot distinguish firms with well-integrated strategic readiness from those with superficial or outdated planning. Qualitative methods such as interviews, textual analysis, or scenario-based assessments could help uncover how crisis planning translates into action and resilience (Williams et al., 2017).

Third, the definition of "high impact COVID" is based on a combination of survey responses and realized revenue declines. While this approach improves internal consistency, it introduces subjectivity through self-reported assessments by managers. These perceptions may not fully capture the operational or financial hardship experienced, especially when firms face disruptions

beyond just lost sales. Future research should explore more objective proxies, such as industry level exposure, sector specific lockdown intensity, or external shock indicators. However, due to the diversity and heterogeneity within the SME sector, using industry-level classifications can be problematic. Many industries encompass a wide range of business models and crisis sensitivities, making it difficult to derive universal effects or consistent patterns. This limits the explanatory power of industry as a standalone variable.

Fourth, there is an important conceptual trade-off that our framework does not fully resolve. That is characteristics that improve crisis performance, such as maintaining high cash buffers, limiting leverage, or overstaffing may come at a cost in normal times. These strategies could suppress profitability and capital efficiency under stable conditions, lowering firm value before a shock occurs. Fahlenbrach et al. (2021) acknowledge this challenge, noting that many resilience enhancing policies may reduce pre-crisis valuations but still prove beneficial once a crisis hits. Future research could explore this cost-benefit tension by modeling long-run performance under alternating economic states.

Lastly, our findings reflect the specific Swedish context where there were light touch lockdowns, targeted support measures, and a high trust regulatory environment (Tillväxtverket, 2022b). As such, results may not generalize to jurisdictions with different containment strategies or insolvency frameworks. Cross country SME panels would be particularly useful in testing whether our conclusions hold in these other settings.

6.3 Implications for Practice

Our findings offer several practical lessons for entrepreneurs, lenders, and policymakers preparing for the next systemic shock.

For SME owners and boards, one clear takeaway is that proactive crisis planning, such as establishing a continuity plan or crisis team can be a powerful, low-cost tool for improving outcomes during severe disruptions. While such measures may seem unnecessary in stable periods, our findings show they are especially valuable once organizational complexity increases. Moreover, this kind of structured preparedness can partially offset the risks associated with weaker financial buffers, offering non-financial pathways to resilience when cash reserves or flexible financing are limited.

For financial managers, long-maturity debt should be viewed not as a last resort but as a viable alternative to large cash reserves, particularly for firms unable to hold large cash buffers such as SMEs. Securing stable financing with flexible terms and manageable covenants can provide the breathing room needed to ride out temporary shocks, just as maturity timing buffered firms in the 2008 crisis (Almeida et al., 2012).

Policymakers and lenders also have a role in reinforcing these behaviors. Guaranteeing long-term credit for viable micro firms, linking subsidies to forward-looking investment, or distributing off-the-shelf crisis planning tools can help make resilience more accessible, especially for firms lacking internal advisory capacity. By lowering the fixed costs of preparedness and incentivizing strong financing structures, public institutions can strengthen systemic resilience from the bottom up.

For accountants and advisors, resilience audits should move beyond static liquidity ratios. A forward-looking approach would include assessments of debt structure, collateral flexibility, operational protocols, and plan executability. This would offer a richer understanding of client vulnerability and preparedness than balance-sheet snapshots alone.

7 Appendices

7.1 Appendix A

Variable Refinement

This appendix contains all the variable refinement conducted and used in the analysis.

Variable Refinement

Variable	Refinement Step	Description
`ROA2020`	Renamed + Winsorized	From `LaggedROA2020`, winsorized at 1st–99th percentile
`ROAMedium`	Constructed + Winsorized	Mean of ROA 2020 and 2021, then winsorized
`ROALong`	Constructed + Winsorized	Mean of ROA 2020–2022, then winsorized
`Z2020, Z2021, Z2022`	Renamed + Winsorized	Renamed from Z-score variables and winsorized
`CashAssets2019`	Renamed	From `Cashtoassets_2019`
`STDebtAssets2019`	Renamed	From `STdebttoassets_2019`
`LTDebtAssets2019`	Renamed	From `LTdebttoassets_2019`
`GrossProfitMargin2019`	Used as-is	Proxy for cost flexibility, no recoding applied
`ROA2019`	Renamed	From `LaggedROA2019`, used to control for baseline profitability
`HistoricalRevenueGrowth`	Renamed	From `HistoricalRevenueGrowth1918`, 2018–2019 growth
`DepreciationAssets2019`	Renamed	From `Depreciationlaggedassets_2019`, proxy for capital intensity
`FirmSize`	Created	Based on `log(Assets2019)` using EU thresholds in SEK: Micro ($< 2M$), Small (2–$10M$), Medium ($> 10M$)
`Industry2, Industry3, Industry4`	Created	Dummy variables for Services, Trade, and Other (Manufacturing is baseline)
`Metro`	Created	Dummy = 1 if located in Stockholm, Gothenburg, or Malmö (based on county code)
`EarlyResponders`	Created from Q1	Dummy = 1 if Q1 equals 1, 2, or 3 (COVID impact recognized before March 2020)
`SurvivalModerate`	Created from Q5	Dummy = 1 if Q5 in 1, 2, 3, or 4 (firm expects to survive up to 1 year)
`HighImpactCOVID`	Created from Q3 + Q4	Dummy = 1 if revenue drop $\geq 20\%$ and Q4 perception responses are high
`CrisisPrepared`	Created from Q6 + Q10	Dummy = 1 if firm had a crisis plan (Q6) or crisis team (Q10) before COVID-19

7.2 Appendix B

Variable Definitions

This appendix lists all variables used in the analysis

Variable Definitions

Variable Name	Label	Description	Measurement Type
ROA 2020	ROA2020	Return on assets in 2020 (EBITDA / lagged assets)	Ratio
ROA Medium	ROAMedium	Average ROA across 2020–2021	Ratio
ROA Long	ROALong	Average ROA across 2020–2022	Ratio
Z-score 2020	Z2020	SME-adjusted Altman Z-score (2020)	Ratio
Z-score 2021	Z2021	SME-adjusted Altman Z-score (2021)	Ratio
Z-score 2022	Z2022	SME-adjusted Altman Z-score (2022)	Ratio
Short-term Debt Ratio	STDebtAssets2019	Short-term debt to total assets (2019)	Ratio
Long-term Debt Ratio	LTDebtAssets2019	Long-term debt to total assets (2019)	Ratio
Cash Ratio	CashAssets2019	Cash and equivalents to total assets (2019)	Ratio
Gross Profit Margin	GrossProfitMargin2019	Gross margin as percent of sales (2019)	Ratio
ROA 2019	ROA2019	Return on assets in 2019	Ratio
Z-score 2019	Z2019	SME-adjusted Altman Z-score (2019)	Ratio
Depreciation Ratio	DepreciationAssets2019	Depreciation expenses to assets (2019)	Ratio
Historical Revenue Growth	HistoricalRevenueGrowth	Revenue growth from 2018 to 2019	Ratio
Firm Size	FirmSize	Micro = 1, Small = 2, Medium = 3 (EU threshold)	Ordinal
Metropolitan Area	Metro	Dummy for metro regions (Stockholm, Malmö, Gothenburg)	Nominal
Crisis Preparedness	CrisisPrepared	Dummy for crisis plan or crisis team	Nominal
High Impact COVID	HighImpactCOVID	Dummy for firms with ≥ 20 revenue drop and high survey impact	Nominal
Early Responder	EarlyResponders	Dummy = 1 if firm reacted before March 2020	Nominal
Survival Moderate	SurvivalModerate	Dummy = 1 if firm expected moderate survival time (up to one year)	Nominal
Industry: Manufacturing (reference)	Industry1	Baseline category: agriculture, raw materials, manufacturing	Nominal
Industry: Services	Industry2	Dummy = 1 for services sector	Nominal
Industry: Trade	Industry3	Dummy = 1 for trade sector	Nominal
Industry: Other	Industry4	Dummy = 1 for all other sectors	Nominal

7.3 Appendix C

Robustness Checks

This appendix summarizes the robustness checks conducted to verify the stability and reliability of the regression results.

Overview of Robustness Checks

#	Robustness check	Description
1	Alternative ratio definitions	Used quick ratio and total liabilities (short- and long-term) to assets as substitutes for standard liquidity and leverage measures.
2	Alternative COVID impact classification	Re-estimated models using modified definitions of "High Impact COVID" (e.g., based solely on survey responses or stricter revenue decline thresholds).
3	Pre-crisis averaging	Averaged financial ratios across 2018–2019 to account for year-to-year variability prior to the crisis.
4	Disaggregated preparedness measures	Tested preparedness effects using crisis plan and crisis management team indicators separately.
5	Alternative distress indicators	Used interest coverage ratio and alternative survival horizon thresholds to proxy financial distress.
6	Winsorization of dependent variables	Re-estimated regressions before and after winsorizing ROA and Z-scores at the 1st and 99th percentiles.
7	Liquidated firms assessment	Compared results with and without assigning liquidated firms the lower end of the distribution in dependent variables.
8	Multicollinearity diagnostics	Conducted variance inflation factor (VIF) analysis to assess potential multicollinearity among regressors.
9	Non-cumulative return structure	Re-ran ROAMedium and ROALong models using annual values instead of cumulative average returns.
10	Outlier treatment in financial ratios	Applied winsorization to independent financial ratios to test sensitivity to outliers.

7.4 Appendix D

Z-Score Regression Results

This appendix presents all regression results for the alternative dependent variable.

Regression results for Z-Score

	(1) Z2020	(2) Z2021	(3) Z2022
ST debt / assets	-1.97 (-3.56)***	-1.54 (-2.45)**	-1.10 (-2.07)**
LT debt / assets	-3.38 (-4.12)***	-3.22 (-3.86)***	-3.34 (-4.65)***
Cash / assets	0.20 (0.48)	0.74 (1.50)	0.23 (0.47)
Crisis Preparedness	0.10 (0.80)	-0.05 (-0.35)	-0.18 (-1.31)
High Impact COVID	-1.30 (-2.77)***	-1.10 (-2.91)***	-0.57 (-1.23)
ST debt × High Impact COVID	-1.90 (-1.77)*	-2.12 (-1.60)**	-2.06 (-1.56)
LT debt × High Impact COVID	3.61 (1.42)	2.97 (1.87)	0.61 (0.58)
Cash × High Impact COVID	0.55 (0.57)	0.80 (0.70)	0.60 (0.56)
CrisisPrep × High Impact COVID	0.35 (0.98)	0.57 (1.21)	0.56 (1.26)
Gross Profit Margin	-0.88 (-3.09)***	-0.35 (-1.05)	-0.55 (-1.58)
ROA 2019	0.17 (1.71)*	0.15 (1.44)	0.23 (2.41)**
Z-score 2019	0.18 (3.07)***	0.19 (2.67)***	0.17 (2.78)***
Depreciation / assets	-2.81 (-2.51)**	-0.76 (-0.61)	-1.40 (-1.13)
Firm size	-0.42 (-3.98)***	-0.17 (-1.31)	-0.29 (-2.51)**
Metro	0.01 (0.12)	0.10 (0.82)	-0.08 (-0.62)
Industry 2	0.55 (3.30)***	0.50 (2.87)***	0.44 (2.32)**
Industry 3	0.11 (0.75)	0.06 (0.33)	0.14 (0.86)
Industry 4	-0.26 (-0.84)	-0.49 (-1.89)*	-0.28 (-0.91)
Historical Revenue Growth	-0.00 (-2.79)***	-0.00 (-3.45)***	-0.00 (-5.16)***
Early Responders	-0.16 (-1.29)	-0.18 (-1.36)	-0.11 (-0.75)
Survival Moderate	-0.21 (-1.53)	0.21 (1.09)	0.25 (1.38)
Observations	965	968	964
R-squared	0.371	0.291	0.261

This table reports results from regressions using the Altman Z-score (SME-adjusted) as the dependent variable. Models correspond to outcomes in 2020, 2021, and 2022. Interaction terms capture heterogeneity among firms severely affected by COVID-19. Industry 1 is the omitted reference group. Robust t-statistics in parentheses. $^{*}p < .1$, $^{**}p < .05$, $^{***}p < .01$.

Regression results for Z-Score in terms of firm size

	(1) Micro firms		**(2) Small, Medium firms**	
	Z2020	Z2021	Z2020	Z2021
ST debt / assets	-2.57 (-3.90)***	-2.29 (-3.43)***	-1.52 (-2.33)**	-1.05 (-1.39)
LT debt / assets	-3.70 (3.50)***	-3.15 (-3.32)***	-2.29 (-5.14)***	-2.59 (-3.45)***
Cash / assets	0.13 (0.29)	0.94 (1.76)*	0.72 (0.62)	0.31 (0.23)
Crisis Preparedness	0.11 (0.77)	0.05 (0.36)	0.01 (0.05)	-0.58 (-1.68)*
High Impact COVID	-1.52 (-2.55)**	-0.88 (-2.13)**	-0.93 (-1.01)	-1.98 (-1.66)*
ST debt × High Impact COVID	-1.78 (-1.31)	-1.34 (-0.81)	-2.29 (-1.48)	-3.16 (-0.85)
LT debt × High Impact COVID	5.30 (1.41)	2.10 (1.32)	-0.33 (-0.35)	1.17 (0.48)
Cash × High Impact COVID	0.71 (0.68)	0.72 (0.62)	-1.47 (-0.54)	-2.15 (-0.49)
CrisisPrep × High Impact COVID	0.45 (0.87)	0.14 (0.27)	1.22 (1.49)	3.03 (2.57)**
Gross Profit Margin	-0.88 (-2.57)***	-0.49 (-1.31)	-0.69 (-1.51)	0.22 (0.31)
ROA 2019	0.19 (1.71)*	0.19 (1.62)	0.40 (0.64)	0.33 (0.39)
Z-score 2019	0.17 (2.45)**	0.16 (1.93)*	0.22 (3.76)***	0.26 (3.62)***
Depreciation / assets	-2.07 (-1.55)	-0.05 (-0.40)	-5.39 (-2.73)***	-2.42 (-0.76)
Metro	0.01 (0.10)	0.07 (0.52)	0.07 (0.39)	0.24 (0.78)
Industry 2	0.50 (2.71)***	0.38 (2.04)**	0.72 (2.75)***	0.84 (3.06)***
Industry 3	0.13 (0.80)	0.05 (0.27)	-0.23 (-0.83)	-0.40 (-0.99)
Industry 4	-0.44 (-1.03)	-0.73 (-2.01)**	0.13 (0.25)	-5.75 (-0.81)
Historical Revenue Growth	-0.00 (-2.61)***	-0.00 (-3.88)***	0.44 (2.03)**	0.59 (1.93)*
Early Responders	-0.13 (-0.89)	-0.08 (-0.53)	-0.36 (-1.81)*	-0.56 (-2.18)**
Survival Moderate	-0.15 (-0.95)	0.12 (0.61)	-0.29 (-1.04)	0.93 (1.31)
Observations	780	783	185	185
R-squared	0.291	0.231	0.672	0.489

This table reports results form regressions using the Altman Z-score (SME-adjusted) as the dependent variable in terms of firm size. Models correspond to outcomes in 2020 and 2021. Interaction terms capture heterogeneity among firms severely affected by COVID-19. Industry 1 is the omitted reference group. Robust t-statistics in parentheses. $^{*}p < .1$, $^{**}p < .05$, $^{***}p < .01$.

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