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Do firm-specific factors moderate the impact of COVID-19 on firm performance? An empirical study from listed companies in North America

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In the face of unprecedented economic challenges posed by the COVID-19 pandemic, this pioneering study examines how firm-specific factors shape the pandemic's impact on firm financial performance. By analyzing data from 12,826 firm-year observations across 14 sectors in North America from 2019 to 2023, the study investigates the moderating role of company size, leverage, earnings management, CEO compensation, and industry sector on this relationship. Regression analysis reveals significant moderation effects from industry sectors, firm size, CEO compensation and earnings management on the influence of the pandemic on firm financial performance. These findings offer valuable insights for policymakers, practitioners, and researchers navigating economic uncertainties. Notably, while leverage's impact appears statistically insignificant, other factors play pivotal roles in firms' resilience during crises. In conclusion, this study provides valuable contributions to understanding the multifaceted effects of the COVID-19 pandemic on firm financial performance and the role of firm-specific factors in moderating the relationship between COVID-19 and firm performance.

Key words: COVID-19 pandemic **(**CVID_19), earnings management, total CEO compensations (TCC), return on assets (ROA), leverage, firm size, industry sectors.

INTRODUCTION

The COVID-19 pandemic has deeply affected us all, extending far beyond its impact on health. It has been a heartbreaking tragedy, resulting in millions of lives lost globally and leaving a mark on every aspect of our lives, particularly our economies. It has been a challenging time, with job losses mounting, and individuals as well as large businesses feeling the pinch, wondering what the future holds for their financial stability. Economically speaking, 2020 was rough, with the global economy, typically valued at around $84.9 trillion, taking a more than $2 trillion hit, a staggering amount, with ripple effects felt everywhere (Bauer et al., 2022).

North America has not escaped the turmoil. The economic upheaval has varied widely, impacting our neighbors in Canada, the US, and Mexico, and extending into Central America. The economy is severely unsettled due to the pandemic, affecting businesses across the board. While larger companies with substantial financial resources are striving to overcome their challenges, medium- and small-scale factories are facing dire

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circumstances. Governments are stepping in to assist by offering lifelines such as financial aid and loans, particularly to support farmers who are the backbone of our food supply.

In the manufacturing sector, it has been a year of disruptions, with factories experiencing shutdowns followed by attempts to restart operations amidst new safety regulations, fluctuating demand, and inadequate staffing. Some sectors have witnessed prolonged closures, lasting over a month on average (Roman and Cooke-Hull, 2022).

The coronavirus pandemic prompted businesses in the healthcare and social assistance sector to increasingly rely on telemedicine in 2020, with revenue from telemedicine accounting for less than 5% of their total revenue. In response to pandemic-induced store closures, businesses had to adapt and turn to e-commerce. In 2020, U.S. merchant wholesalers recorded sales of $8,037.4 billion, marking a 6.6% decrease from $8,607.1 billion in 2019. E-commerce sales of U.S. merchant wholesalers totaled $2,860.0 billion in 2020, reflecting a 1.0% decrease from $2,887.9 billion in 2019. Notably, e-commerce as a percentage of total sales increased to 35.6% in 2020 from 33.6% in 2019 (Roman and Cooke-Hull, 2022). COVID-19's impact on Canadian firms' economic activity spans across company sizes, affecting actual hours worked by company production workers and real GDP. Analysis reveals that small companies bore the brunt of the pandemic's effects in the first quarter of 2020. Specifically, small firm hours worked declined by 9.4% during this period, compared to a 5.6% reduction across the business sector as a whole. Furthermore, small firms experienced a 2.1% decrease in real production, whereas business output as a whole fell by 1.7%. Notably, small companies in the service sector suffered more significant losses in hours worked and actual production compared to those in the goods sector (Gu, 2020).

While numerous studies have meticulously explored how the pandemic directly influenced aspects like business financial performance, stock markets, liquidity, risk, leverage, and firm returns (Narayan and Phan, 2020; Baek et al., 2020; Just and Exhaust, 2020; Rizwan et al., 2020; Narayan et al., 2021; Shen et al., 2020), a pivotal and often overlooked aspect demands attention.

Within the extensive body of literature dedicated to examining the consequences of the COVID-19 pandemic, an intriguing terrain awaits exploration—an understudied realm, which is the significant role played by financial and firm-specific factors. Previous research has primarily focused on the direct effects of the pandemic on financial outcomes, at times overlooking the nuanced interplay of factors such as a company's financial leverage, size, or the industry in which it operates.

This aspect takes center stage for several compelling reasons. This study aims to illuminate the moderating influence of financial and firm-specific factors amid the pandemic's tumultuous journey. By doing so, it aims to uncover hidden complexities that have thus far remained in the shadows. For instance, it explores whether businesses strategically adapted their financial profiles during the pandemic and how these adaptations influenced their financial performance.

This study, titled “Examining the Moderating Effects of Firm-Specific Factors on the Impact of the COVID-19 Pandemic on North American Public Company Financial Performance,” aims to look into the interesting question of how CEO pay might affect a company's success in these tough times, and it checks to see if this effect is different across different industries. It shows how important it is to understand how the many factors that affect how companies deal with unexpected problems work together.

New research shows that to fully understand the direct effects of an independent variable, it is necessary to look at moderation effects along with control factors (Tarighi et al., 2023; Dyvik, 2023; Uddin, 2023). The author use data from publicly traded companies in North America from 2019 to 2023 to look into how firm-specific factors (like size, leverage, earnings management, CEO total pay, and industry) affected how well the companies did during the pandemic. These characteristics were used as both independent variables and moderators to change the size and direction of the effects.

This study is very helpful because it looks at how these factors affect the results of the COVID-19 pandemic as an independent variable. It does this by looking at the many factors that affect how resilient or vulnerable companies are to crises. This study looks at moderation effects and control factors in great detail to try to figure out the complicated relationships at play. This will help people come up with better ways to deal with uncertainty.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Covid-19

As anticipated, the Covid-19 shock has predominantly negatively impacted firm profitability and leverage on a global scale. Revenues and profits declined by two percent for the median firm, while debt and leverage ratios increased.

Additionally, the interest coverage ratio (ICR), a critical solvency metric, decreased by approximately two percentage points (Rawdanowicz and Puy, 2021). Research indicates significant blows to companies in China, Indonesia, and Vietnam, particularly in the logistics sector, as well as in Germany, Korea, and the UK (Rababah et al., 2020; Devi et al., 2020; Atayah et al., 2021). Stock markets in sixteen countries have suffered due to COVID-19, leading to significant income drops in industries such as those in Poland (Hu and Zhang, 2021;

Kubiczek and Derej, 2021; Nguyen, 2022). In North America, as in other regions globally, the COVID-19 pandemic has inflicted devastating effects on both public health and economies. With thousands of lives lost in the United States and Canada, the virus has precipitated a significant decline in small business revenue by 20% since January, coupled with an increase in Chapter 11 bankruptcies. Although new business formations initially experienced a decline, they are now showing signs of recovery.

Layoffs and shutdowns, rather than reduced average hours, are the primary drivers of declines in total hours worked. The number of labor force participants not at work quadrupled from January to April, and the number of individuals not in the labor force but desiring employment surged by 4.5 million in April and has remained elevated. Additionally, the personal saving rate reached its highest recorded level in April 2020, yet low-income families with children faced disproportionate income shocks, with over one in five households behind on rent payments in 26 states in July. The rate of food insecurity doubled for households with children between 2018 and mid-2020 (Bauer et al., 2022).

This economic upheaval has prompted extensive research into the pandemic's impact on firm financial performance. Diminished total income has resulted in declining financial health for companies, as evidenced by decreases across key metrics such as return on assets (ROA), return on equity (ROE), and earnings per share (EPS) (Shen and Chen, 2020; Vo and Tran, 2021). Despite challenges, certain sectors like e-commerce, technology, and healthcare have experienced accelerated growth, while traditional brick-and-mortar retailers and small businesses continue to face difficulties. The onset of the pandemic led to a sharp decline in the region's real gross domestic product (GDP), dropping by 9%, a downturn unprecedented even in the worst years of the Great Recession (Gagnon et al., 2023). Given the significant negative impact of COVID-19 on firm performance, the following hypothesis is proposed:

H1.1: The COVID-19 pandemic has negatively impacted the financial performance of listed firms in North America

The dependent variable for the testing of hypothesis 1 is the firm financial performance and is based on the COVID-19 impact.

$$\text{Firm financial performance} = \beta 0 + \beta\ 1(\text{CV19})_{it} + \epsilon_{it} \quad \text{Model 1}$$

When analyzing the negative effects of the COVID-19 epidemic on business performance, it's important to recognize that fundamental firm-specific factors, including size, leverage, management compensation, earnings management practices, and the industrial sector, also have a major influence. While these variables may not directly instigate changes in company performance, they act as mediators, shaping how other factors, such as the pandemic, affect financial outcomes.

These firm-specific variables reflect the unique features and behaviors associated with different businesses. By accounting for these factors, researchers can consider existing circumstances that influence company performance beyond the pandemic alone. For instance, compared to smaller businesses, larger companies often have greater resources available to weather economic storms. Additionally, various industries may encounter different challenges or opportunities during the pandemic, which is evident in the characteristics used to classify sectors. Moreover, insights into managerial choices and behaviors provided by factors like management compensation and earnings management are significant. They illustrate how managers respond to external shocks and make strategic decisions to mitigate risks or capitalize on opportunities.

By accounting for additional sources of variation, this approach enhances the ability to explain and anticipate changes in company performance. Ultimately, it yields findings that are more robust and nuanced regarding the epidemic's impact on a firm's financial performance. As a result, a careful evaluation of some of these business-specific characteristics and their moderating effects is required to understand the complicated interaction between pandemics and firm performance.

Hypothesis 1 is tested again with the additional control variables based on the next cross-sectional regression, including the control variables, is performed.

H1.2: The impact of the COVID-19 pandemic on financial performance varies based on factors such as leverage, firm size, discretionary accruals, CEO total compensation, and industry sector

This hypothesis is tested by the model:

$$\text{Firm Performance}_{it} = \beta 0 + \beta 1(\text{CV19})_{it}\ \beta(\text{LEV})_{it} + \beta 3(\text{SIZE})_{it} + \beta 4(\text{DACC})_{\_it} + \beta 5(\text{CTC})_{it} + \beta 6\ (\text{IS})_{\_it} + \epsilon_{it} \quad \text{Model 2}$$

To expand the understanding of the relationships among the fundamental firm-specific factors variables in the model and allow for more hypotheses to be tested, the focus shifts from considering these factors as mediators to viewing them as important components of firm-specific factors that may influence the relationship between the COVID-19 pandemic and the company's financial performance. By including these control variables in the study, the aim is to investigate how differences in company size, debt ratio, executive compensation, earnings management practices, and industrial sector

might impact the degree to which the COVID-19 epidemic affects company performance. These variables function as moderators, enabling the analysis of how the impacts of the pandemic change across firms with different characteristics. The interaction between independent control variables and the Covid-19 pandemic towards the effect on firm performance is studied.

Firm-specific factors

Firm size

It has long been recognized that a company's size is a critical factor in determining how effectively it can withstand external shocks. The success, innovation capacity, and adaptability of a company can be influenced by its size, often indicative of economies of scale and market dominance. Larger firms are more likely to achieve their objectives effortlessly due to their access to resources, which confers a competitive edge. They tend to possess qualified management teams, more specialized skills, and greater centralization compared to smaller firms. In the context of the COVID-19 pandemic, firm size is crucial as a control variable because it can influence how businesses navigate economic downturns.

Several scholars suggest a positive relationship between size indicators and profitability. Big firms possess greater competitive power than small firms owing to their larger market share, improved access to capital, experience, and operational efficiencies (Ichev and Marinc, 2018). Similarly, Baldwin and di Mauro (2020) argue that smaller firms may be particularly vulnerable to the impact of the COVID-19 pandemic. Levy (2020) notes that coronavirus-related restrictions have boosted revenues for large technological and pharmaceutical companies while adversely affecting or bankrupting many smaller firms reliant on traditional economies.

There is currently no evidence demonstrating the effect of size as a moderating variable on the relationship between COVID-19 and firm performance. Hence, the role of firm size is examined as a moderator variable. Therefore, the hypotheses of this study are as follows:

H2: Firm size moderates the relationship between COVID-19 and firm performance after controlling for other control variables

This hypothesis is tested by the model:

$$\text{Firm performance}_{it} = b0 + \beta1(CV19)_{it} \quad \beta2(LEV)_{it} + \beta3(SIZE)_{-it} \beta4(DACC)_{-it} \beta5(CTC)_{it} + \beta6\ (IS)_{-it} + \beta7\ (CV19 * SIZE)_{it} + \epsilon_{it} \quad \text{Model 3}$$

Finance leverage

Financial leverage, indicating a company's reliance on debt, is a crucial factor in assessing how businesses respond to the pandemic's economic effects. Strong financial pressure is particularly significant for managers during the COVID-19 pandemic as it greatly influences how companies address challenges stemming from the economic downturn. Numerous studies have demonstrated the link between a company's debt level and its financial stability.

Matar et al. (2018) analyze the impact of macroeconomic and firm-specific factors, including financial leverage, on corporate performance. Their findings indicate a positive effect of financial leverage on firm value, measured by ROA.

However, Gharsalli (2019) investigates the effect of leverage on firm performance in France and finds a negative relationship, suggesting that highly leveraged firms tend to perform poorly. Conversely, Wardani and Rudolfus (2019) highlight a positive relationship between leverage and firm performance. Siswanto (2021) also notes that the leverage ratio is a commonly used indicator for assessing a corporation's reliance on debt for funding. High leverage raises concerns as it indicates significant debt is being utilized to cover corporate expenses.

The Debt to Asset Ratio (DAR) serves as a metric of leverage in this analysis. A higher DAR signifies a greater percentage of debt-financed assets in the corporation, increasing the risk of default, which can profoundly impact the company's finances. In the context of the COVID-19 pandemic, increased debt levels may exacerbate the negative impacts, while decreased debt levels can act as a safeguard, affecting financial performance in various ways.

Currently, there is no evidence demonstrating the effect of financial leverage as a moderating variable on the relationship between COVID-19 and firm performance. Hence, the role of financial leverage is examined as a moderator variable.

Therefore, the hypothesis of this factor is as follows:

H3: Firm financial leverage (LEV) moderates the relationship between COVID-19 and firm performance after controlling for other control variables.

This hypothesis is tested by the model:

$$\text{Firm Performance}_{it} = b0 + \beta1(CV19)_{it} \quad \beta2(LEV)_{it} + \beta3(CV19 * LEV)_{-it} + \beta4(SIZE)_{it} + \beta5(DACC)_{-it} + \beta6(CTC)_{it} + \beta7\ (IS)_{-it} + \epsilon_{it} \quad \text{Model 4}$$

CEO compensation

CEO compensation plays a crucial role as a moderator between COVID-19 and firm performance due to its influence on executive decision-making and organizational strategy. During periods of economic uncertainty, such as

the COVID-19 pandemic, firms often adjust CEO compensation structures as part of broader cost-cutting measures or to align incentives with shifting organizational priorities. In recent years, there has been a greater emphasis placed on executive compensation. CEOs have a significant role in possibly impacting the success of the firm during the pandemic, and their compensation is generally comprised of a combination of base salary, annual cash bonus payments, and long-term equity-based awards. Often, executive compensation will lean heavily on equity-based awards, which are intended to provide long-term incentives and align management and shareholder interests. However, granting and pricing equity-based awards during a period of uncertainty and stock market volatility may raise other issues, as may the impact of a sudden drop in equity prices on the value of previously granted equity-based awards. In addition, notwithstanding that most executives are working longer hours under immense pressure to navigate their organizations through the COVID-19 crisis, several world executives and boards have taken salary deferrals or cuts to save costs, preserve cash, and better align the leadership team with the broader employee base. Batish et al. (2020) discuss the effect of the COVID-19 pandemic on the size and shifts in CEO compensation. They found that nearly half of the salaries of CEOs who had adjustments made to their salaries were forfeited by the CEOs themselves. According to Batish et al. (2020), many firms reduced director fees, CEO salaries, and long-term incentive programs. Several studies have shown the correlation between CEO compensation and firm performance. Raviv and Sisli-Ciamarra (2013) study the impact of different CEO compensations on asset risk in varied economic states. In their paper, the authors find that under a good economy, executives tend to target the maximum possible level of asset risk optimally. In comparison, under systemic crises, executives tend to choose lower to intermediate levels of asset risk as the optimal solution. In addition, the authors find that this result is related to the level of equity incentives during a recession. Furthermore, Yang et al. (2014) studied whether the relationship between CEO compensation and firm performance was affected by the financial crisis of 2007-2008. Their total sample consists of 3286 different firms, with data from 1992 to 2011. The authors find that different CEO compensation components show a positive and significant effect on the return on assets in their sample for both before and after the 2007-2008 financial crisis. When examining CEO compensation as a moderator, it shows how the incentives provided to or cut from CEOs may either enhance or diminish a company's resilience in challenging circumstances. Analyzing this relationship sheds light on how changes in CEO compensation influence strategic decisions, organizational resilience, and ultimately firm outcomes during times of crisis. This will underscore the critical importance of examining how CEO compensation acts a s a key moderator between COVID-19 and firm performance. Based on the literature discussed in this section, and the lack of evidence regarding the moderating role of CEO compensation in the relationship between COVID-19 and firm performance, the study will aim to explore its potential moderating effect. Therefore, the hypothesis of this factor is as follows:

H4: Total CEO compensation (TCO) moderates the relationship between COVID-19 and firm performance after controlling for other control variables

This hypothesis is tested by the model:

$$\text{Firm Performance}_{it}=b0+\beta1(\text{CV19})_{it}\beta2(\text{LEV})_{it}+\beta3(\text{SIZE})_{-it}+\beta4(\text{DACC})_{it}+\beta5(\text{CTC})_{-it}\beta6(\text{CV19}*\text{CTC})_{it}+\beta7(\text{IS})_{-it}+\epsilon_{it} \quad \text{Model 3}$$

Earnings management

Earnings management involves manipulating financial statements to achieve desired results, while Earnings management (EM) is subjective accounting adjustments made by management to manage earnings. During times of crisis such as the COVID-19 pandemic, CEOs may resort to earnings management strategies to mitigate the negative impact on firm performance. For example, they might employ income-increasing tactics to offset revenue losses or boost stock prices. Conversely, they may opt for income-decreasing strategies to conserve resources or manage investor expectations during periods of uncertainty. The moderation effect of CEO earnings management lies in its ability to influence how the firm responds to the challenges posed by COVID-19. By strategically manipulating earnings, CEOs can potentially alter the perceived impact of the pandemic on the company's financial health. According to the signaling theory (Spence, 1978), because investors are more sensitive to “good news” in a sluggish economy, companies that create the illusion of good development can release positive signals to the market. Such signals help enterprises obtain more funds from external investors, so it becomes possible for them to turn losses into profits and get rid of practical difficulties. Lassoued and Khanchel (2021) conducted a study examining the impact of the COVID-19 pandemic on earnings management across a sample of 031 firms listed in 15 European countries. Their findings revealed a notable increase in earnings management among the sampled firms during the pandemic period compared to the preceding period. Particularly, the analysis highlighted significant income-increasing earnings management practices observed throughout 2020. This observation suggests that firms engaged in upward earnings management strategies, likely aimed at mitigating reported losses to bolster investor and stakeholder

confidence. Such actions are crucial for supporting economic recovery during the pandemic and enhancing the perception of the firm financial performance. According to a study by Khuong et al. (2019), there is a positive correlation between real earnings manipulation and financial performance among Vietnamese energy companies as measured by the ROA and ROE ratios. Similarly, Abbas (2018) observed a similar trend in his study, where earnings management through income increases led to a rise in the value of banks in Indonesia. These findings confirm that managers engage in earnings management to demonstrate stable income and favorable economic conditions. Several other studies have demonstrated the correlation between earnings management practices and firm performance (Fatzel et al., 2022; Golubeva et al.,2022). By examining earnings management as a mediator, we can discern how such practices, whether conservative or aggressive, influence a company's reported financial performance and offer a more comprehensive understanding of the effects of the pandemic on firm performance. Given the lack of evidence from previous literature regarding the moderating role of earnings management in the relationship between COVID-19 and firm performance, this study aims to explore its potential moderating effect. Therefore, the hypothesis of this factor is as follows:

H5: Earnings management (EM) moderates the relationship between COVID-19 and firm performance after controlling for other control variables

This hypothesis is tested by the model:

$$\text{Firm Performance}_{it} = b0 + \beta1(CV19)_{it} \beta2(LEV)_{it} + \beta3(SIZE)_{-it} + \beta4(DACC)_{it} + \beta5(CV19 * DACC)_{-it} \beta6(CTC)_{it} + \beta7(IS)_{-it} + \epsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{Model 6}$$

Industry sectors

During the pandemic, changes in customer behavior, disruptions in the supply chain, and shifts in market dynamics have presented unique challenges for each industry sector. Firms operating in the energy sector witnessed a significant decline in revenues and profits, ranging between 30% and 50%, reflecting the downturn in oil prices throughout most of 2020. Similarly, contact-intensive consumer services such as hotel and restaurant chains, casinos and gaming, and cruise lines also experienced substantial income shocks. The transportation and automobile sectors were also significantly affected. Conversely, firms in software services, pharmaceuticals, healthcare, and retailing experienced notable expansions in fiscal year 2020, both in terms of revenues and profits (Rawdanowicz and Puy, 2021). In Canada, many firms in the service sector encountered a substantial drop in revenues as a consequence of the pandemic (Table 1).

Considering business sectors as a factor, one can examine how the pandemic affects different sectors in various ways. Strong industries may exist alongside others facing significant challenges that impact the bottom lines of companies within those sectors. Regarding the COVID-19 pandemic, industry sectors emerge as crucial factors due to their substantial influence on how companies navigate economic slowdowns. The unique features and structures of each sector influence companies' responses and strategies, subsequently affecting their ability to maintain financial stability and performance during challenging times (Nguyen et al., 2022; Nayak et al., 2022). Given the lack of evidence from previous literature regarding the moderating role of the industry sector in the relationship between COVID-19 and firm performance, this study aims to explore its potential moderating effect. Therefore, the hypothesis of this factor is as follows:

H6: Firms industry sectors (IS) moderate the relationship between COVID-19 and firm performance after controlling for other control variables

This hypothesis is tested by the model:

$$\text{Firm Performance}_{it} = b0 + \beta1(CV19)_{it} \beta2(LEV)_{it} + \beta3(SIZE)_{-it} + \beta4(DACC)_{it} + \beta5(CTC)_{-it} + \beta6(IS)_{-it} + \beta7(CV19 * IS)_{it} + \epsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{model 7}$$

METHODOLOGY

This study employs an empirical research design to investigate the moderation effect of firm-specific factors on the impact of COVID-19 on firm performance among listed companies in North America. Data collection is conducted through Compustata's annual databases. Statistical analyses, including regression analysis and moderation analysis, are performed to assess the relationships between COVID-19, firm-specific factors, and firm performance. The empirical analysis adheres to the guidelines outlined in the American Psychological Association (APA) Publication Manual, 7th edition, ensuring rigor and accuracy in the research process.

Model selection

To examine the impact of the COVID-19 pandemic on North American public company financial performance, a rigorous model selection process was conducted. The objective was to choose the most appropriate panel data model, considering the presence of individual-specific effects and potential moderating factors.

Hausman test

To determine the most suitable model for the analysis, we initiated a Hausman test. This test (Table 2) revealed a systematic difference in the coefficient estimates between the fixed-effects and random-effects models (Chi-squared statistic = 8.017, p-value =

Table 1. Impact of the pandemic on revenue by industry sector.

Industry	Decreased 40% or more	Decreased 20% to less than 40%	Decreased 1% to less than 20%	Increased	Stayed the same	Not applicable
Accommodation and food services	High	Moderate	Low	Very Low	None	None
Arts, entertainment, and recreation	High	Moderate	Low	Very Low	None	None
Other services	Moderate	Moderate	Moderate	Low	Very Low	None
Information and cultural industries	Low	Moderate	High	Low	Very Low	None
Admin. support, waste management, and remediation services	Low	Moderate	Moderate	Low	Very Low	None
Transportation and warehousing	Low	Moderate	High	Very Low	None	None
Retail trade	Very Low	Low	High	Moderate	Low	None
Mining, quarrying, and oil and gas extraction	Very Low	Low	Moderate	Moderate	Low	None
Construction	Very Low	Low	High	Moderate	Low	None
Wholesale trade	Very Low	Low	High	Moderate	Low	None
Manufacturing	Very Low	Low	High	Moderate	Low	None
Professional, scientific, and technical services	Very Low	Very Low	High	Moderate	Moderate	None
Health care and social assistance	None	Low	Moderate	High	Moderate	None
Real estate and rental and leasing	None	Very Low	Moderate	High	High	None
Agriculture, forestry, fishing and hunting	None	Very Low	High	High	Moderate	None

Source: Grieder et al. (2021, May). Bank of Canada Staff Analytical 2021.

Table 2. Hausman specification test.

	Coef.
Chi-square test value	8.017
P-value	0.0046

0.0046) which is less than the common significance level of 0.05 (5%), consequently, the fixed-effects model was chosen due to its ability to effectively account for entity-specific effects that appear to systematically influence the relationship between COVID-19 and financial performance.

Control variables

Control variables were selected based on their theoretical relevance and previous empirical studies. These variables are included to mitigate potential confounding effects and enhance the precision of the analysis:

LEV (Total Liabilities/Total Assets): To control the financial structure of firms, **SIZE** (Natural Logarithm of Total Assets): To account for firm size effects, **EM** (Modified Jones Models): To consider accounting earnings quality, **IS** (Standard Industrial Classification): To capture industry-specific effects, **CTC** (Total Compensation): To incorporate CEO compensation-related factors.

Moderation variables

The study explores the moderating effects of certain variables on the relationship between COVID-19 and financial performance. These moderation variables are of particular interest due to their potential to influence this relationship in various ways:

LEV_CV19: Represents the interaction between firm leverage and the COVID-19 pandemic, **SIZE_CV19:** Represents the interaction between firm size and the COVID-19 pandemic, **IS_CV19:** Accounts for the industry-specific interaction with COVID-19, **EM_CV19:** Represents the interaction between accounting quality and the COVID-19 pandemic, **CTC_CV19:** Captures the interaction between CEO compensation and the COVID-19 pandemic.

Model specification

The fixed-effects model, chosen based on the Hausman test results, is specified as follows:

$$\text{Financial Performance} = \alpha + \beta_1(\text{COVID-19}) + \beta_2(\text{LEV}) + \beta_3(\text{SIZE}) + \beta_4(\text{EM}) + \beta_5(\text{IS}) + \beta_6(\text{CTC}) + \beta_7(\text{LEV\_CV19}) + \beta_8(\text{SIZE\_CV19}) + \beta_9(\text{IS\_CV19}) + \beta_{10}(\text{EM\_CV19}) + \beta_{11}(\text{CTC\_CV19}) + \varepsilon_i$$

Table 3. Partitions of the observations per Industry.

Industry sectors	Frequency	Percent	Cummulative
Delivery and logistics (23%)	65	0.82	0.82
E-commerce and online retail (79%)	66	0.83	1.65
Healthcare and pharmaceuticals (37%)	666	8.39	10.05
Streaming and online entertainment (30%)	669	8.43	18.48
Agriculture (30%)	11	0.14	18.62
Construction (30%)	150	1.89	20.51
Finance (63%)	1882	23.72	44.23
Manufacturing (23%)	2543	32.05	76.28
Public (71%)	17	0.21	76.49
Retail (26%)	567	7.15	83.64
Services (47%)	434	5.47	89.11
Telecommunication (60%)	163	2.05	91.16
Transportation (48%)	440	5.55	96.71
Wholesale (26%)	261	3.29	100.00
Total	7934	100.00	

In this model, α represents the intercept, and β_1 to β_{11} represent the coefficients to be estimated. The moderation variables (LEV_CV19, SIZE_CV19, IS_CV19, EM_CV19, and CTC_CV19) are introduced as interaction terms with COVID-19 (COVID-19) to assess their moderating effects.

Population, sample, and data collection method

Using the fixed-effects model, the dataset for this study comprises panel data spanning from the years 2019 to 2023, encompassing 12,826 firm-year observations derived from 7,934 Canadian and American firms across 14 sectors. Following the removal of outliers and observations with insufficient data, the final sample size amounted to 7,934. Table 3 illustrates the distribution of observations by industry. The data were sourced from annual financial reports obtained from Compustat North America and Execucomp, renowned sources of financial data for North American companies.

Measurement of variables

1. This study utilizes key financial indicators commonly used to assess a firm's financial performance. These indicators include return on assets (ROA) and return on equity (ROE), widely employed in previous research by Shen et al. (2020), Jin et al. (2021), Al-matairi et al. (2014), Fu and Shen (2021), Buallay (2022), Xu et al. (2022); Xu and Wang (2018). ROA measures the net profit generated per unit of assets, while ROE reflects income from shareholders' equity. The analysis also incorporates earnings per share, revenue growth, and earnings growth as additional dependent variables. Earnings per share represent per-share profitability, while revenue growth and earnings growth offer insights into sales growth and profitability trends. Collectively, these financial indicators contribute to a comprehensive understanding of the COVID-19 pandemic's impact on the financial performance of North American firms.
2. Independent variable: The COVID-19 pandemic is the independent variable of interest in this study, as it is hypothesized to have a significant impact on the financial performance of North American firms. By examining the relationship between the pandemic and various factors that could influence its impacts, such as company size, industry, debt ratio, use of Earnings management, and CEO total compensation.
3. Control variables: The study aims to provide new insights into the challenges faced by North American firms during this crisis. Various financial indicators have been selected as dependent variables to measure the impact of the pandemic on firm financial performance. (Company size, industry, debt ratio, use of Earnings management, and CEO total compensation) are considered control or moderating variables. These variables are being tested to see how they may influence the relationship between the independent variable (COVID-19 pandemic) and the dependent variable (Firm financial performance) All variables and their measurements are shown in Table 4.

RESULTS AND DISCUSSION

Descriptive statistics and correlation matrices

The descriptive statistics presented in Tables 5 and 6 reveal a significant impact of the COVID-19 pandemic on the financial performance of North American firms. Financial indicators such as ROA, ROE, earnings growth, EPS, and revenue growth experienced lower average values during the pandemic compared to the pre-pandemic period. For instance, the average ROA declined from 0.1197 to 0.1100, while the average ROE decreased from 0.2312 to 0.3445. EPS and revenue growth also saw declines, with average EPS dropping from 54.86 to 8.62 and average revenue growth reducing from 26.08 to 14.26. However, it is noteworthy that the mean earnings growth shifted from negative (-0.1175) before the pandemic to positive (1.1653) during the pandemic, indicating varying impacts across industries. Companies in certain sectors experienced growth, such

Table 4. Variable definition and measurement.

Variable	Symbol	Measurement
Return on assets	ROA	Net income/Total assets
Return on equity	ROE	Net income/Shareholders' equity
Earnings per share	EPS	Net Income - Preferred Dividends) / Weighted Average Common Shares Outstanding
Revenue growth	REG	(Revenue current year – Revenue a prior year) / revenue prior year
Earnings growth	ERG	(Earnings current year- Earnings a prior year) (Revenue current year – revenue a prior year) / Earnings prior year
Firm financial performance	Firm financial performance	The sum of the weighted standard deviation (std) for each variable (ROA, ROE, EPS, REG, ERG)
COVID-19	CV19	Dummy variable, taking on a value of 1 for the years 2019 and beyond, and 0 otherwise.
Debt ratio	LEV	Total liabilities/Total assets
Firm size	SIZE	Natural logarithm of total assets
Earnings management	EM	Discretionary accruals Modified Jones Models (1995)
Industry sectors	IS	By Standard Industrial Classification
CEO total compensations	CTC	Total Compensation (Salary + Bonus + Other Annual + Restricted Stock Grants

Table 5. Descriptive statistics for the proxies of firm financial performance (ROA, ROE, EPS, ERG.REG) before the Covid-19 Pandemic (2019-2023).

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	4692	012	0.231	-2.023	11.012
ROE	4692	0.231	3.718	-178.717	52.796
EPS	4666	54.856	2350.627	-132	134514
earnings growth	4692	-0.117	6.415	-339.475	49.471
revenue growth	4660	26.083	535.41	-100	22586.945

Table 6. Descriptive statistics for the proxies of Firm financial performance (ROA, ROE, EPS, ERG.REG) after the Covid-19 Pandemic (2019-2023).

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	3236	0.11	0.122	-1.252	1.582
ROE	3236	0.345	4.855	-119.434	137.5
EPS	3230	8.616	31.758	-304	1548.5
earnings growth	3239	1.165	46.915	-60.867	2641.97
revenue growth	3225	14.255	93.523	-190.697	2564.587

as those offering teleconferencing, online shopping, and delivery services, while others, especially in the travel and tourism industry, faced significant challenges.

Checking for multicollinearity in regression models is crucial to ensure unbiased coefficient estimates. A common method to assess multicollinearity is examining Variance Inflation Factor (VIF) values, with a VIF of 1 indicating no multicollinearity, and values above 5 or 10 indicating high levels. High multicollinearity can hinder discerning individual effects of independent variables on the dependent variable, increase standard errors, and render coefficients unstable.

Table 7 displays VIF and its reciprocal (1/VIF) for the regression variables. CV19, IS_CV19, CTC_CV19, and IS_CTC_CV19 have VIF values above 5, indicating moderate to high multicollinearity. Nonetheless, the mean VIF value for all variables is 4.16, below the threshold of 5, suggesting multicollinearity is not a major issue in the

Table 7. Variance inflation factor.

Varaiable	VIF	1/VIF
CV19	11.441	0.087
IS CV19	9.573	0.104
CTC CV19	7.513	0.133
IS CTC CV19	5.756	0.174
SIZE CV19	2.103	0.476
CTC	2.098	0.477
EM CV19	1.776	0.563
SIZE	1.654	0.605
IS	1.614	0.62
EM	1.233	0.811
LEV	1.001	0.999
Mean VIF	4.16	.

model (Everitt, 2010). Overall, these results suggest that the variables included in the model have acceptable levels of multicollinearity, and their effects on firm financial performance can be reasonably estimated.

Hypothesis testing and moderating effects of firm-level factors

H1: The COVID-19 pandemic has negatively impacted the financial performance of listed firms in North America

Table 8 presents the results of the analysis, aiming to understand how the COVID-19 pandemic (represented by the CV19 variable) influenced the firm's financial performance. The low R-squared value of 0.009 indicates that the model explains only a small 0.9% of the variance in the firm's financial performance, suggesting the presence of other influential factors not considered. However, the standout finding is the CV19 coefficient of -0.588, with an impressively low p-value of 0.000. This indicates that the pandemic, or related factors, had a statistically significant and negative impact on firm financial performance. For each unit increase in the CV19 variable, firm financial performance can be expected to drop by approximately 0.588 units. This relationship is visually evident in Figure 1. These results strongly support the notion that the financial performance of North American companies was significantly harmed by the COVID-19 pandemic. These findings align with previous research conducted by Cui et al. (2020), Li and Li (2020), Zhang and Liu (2020), Wang et al. (2021), and Zhang and Zheng (2022), all of which reached similar conclusions regarding the pandemic's negative impact on the financial performance of Chinese companies. However, this contradicts a study by Jian and Zhenji (2022), which found no significant effect of the COVID-19 outbreak on the financial performance and cash reserves of agri-food companies. Moving forward, the analysis is enhanced by introducing additional variables, including firm leverage(LEV), firm size(SIZE), Total CEO Compensation(TCC), Earnings Management (EM), and Industry Sectors (IS). These variables are expected to provide deeper insights into how the pandemic influenced firm financial performance, considering a broader range of factors. Recognizing the potential impact of these unmeasured variables, the study subsequently explores additional hypotheses to examine the effects of other controlling variables that may contribute to variations in firm financial performance during the pandemic.

Recognizing the impact of these other unmeasured factors, the study subsequently explored additional hypotheses to investigate the effects of other controlling variables that may contribute to variations in firm financial performance during the pandemic.

$$\text{Firm Performance}_{it} = \beta\ 0\ + \beta 1(\text{CV19})_{it}\ \beta(\text{LEV})_{it} + \beta 3(\text{SIZE})_{it} + \beta 4(\text{DACC})_{\_it} + \beta 5(\text{CTC})_{it} + \beta 6\ (\text{IS})_{\_it} + \epsilon_{it}$$

The regression analysis results in Table 9 demonstrate a significant negative impact of the COVID-19 pandemic on firm financial performance ($p < 0.001$), supporting H2, which suggests that the pandemic's effects on financial performance vary depending on other variables. Although the adjusted R-squared value of 0.7533 indicates that the independent variables explain a substantial portion of the variance in firm financial performance, significant interaction effects were observed between COVID-19 and other variables, such as Earnings Management (EM) and industry sector (IS).

Despite the positive coefficient for EM (24474.534), suggesting a positive relationship between EM and firm financial performance, the associated p-value of 0.267 is not statistically significant at the 0.05 level. This implies that the relationship between EM and firm financial performance may be due to chance and does not significantly impact the relationship between COVID-19 and firm financial performance. However, further investigation is necessary to confirm this.

Similarly, the coefficient for the industry sector (IS) is negative (-28191.291), indicating a negative relationship between IS and firm financial performance. This suggests that firms in certain industry sectors may have experienced a greater negative impact on their financial performance due to the pandemic. However, additional analysis is needed to identify the industry sectors most affected.

Overall, exploring the potential interaction effects of multiple independent control variables, including EM and IS, can offer a more nuanced understanding of the factors that exacerbate or mitigate the negative impact of the COVID-19 pandemic on firms. This is particularly important given the focus of this research on investigating the moderating effects of firm financial and firm-specific factors on the impact of the COVID-19 pandemic on North American public firms.

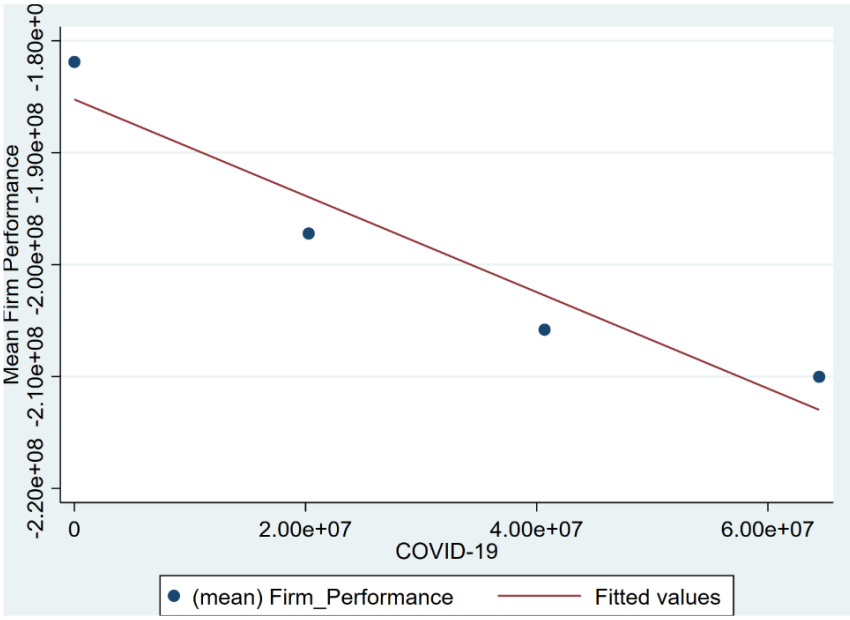

Figure 1. Relationship between COVID-19 and Mean Firm financial performance.

Table 8. Regression Analysis of Firm Performance During COVID-19 Pandemic.

Firm financial performance	Coef.	St.Err.	t-Value	p-Value	[95% Conf	Interval]	Sig
CV19	-0.588	0.069	-8.52	0	-0.723	-0.452	***
Constant	-1.825	1471236.5	-124.02	0	-1.854	-1.796	***
Mean dependent var	-189992140.241		SD dependent var		105250654.995		
R-squared	0.009		Number of obs		7934		
F-test	72.522		Prob > F		0.000		
Akaike crit. (AIC)	315557.905		Bayesian crit. (BIC)		315571.863		

*** p<.01, ** p<.05, * p<.1

Table 9. Regression analysis of firm-specific factors and covid-19 impact on firm financial performance.

Firm financial performance	Coef.	Std. Err.	t-Value	p-Value	[95% Conf	Interval]	Sig
CV19	-.623	.035	-18.00	0	-0.691	-0.555	***
SIZE	-51091.598	54304.315	-9.41	0	-61736.684	-40446.513	***
LEV	-6990.689	7407.454	-0.94	0.345	-21511.263	7529.885	
IS	-28191.291	187941.58	-150.00	0	-28559.706	-27822.876	***
EM	24474.534	22052.586	1.11	0.267	-18754.381	67703.45	
CTC	210.793	51.612	4.08	0	109.62	311.966	***
Constant	37200.556	187294.24	19.86	0	33529.093	40872.020	***
Mean dependent var	-190172383.906		SD dependent var		105191939.706		
R-squared	0.753		Number of obs		7934		
F-test	4014.020		Prob > F		0.000		
Akaike crit. (AIC)	302678.388		Bayesian crit. (BIC)		302727.198		

*** p<.01, ** p<.05, * p<.1

Table 10. Moderation analysis of firm size on firm performance during COVID-19 Pandemic.

Firm performance	Coef.	Std. Err.	t-Value	p-Value	[95% Conf	Interval]	Sig
CV19	-0.337	0.039	-8.65	0	-0.414	-0.261	***
LEV	-3176.16	6828.496	-0.47	0.642	-16561.489	10209.168	
SIZE	-13920.692	58278.8510	-23.89	0	-15063.083	-12778.300	***
SIZE_CV19	0.564	0.029	19.15	0	0.506	0.622	***
EM	29350.32.7	21245.56	1.38	0.167	-12295.57	70996.223	
CTC	182.619	49.622	3.68	0	85.349	279.889	***
IS	-28301.663	17073.926	-165.76	0	-28636.348	-27966.977	***
Constant	36344.595	17130.021	21.22	0	32986.741	39702.450	***

Mean dependent var	-186297877.189	SD dependent var	106563614.900
R-squared	0.764	Number of obs	7934
F-test	4341.796	Prob > F	0.000
Akaike crit. (AIC)	361172.748	Bayesian crit. (BIC)	361229.947

*** p<.01, ** p<.05, * p<.1

H2: Firm size moderates the relationship between COVID-19 and firm performance after controlling for other control variables

Table 10 presents the estimated coefficients, standard errors, t-values, and p-values of the independent variables on the dependent variable (firm financial performance), as well as the constant term. The results indicate that the COVID-19 variable has a negative and statistically significant effect on firm financial performance, as its coefficient is -0.337 with a p-value of 0. The size variable also has a negative and statistically significant effect on firm financial performance, with a coefficient of -13920.692 and a p-value of 0. The interaction between size and COVID-19 (size_CV19) is positive and statistically significant, indicating that smaller firms are more negatively affected by COVID-19 than larger firms. This is supported by the positive coefficient of 0.564 and a p-value of 0. Leverage (LEV) remains non-significant in its impact on financial performance (LEV coefficient: -3,176.16, p = 0.642). Earnings management (EM), CEO total compensation (CTC), and industry sector (IS) also maintain their presence in the model without significant alterations. In summary, the introduction of the new variable SIZE_CV19 indicates that the relationship between firm size (SIZE) and the impact of COVID-19 (CV19) is positive, implying that larger firms may have experienced a relatively more positive effect from the pandemic. The results of this study are in line with the findings of research conducted by Gur et al. (2023), which found that company size has a significant effect on firm financial performance during the pandemic. So, the bigger the size of the company, the better the performance of the company, which is contrary to the findings of Ismanu et al. (2022). Based on their study, it turns out that smaller businesses did better than bigger businesses during the pandemic period.

H3: Firm financial leverage (LEV) moderates the relationship between COVID-19 and firm performance after controlling for other control variables

In Table 11, the coefficient for "LEV" was -6308.037, and it was not statistically significant (p = 0.41). This indicates that, in the context of the original model, leverage did not have a statistically significant impact on firm financial performance during the COVID-19 pandemic. With the new variable, "LEV_CV19," its coefficient is 0, and its p-value is 0.723, indicating it is not statistically significant. Since the coefficient is 0 and not statistically significant, it suggests that the interaction between leverage and COVID-19 impact does not have a statistically significant effect on firm financial performance in this model. This means the introduction of the "LEV_CV19" interaction variable does not change the status of "LEV" as not being statistically significant. In both cases, "LEV" remains non-significant (p > 0.05) and does not affect financial performance in the context of this model. These findings contradict a study conducted by Aditya and Efendi (2021), which showed that the leverage variable significantly influences a company's financial performance.

According to their study, companies that rely on borrowing money might feel the impact of those loans on their overall performance. In a study conducted by Xu and Jin (2022), they discovered that the COVID-19 pandemic had a more significant negative effect on the cash reserves of highly leveraged companies. Interestingly, regardless of their level of leverage, the pandemic did not appear to affect the overall financial performance of these firms. Similarly, Chu and colleagues in 2021 focused on Chinese real estate companies and found that those with higher levels of leverage experienced reduced returns during the pandemic. However, larger companies managed to

Table 11. Moderation analysis of leverage on firm performance during covid-19 pandemic.

Firm performance	Coef.	Std. Err.	t-Value	p-Value	[95% Conf	Interval]	Sig
CV19	-0.622	0.035	-17.95	0	-0.69	-0.554	***
LEV	-6308.037	7654.781	-0.82	0.41	-21313.437	8697.364	
LEV_CV19	0	0.001	-0.35	0.723	-0.002	0.001	
SIZE	-51141.58.6	54325.687	-9.41	0	-61790.861	-40492.31	***
IS	-28190341	18797115	-149.97	0	-28558.815	-27821.868	***
EM	24554.40.1	22054.965	1.11	0.266	-18679.178	67787.979	
CTC	210.607	51.617	4.08	0	109.423	311.791	***
Constant	37191.938	18732.046	19.85	0	33519.960	40863.916	***
Mean dependent var	-190172383.906		SD dependent var		105191939.706		
R-squared	0.754		Number of obs		7934		
F-test	3440.224		Prob > F		0.000		
Akaike crit. (AIC)	302680.263		Bayesian crit. (BIC)		302736.045		

*** p<.01, ** p<.05, * p<.1

Table 12. Moderation analysis of ceo total compensation on firm performance during covid-19 pandemic.

Firm performance	Coef.	Std. Err.	t-Value	p-Value	[95% Conf	Interval]	Sig
CV19	-0.792	0.041	-19.29	0	-0.873	-0.712	***
LEV	-4750.908	6957.908	-0.68	0.495	-18389.912	8888.095	
SIZE	-79275.031	50109.944	-15.82	0	-89097.664	-69452.399	***
EM	44551.984	21635.808	2.06	004	214112.2	86962.847	**
CTC	68.905	70.579	0.98	0.329	-69.446	207.255	
CTC_CV19	627	0	2.31	0.021	0	0	**
IS	-28326.443	17398.276	-162.81	0	-28667.487	-27985.399	***
Constant	41535.011	17699.23	23.47	0	38065.579	45004.442	***
Mean dependent var	-186297877.189		SD dependent var		106563614.900		
R-squared	0.785		Number of obs		7934		
F-test	4131.466		Prob > F		0.000		
Akaike crit. (AIC)	361527.613		Bayesian crit. (BIC)		361584.813		

*** p<.01, ** p<.05, * p<.1

mitigate the pandemic's adverse impact by implementing diversified strategies. Moreover, in 2022, Nguyen highlighted a trend in the Vietnamese logistics industry during the COVID-19 crisis. The study indicated an increase in the leverage ratio while the profitability ratio decreased for companies in this sector.

H4: Total CEO compensation (TCO) moderates the relationship between COVID-19 and firm performance after controlling for other control variables

Table 12 reveals a significant and positive relationship (627, $p < 0.05$) between CEO Total Compensation (CTC) and the impact of COVID-19 (CTC_CV19) on firm financial performance. In simpler terms, firms with higher CEO compensation tended to fare better during the COVID-19 pandemic, experiencing a more positive impact on their financial performance. This contrasts with firms where CEOs had lower compensation, which faced a comparatively more negative impact. This finding is consistent with recent research by Brass (2023) and aligns with Kumar and Zbib (2022), which also noted an increase in CEO compensation during the pandemic. Additionally, Kumar and Zbib's research highlighted a strong connection between higher CEO compensation and improved firm financial performance, underscoring the relevance of executive compensation in challenging economic conditions.

H5: ***Earnings management (EM) moderates the relationship between COVID-19 and firm performance after controlling for other control variables***

Based on the results presented in Table 13, it is evident

Table 13. Moderation analysis earnings management on firm performance during covid-19 pandemic.

TOTAL_FIRM_PERFORM~E	Coef.	Std. Err.	t-Value	p-Value	[95% Conf	Interval]	Sig
CV19	-0.812	0.042	-19.39	0	-0.894	-0.73	***
SIZE	-54119.667	54224.493	-9.98	0	-64749.105	-43490.228	***
LEV	-6220.511	7378.965	-0.84	.399	-20685.239	8244.218	
IS	-28104.147	18752.269	-149.87	0	-28471.741	-27736.552	***
EM_CV19	-1.425	0.179	-7.96	0	-1.776	-1.074	***
EM	95015.765	23687.182	4.01	0	48582.607	14144.892	***
CTC	181.063	51.545	3.51	0	80.022	282.104	***
Constant	37404.296	18657.543	20.05	0	33746.923	41061.670	***
Mean dependent var	-190172383.906		SD dependent var		105191939.706		
R-squared	0.755		Number of obs		7934		
F-test	3476.850		Prob > F		0.000		
Akaike crit. (AIC)	302617.254		Bayesian crit. (BIC)		302673.037		

*** p<.01, ** p<.05, * p<.1.

that the coefficient for the interaction term EM_CV19 is negative (-1.425) and statistically significant (p-value < 0.001). This suggests that the effect of COVID-19 impact on firm financial performance is moderated by the level of earnings management (EM). Specifically, the negative effect of COVID-19 on the dependent variable is less severe for firms with higher levels of earnings management, after controlling for other relevant factors. This aligns with the notion that firms with higher earnings management were using accounting adjustments to manage their reported earnings, potentially presenting a worse financial situation considering the pandemic's uncertainty. Therefore, this finding is consistent with the hypothesis that "Firms with higher earnings management will experience a less significant negative impact from the COVID-19 pandemic on their financial performance than firms with lower earnings management." This finding is consistent with previous studies done by Rusmin et al. (2013), who provided evidence that transportation firms from eight Asian countries had lower amounts of earnings management, suggesting that management intentionally reduced earnings in crisis years to inflate earnings in future years. Similarly, Liu and Sun (2022) noted a substantial decrease in earnings management between 2019 and 2023, implying that businesses adopted income-decreasing earnings management strategies to offset pandemic-related earnings challenges.

H6: Firms industry sectors (IS) moderate the relationship between COVID-19 and firm performance after controlling for other control variables

The statistical numbers in the regression show that the relationship between the pandemic and firm financial performance differs across industries. Table 14 summarizes this analysis.

As depicted in Table 15, the analysis supports the hypothesis that firms in certain industry sectors will experience a more substantial negative impact from the COVID-19 pandemic on their financial performance compared to firms in other industry sectors, even after controlling for other relevant factors. The coefficient values in the table distinctly indicate that different industry sectors encountered varying levels of impact during the pandemic. Sectors such as manufacturing, retail, and public displayed highly negative coefficient values, signifying a significant negative impact.

Conversely, sectors like e-commerce and online, healthcare and pharmacies, and streaming and online exhibited positive coefficient values, indicating a positive or resilient impact. This disparity in coefficients lends support to the notion that certain industry sectors were more affected than others. Additionally, the low p-values ($p < 0.001$) for many sectors indicate that these findings are statistically significant, reinforcing the argument that the differences in impact between sectors are not due to random chance but are indeed related to the COVID-19 pandemic. The study's results align with the S&P Global study (2022), which also found that manufacturing, retail, auto components, and multiline retail were among the industries most significantly impacted by COVID-19. In contrast, healthcare equipment and supplies, communication and services, and pharmaceuticals appeared to be less affected by the pandemic.

Limitations of the study

One significant limitation encountered in this study relates to the scarcity of existing literature examining the moderating effect of firm-specific factors on the relationship between the COVID-19 pandemic and firm performance. While numerous studies have investigated the direct impact of the pandemic on these factors and overall firm performance, few have delved into the

Table 14. Moderation analysis of firms industry sectors on firm performance during covid-19 pandemic.

Firm financial performance	Coef.	Std. Err.	t-Value	p-Value	[95% Conf	Interval]	Sig
CV19	-0.912	0.029	-31.79	0	-0.969	-0.856	***
LEV	-7966.308	2296.562	-3.47	0.001	-12468.179	-3464.438	***
SIZE	338430	252621.15	1.34	0.18	-156774.56	833634.56	
EM	250835.75	700397.75	0.36	0.72	-1122129.9	1623801.4	
CTC	17.2	16.192	1.06	.288	-14.541	48.941	
IS	-22681667	166397.64	-136.31	0	-23007851	-22355483	***
IS_CV19	0.041	0.003	12.14	0	0.034	0.047	***
Industry Sectors ~r	0	.	.	.	.	.	
E-commerce and online	21009.001	27424.30.4	7.66	0	15633109	26384893	***
Healthcare and pharmacies	38681.876	18622.26.4	20.77	0	35031417	42332334	***
Streaming and online	54649.927	17346.09.5	31.51	0	51249632	58050222	***
Agriculture	74878.206	50998.731	14.68	0	64881.101	84875312	***
Construction	95081.259	18841.532	50.46	0	91387.818	98774700	***
Finance	-23391769	14335.793	-16.32	0.001	-26201.965	-20581572	***
Manufacturing	-97806.520	11814.957	-82.78	0	-17400.108	-95490475	***
Public	-75551.934	41770.145	-18.09	0	-83739.992	-67363876	***
Retail	-57548.331	11457.422	-50.23	0	-59794.290	-55302372	***
Services	-38364.940	12089.711	-31.73	0	-40734.845	-35995036	***
Telecom.	-24020.100	16094.675	-14.92	0	-27175.084	-20865116	***
transport	-15554.613	13050.219	-11.92	0	-18112.803	-12996424	***
Constant	32949.712	21854.637	15.08	0	28665.622	37233801	***

Mean dependent var	-190172.383	SD dependent var	105191.939
R-squared	0.976	Number of obs	7934
F-test	17091.999	Prob > F	0.000
Akaike crit. (AIC)	284219.200	Bayesian crit. (BIC)	284358.657

*** p<.01, ** p<.05, * p<.1

Table 15. Impact of the COVID-19 pandemic on financial performance by industry sector.

Industry sector	Coefficient	P-Value	Impact Level
Streaming and online	54.649.927	0	Low (Positively Affected)
Healthcare and pharmacies	38.681.876	0	Low (Positively Affected)
E-commerce and online	21.009.001	0	Low (Positively Affected)
Public	-75.551.934	0	High (Negatively Affected)
Manufacturing	-97.806.520	0	High (Negatively Affected)
Retail	-57.548.331	0	High (Negatively Affected)
Finance	-23.391.769	0.001	Mid (Moderately Affected)
Telecommunication	-24.020.100	0	Mid (Moderately Affected)
Services	-38.364.940	0	Mid (Moderately Affected)
Construction	-95.081.259	0	Mid (Moderately Affected)
Transportation	-15.554.613	0	Mid (Moderately Affected)

nuanced interplay between specific firm characteristics and the pandemic's effects. This scarcity of research is further compounded by the limited availability of studies focusing on North American listed companies, making this study one of the pioneering endeavors in this area. Thus, despite efforts to shed light on this crucial aspect, the lack of prior research poses a notable constraint on the depth and breadth of this analysis.

Conclusion

To summarize the impact of various moderation variables

Table 16. Summary of regression analysis on the impact of moderation firm-specific factors on covid-19's effect on firm financial performance.

	Coefficients and significance	Comments	Hypothesis status
H1.1Model1	CV19: Coef= -.588 (p<0.01)	The coefficient for CV19 is significant (p<0.01), indicating a significant negative impact of COVID-19 on financial performance.	Accepted
H1.2Model2	CV19: Coef=-0.622 (p < 0.01), SIZE: Coef= -51091.5(p<0.01), LEV: Coef= -6990.689(p = 0.345), IS: Coef= -28191.291 (p<0.01), EM: Coef= 24474. (p=0.267), CTC: Coef= 210.793(p<0.01)	The regression results show that the impact of the COVID-19 pandemic on financial performance varies based on firm size, industry sector, and CEO Total Compensation, while leverage and Earnings management do not appear to have a statistically significant impact in this analysis.	Accepted: for the firm SIZE, IS, and CTC. Rejected: For the LEV and ADCC
H2.Model3	CV19: Coef= -.337(p <0 .01) SIZE: Coef= -13920.692 (p<0.01), SIZE_CV19: Coef=.564 (p<0.01).	SIZE and SIZE_CV19 coefficients are significant. The positive coefficient for "SIZE_CV19" suggests that the impact of COVID-19 on firm financial performance is moderated by firm size, providing evidence that firm size moderates the impact of the COVID-19 pandemic on firm performance.	Accepted
H3 .Model4	CV19: Coef=-0.622 (p < 0.01) LEV: Coef= -6308.037 (p>0.1), LEV_CV19: Coef= 0 (p>0.1).	The "LEV" coefficient is negative but not statistically meaningful (p = 0.41), indicating that leverage alone doesn't significantly affect financial performance in this model. Similarly, the "LEV_CV19" interaction coefficient is 0 with a non-significant p-value (p = 0.723), suggesting the moderating effect of Leverage (LEV) on the impact of the COVID-19 pandemic on firm financial performance is not statistically significant in this analysis after controlling for other relevant factors.	Rejected
H4.Model5	CV19: Coef= -0.792(p < 0.01), CTC_CV19: Coef= 627 (p<0.05), CTC= Coef= 68.905(p= 0.329).	The coefficient for "CTC" alone is not statistically significant (p = 0.329), suggesting that CEO total compensation alone does not have a significant effect on firm financial performance during the pandemic. However, the interaction term "CTC_CV19" is statistically significant (** p<0.05). This suggests that CEO Total Compensation does indeed have a statistically significant effect on the impact of the COVID-19 pandemic on firm financial performance	Accepted
H5.Model6	CV19: Coef= -.812 (p < 0.01) EM_CV19: Coef= -1.425 (p<0.01), EM: Coef= 95015.765 (p<0.05)	EM and EM_CV19 coefficients are significant, indicating that firms with higher Earnings management experienced a less significant negative impact from the COVID-19 pandemic on their financial performance compared to firms with lower Earnings management.	Accepted
H6.Model7	CV19: Coef= -0.912 (p <0 .01) IS: Coef= -2268 (p<01) IS_CV19: Coef= 0.041 (p<01)	The interaction between Industry Sectors (IS) and the impact of COVID-19 (CV19) is statistically significant after controlling for other relevant factors. Therefore, the moderating effect of Industry Sectors on the impact of the COVID-19 pandemic on firm financial performance is supported by the regression analysis.	Accepted

on the relationship between COVID-19 and firm financial performance, Table 16 presents the findings from the previous analysis. Table 16 aids in assessing the differential impact of the pandemic on financial performance across different conditions and provides valuable insights into the moderating effects of specific variables. Looking at Table 16, it becomes clear that there are significant effects of certain moderation variables on the impact of COVID-19 on firm performance, while others may not play a significant role.

H1: the effect of Covid-19 on company performance, the coefficient for CV19 is significant (p<0.01), indicating a significant negative impact of COVID-19 on financial performance. The results of this study are in line with research that has been conducted by Albuquerque et al. (2020), Baker et al. (2020), and Hale et al. (2020), which all indicate a significant negative effect of the COVID-19 pandemic on company performance, as evidenced by substantial declines in stock prices, market volatility, and government measures to mitigate economic.

H2: (size moderation), the coefficient for CV19 is -0.337 (p < 0.01), which is significantly different from H1 and H2. This suggests that firm size (SIZE) significantly moderates the impact of

COVID-19, resulting in a different effect compared to H1 and H2. In this case, the negative impact of COVID-19 is less severe for larger firms, leading to a less negative CV19 coefficient. Firm size in this study is measured by looking at how much assets a company has. The assets owned by this company describe the rights and obligations as well as the company's capital. Company size will affect the development of the company. This shows that the increase and decrease in company performance are influenced by the size of the company The results of this study are in line with the results of research conducted by Wardani and Rudolfus (2019) and Prijanto et al. (2020) found that company size has a positive effect on performance during the pandemic.

H3: (Leverage moderation), the coefficient for CV19 is -0.622 ($p < 0.01$), consistent with the findings in H1. This suggests that even when considering leverage (LEV) as a moderator in H3, the impact of COVID-19 on firm performance remains consistent with the earlier hypothesis. Essentially, leverage doesn't appear to significantly alter how much the COVID-19 pandemic affects a firm's financial performance. This could be due to various factors, such as companies having access to government-backed loans like the Paycheck Protection Program (PPP) and Canada Emergency Business Account (CEBA), specific grants for certain industries, and wage subsidy programs. Additionally, market-related factors and shifts in consumer behavior may have played a more substantial role in influencing firm performance. These findings emphasize the critical importance of government support and market dynamics in helping businesses weather crises.

To the best of the author knowledge, he could not find any previous research directly addressing the impact of leverage moderation on how the COVID-19 pandemic affects firm performance. This highlights a gap in the existing literature on this topic. Therefore, my study fills this gap and offers original insights into the challenges faced by firms during the COVID-19 crisis, based on individual research efforts.

H4: (CEO Total Compensation Moderation), the coefficient for CV19 is -0.792 ($p < 0.01$). Here, CEO Total Compensation (CTC_CV19) is a significant moderator, but CTC alone does not significantly moderate the impact. The CV19 coefficient shows a slightly less negative impact compared to H2 but is still substantial. aligning with findings by Konigsburg and Finzi (2020) on CEO compensation practices during crises, the study underscores the significance of CEO total compensation as a moderator during the COVID-19 pandemic. While CEO total compensation alone did not significantly moderate firm performance, its combined effect with the pandemic (CTC_CV19) was substantial. This highlights the importance of considering CEO compensation dynamics in understanding firms' resilience during crises.".

H5: (Earnings management moderation) introduces Earnings management (EM) as a moderator, and the CV19 coefficient becomes -0.812 ($p < 0.01$). This significant change indicates that EM has a substantial moderating effect on COVID-19's impact. Firms with higher Earnings management experience a less negative impact from COVID-19. This finding is consistent with prior research by Fatzel et al. (2022) and Zamri et al. (2022).

H6: (Industry sectors moderation) introduces industry sectors (IS and IS_CV19) as moderators, resulting in a CV19 coefficient of -0.912 ($p < 0.01$). This coefficient signifies a more pronounced negative impact of COVID-19 across industry sectors compared to H2. The industry sectors significantly moderate the effect of COVID-19 on firm performance, leading to a larger negative coefficient. This finding is consistent with previous studies by Bongini et al. (2023), Al-Awadhi et al. (2020), Shen et al. (2020), and Hassan et al. (2020), which have underscored sector-specific vulnerabilities to pandemic-related disruptions. Bartik et al. (2020) highlighted retail businesses as particularly susceptible, while Baldwin and di Mauro (2020) warned of additional challenges faced by the manufacturing sector. Additionally, Shen et al. (2020) noted that the tourism and catering industries bore the brunt of the pandemic's impact in China.

In conclusion, this study sheds light on the complex interplay of financial and firm-specific factors in moderating the impact of the COVID-19 pandemic on North American public firms. The results highlight the importance of considering these variables when assessing the pandemic's consequences on financial performance. Further research is encouraged to delve deeper into these interactions and their implications for firms in times of crisis.

Study importance and contribution to the field

This study offers valuable insights into how various company-specific factors influence their response to the COVID-19 pandemic, particularly among North American firms. It stands out as one of the pioneering efforts in examining these dynamics within this context. By delving into aspects such as company size, debt levels, CEO compensation, and earnings management, it illuminates the nuanced ways in which firms navigate economic challenges during crises.

Furthermore, the study underscores the significance of industry-specific vulnerabilities in shaping the impact of the pandemic on different sectors. Through its comprehensive analysis, this study aims to inform both businesses and regulators, providing actionable knowledge for better decision-making amidst the ongoing pandemic."

Recommendations

The following recommendations, derived from the research results and findings, help businesses maintain their growth and success even in difficult times, securing their prosperity in an ever-changing world:

1) Strengthen financial stability: Companies should focus on managing debts carefully and optimizing capital structures to withstand economic challenges and reduce vulnerabilities.
2) Customize strategies for industry-specific challenges: Companies should Adapt strategies to suit the specific challenges and opportunities that the pandemic has brought to different industries. Conduct thorough analyses to gain a deep understanding of the unique impacts in each sect.
3) Review CEO compensation and incentives: Boards of directors should take a close look at how they structure executive pay and make sure that CEO incentives are aligned with the company's long-term growth and its ability to handle crises effectively.
4) Financial flexibility: Companies should maintain financial flexibility, especially in terms of Earnings management (EM). As the study finds a statistically significant relationship between EM and firm financial performance, the positive trend suggests that managing reported earnings during crises could be beneficial.
5) Consider the impact of a firm's size during the pandemic— Businesses need to think about their size when dealing with pandemic challenges. Big companies seem to handle the difficulties better, while smaller ones can use their flexibility and adaptability as strengths during tough times. This means that all companies should make personalized plans to use their advantages and deal with their unique challenges when facing uncertainties like the COVID-19 pandemic.
6) Industry collaboration: Companies working together with others in their industry and beyond can find valuable insights. It allows them to learn from each other's experiences and share the best ways to handle tough situations like crises. This collaboration can provide a better understanding of the specific challenges the industry faces and help in devising smarter strategies for success during difficult times.
7) The study highlights the complexity of pandemic impacts and the moderating effects of various factors. Further research is recommended to gain a deeper understanding of these interactions, potentially leading to more precise strategies for firms.
By incorporating these recommendations into their plans, North American companies can enhance resilience and navigate the challenges brought on by the COVID-19 pandemic and future disruptions. Collaborating with academics, policymakers, and industry experts to conduct in-depth studies will further enrich knowledge and support a culture of continuous learning and improvement for a stronger future.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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