International Journal of Management and Sustainability
2023 Vol. 12, No. 2, pp. 114-123.
ISSN(e): 2306-0662
ISSN(p): 2306-9856
DOI: 10.18488/11.v12i2.3281

The impact of the COVID-19 pandemic on firm performance: Evidence from Thailand

Nongnit Chancharat[1]
Sirinada Preecha[2]
Surachai Chancharat[3+]

[1,2,3]*Faculty of Business Administration and Accountancy, Khon Kaen University, Thailand.*
[1]*Email: mnongn@kku.ac.th*
[2]*Email: sirinada.pr@kkumail.com*
[3]*Email: csurac@kku.ac.th*


(+ Corresponding author)

Article History
Received: 30 August 2022
Revised: 12 January 2023
Accepted: 27 January 2023
Published: 7 February 2023

Keywords
COVID-19
Emerging market
Financial performance
Firm performance
Thailand
Uncertainty.

ABSTRACT

The worldwide economy has been greatly impacted by COVID-19 pandemic, and it has had a huge impact on the capital markets. This paper aims to investigate the impact of COVID-19 on the performance of companies listed on the Stock Exchange of Thailand (SET) using quarterly financial data of listed companies from 2016 to 2021 to predict corporate performance. The results show that the COVID-19 outbreak negatively impacted Thai firm performance, especially in the service, resource, real estate, and manufacturing industries, due to the implementation of a wide range of policies to control the spread of the virus. The findings support earlier research that the pandemic has had a serious negative impact on firm performance. However, uncertainty will remain until COVID-19 ends; policy implementations should facilitate these suffering industries in the short and long runs. This study addresses the research gap regarding the impact of COVID-19 on emerging economic activity from a firm-level perspective.

Contribution/Originality: This study provides the first empirical proof of the effect of the COVID-19 pandemic on the financial performance of enterprises listed on the Stock Exchange of Thailand.

1. INTRODUCTION

The COVID-19 outbreak was officially detected in China in December 2019 and declared a pandemic by the World Health Organization (WHO) due to the rapid spread of the disease across the globe, resulting in an economic crisis (WHO, 2022). In response to the pandemic, governments implemented a wide range of policies to control the spread, including lockdowns, quarantine, and travel bans. The COVID-19 outbreak not only had harmful health effects, but it also had a seriously negative effect on the average global economic growth of about 3.0%, the worst since the Great Depression in 1930 and drop to 8.1% from its previous projection for the Thai economy, the highest decrease of economic growth among the Southeast Asian countries after the global financial crisis in 2008 (World Bank, 2022).

Thailand's economy is driven by export, manufacturing, tourism, and related service industries suffering from the shock through direct and indirect effects of the policies limiting the spread of the virus. Thailand's economic structures rely heavily on China in terms of exports and tourism. China market is one of the most prominent destinations for Thailand's exports after the US, and Chinese tourists account for 12% of the total export value and 25% of foreign tourists. According to an initial examination by Shen, Fu, Pan, Yu, and Chen (2020), the COVID-19 outbreak negatively impacted Chinese firm performance. As a result, considering how heavily dependent many

nations are on China, it is fascinating and essential to analyze the impact of the COVID-19 pandemic on the performance of listed companies in Thailand.

The black swan theory and the fundamental option theory were introduced based on two approaches to explain the impact of the COVID-19 pandemic on businesses' behavior, decisions, and performance (Fu & Shen, 2021; Shen et al., 2020). In the literature, financial and political shocks, disasters, and unpredictable crises, including the current COVID-19 pandemic, lead to economic uncertainty. This outbreak is more severe than previous crises because it has spread worldwide, unlike the financial crises in 1997 and 2008, or the previous severe acute respiratory syndrome (SARS) in 2003 that only spread to specific areas. According to all indications, the pandemic and its economic repercussions have caused significant increases in uncertainty (Altig et al., 2020; Caggiano, Castelnuovo, & Kima, 2020; Fishman, 2020).

For a firm-level analysis, the fundamental option theory examines business investment decisions under uncertain or highly risky situations in the equity market (Fu & Shen, 2021; Shen et al., 2020). There was a drop in demand due to consumers not being able to go into physical shops, and the tourism sector lost business due to travel bans. Additionally, during this crisis, workers lost their jobs or had their working hours or wages decreased. These reasons significantly decreased household and worker income and their willingness to pay for goods and services. Both supply and demand shocks resulting from the COVID-19 pandemic led to a significant decrease in corporate earnings and business sentiment.

The COVID-19 pandemic and its impact on business performance has been studied in various contexts in developed countries (Chen, Su, & Chen, 2022; Fontanet-Pérez, Vázquez, & Carou, 2022; García-Gómez, Demir, Díez-Esteban, & Bilan, 2021), emerging economies (Ben, Agouram, & Lakhnati, 2022; Brahmana, Setiawan, & Trinugroho, 2022; Costa, da Silva, & Matos, 2022; Fernández-González, Pérez-Pérez, & Garza-Gil, 2022; Ghosh & Bhattacharya, 2022; Nguyen, Kim-Duc, & Freiburghaus, 2021; Njomane & Telukdarie, 2022; Shear & Ashraf, 2022; Wang, Dong, & Liu, 2022), and specific regions, such as G20 countries (Atayah, Dhiaf, Najaf, & Frederico, 2021; El Khoury, Nasrallah, Harb, & Hussainey, 2022), the ASEAN-5 (Ardiyono, 2022), and the Gulf Cooperation Council (Mzoughi, Amar, Belaid, & Guesmi, 2022). Some studies analyzed the impact on the financial performance of a particular industry, such as hospitality or tourism (García-Gómez et al., 2021; Ghosh & Bhattacharya, 2022), health care (Vrontis, El Chaarani, El Abiad, El Nemar, & Yassine Haddad, 2022), banking (El-Chaarani, Ismail, El-Abiad, & El-Deeb, 2022; Nguyen et al., 2021), and airline (Chen et al., 2022; Fontanet-Pérez et al., 2022).

Currently, no study has explored the impact of the COVID-19 pandemic on firm performance in Thailand, even though Thailand's economy is driven by export, tourism and related service industries, which suffered due to lockdowns, quarantine, and travel bans during the pandemic. Some relevant studies concerning the COVID-19 impact have been done in a regional context, including Thailand, and focus on a specific industry. For example, Abdullah and Achsani (2020) conducted an analysis of bankruptcy among Asian airline companies after COVID-19. Thai Airways International Public Company Limited is included in the study. Adyaningrum and Soenarno (2022) investigated the impact of intellectual capital on banks' financial performance in Indonesia, Malaysia, and Thailand from 2019–2020.

Furthermore, some research has focused on exploring the impact of COVID-19 on a macro level in a regional context. For example, Ardiyono (2022) used data from ASEAN-5 firms from Q1 of 2018 to Q3 of 2021 and presented how the pandemic affected firms' revenue, costs, profitability, and employment heterogeneously across countries. However, to the best of our knowledge, this current paper offers the first empirical evidence on the impact of the COVID-19 pandemic on the financial performance of companies listed on the Stock Exchange of Thailand.

This study sheds light on Thailand in a micro-level context and shifts the research objective from previous studies to address how the pandemic has affected the return on assets (ROA) performance in Thai corporations. The findings will be helpful for investors and policymakers, especially in the nations that rely on the Chinese market

during unpredictable crises, to understand and monitor the COVID-19 influence on firm performance. The rest of this paper is organized as follows: Section 2 contains the literature review, Section 3 presents the data and methodology, Section 4 explains the empirical results, and Section 5 concludes the study.

2. LITERATURE REVIEW

Taleb (2007) described unpredictable events using the black swan theory and the magnitude of their impact in the financial world (Faulkner, Feduzi, & Runde, 2017; Flage & Aven, 2015; Westfall & Hilbe, 2007). Baker, Bloom, Davis, and Terry (2020) stated that COVID-19 is not similar to past crises due to its effects on human health and its severe negative impact on global economies and financial stability. Compared to past pandemics, such as the Spanish flu in 1918, SARS in 2003, Middle East respiratory syndrome (MERS) in 2012, and Ebola in 2014, the COVID-19 pandemic has a lower fatality rate than Ebola and MERS but has a higher infection rate.

The fundamental option theory describes business behavior under uncertainty. The coronavirus affected firm performance by generating uncertainty in business decision-making and revenue (Altig et al., 2020; Baker et al., 2020). Amid the pandemic, firms faced more significant uncertainty from the increase in external risks. According to the fundamental option theory, decreasing revenue and increasing costs generate greatly enhanced uncertainty regarding the operation of enterprises. Therefore, the uncertainties brought by COVID-19 led to investors decreasing their investments, and firms experienced financial constraints and liquidity shortages. According to the above analysis, COVID-19 will have a negative effect on firm performance (Fu & Shen, 2021; Shen et al., 2020).

In the empirical research, most previous studies emphasize the negative impacts of COVID-19 on the fundamental economic and financial factors such as consumption, investment, economic growth, trade, and the stock market (Ashraf, 2020; Caggiano et al., 2020; Phan & Narayan, 2020; Topcu & Gulal, 2020; Xu, 2021), and others focus on measuring and forecasting the uncertainty of COVID-19 (Altig et al., 2020; Pellegrino, Ravenna, & Züllig, 2021). COVID-19 has had effects on crucial economic factors, such as a sharp reduction in domestic consumption, lower tourism, a significant reduction in production, and global drops in employment and economic growth (Altig et al., 2020; Sudeshna, 2020). Recent empirical studies show that COVID-19 has had a negative impact on Chinese corporate performance in manufacturing and energy industries via less revenue, and poor investment and sales, while digital data transfer and health care had opportunities to improve (Bretscher, Hsu, Simasek, & Tamoni, 2020; Fu & Shen, 2021; Papadopoulos, Baltas, & Balta, 2020; Ren, Zhang, & Zhang, 2021; Shen et al., 2020).

Based on the literature review, most studies on the impact of COVID-19 focus on macroeconomic factors. However, less research focuses on a micro-level analysis, especially on firm performance, which significantly contributes to employment, investment, and other economic perspectives. In addition, existing studies have predominantly focused on developed countries, while few studies focus on emerging countries, including Thailand. However, Hu and Zhang (2021) investigated COVID-19 and firm performance across countries, including Thailand, but they did not explore the impact of COVID-19 on the industry dimension, which was affected differently by the pandemic. Similarly, Chancharat and Chancharat (2019) and Chancharat., Detthamrong, and Chancharat (2019) explored corporate performance in a Thai context but these studies were not related to the COVID-19 pandemic period. In the context of Thailand, which exports heavily to China and Chinese tourists dominate the tourism and hospitality industries, current research still tends to reveal the COVID-19 effects on market volatility (Khanthavit, 2020) and its impact on other aspects, such as public health (Pan-ngum et al., 2021; Tantrakarnapa, Bhopdhornangkul, & Nakhaapakorn, 2022). Therefore, it is necessary to evaluate the impact of COVID-19 on firm performance in terms of net profit margin on total assets or ROA in listed Thai companies to fill the research gap regarding firm performance in Thailand.

3. DATA AND METHODOLOGY

This study focuses on external factors and the market environment and the impact of COVID-19 on firm performance. Few studies have investigated the relationship between COVID-19 and corporate performance, especially in emerging markets (Fu & Shen, 2021; Shen et al., 2020). The results show that this outbreak had a negative impact on firm performance in listed Chinese companies. Based on this analysis, the research hypothesis is as follow:

H_a: COVID-19 has had a negative impact on the performance of listed Thai companies.

The study's objective is to identify the impact of COVID-19 on firm performance in Thailand. Our study used the Financial and Economic Bureau database to gather 4,860 observations of quarterly data from companies listed on the Stock Exchange of Thailand (SET) in seven industries from 2016–2021. The financial sector, e.g., banks and financial institutions, were excluded from this study due to differences in financial statements. This study employs panel data and controls for industry and quarterly effects. To measure firm performance, *ROA* was used as a proxy for firm performance following Shen et al. (2020). In addition, we ensure the robustness of the result with return on equity (*ROE*), which is another measurement of firm performance.

To explore how COVID-19 affected corporate performance, our study adopted the difference-in-differences (DID) method used by Shen et al. (2020). The model equation is as follows:

$$ROA_{it} = \beta_0 + \beta_1 COVID-19_t + \beta_2 NPM_{it} + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 NCF_{it} + \beta_6 IND_i + \beta_7 YEAR_t + \varepsilon_{it}$$

The COVID-19 term is mentioned in the DID model; when that term is negative, it can be interpreted as COVID-19 negatively impacting corporate performance. Moreover, we control the net profit margin (*NPM*), corporate size (*SIZE*), leverage ratio (*LEV*) and net cash flow (*NCF*), industry (*IND*), and time (*YEAR*) to remove the effects of other influences and time-invariant characteristics so we can evaluate the pure impact of COVID-19 on firm performance.

4. EMPIRICAL RESULTS

Table 1 shows the characteristics of the variables of 4,860 observations from 2016 to 2021. Table A1 in the Appendix contains the definitions of the variables. The return on total assets averages at about 4.031 with a standard deviation of 5.426, implying that listed companies' overall profitability is low or that these companies are just about to break even. Additionally, the return on equity figures and characteristics are similar to those for return on assets. In contrast, listed companies' net profits have an average of about 235.902 with a high standard deviation, which shows that listed Thai companies make a profit overall but still have significant profitability differences. The leverage ratio is one of the financial measurements used to assess a company's ability to meet its financial obligations. The average leverage ratio is 1.191, which indicates that the companies are well-managed and are maintained at a suitable level. Finally, the average net cash flow is 48.625, with a high standard deviation similar to the net profit margin, which implies that most companies have excess cash and can therefore reinvest in business activity, offer returns to shareholders, and pay off debt, but the net cash flow still differs between companies.

Table 1. Descriptive statistics.

Variable	Mean	SD	Min.	Max.	Skewness	Kurtosis
ROA	4.031	5.426	-23.562	29.967	1.307	4.185
ROE	8.080	12.329	-98.378	99.187	0.807	14.288
COVID-19	0.501	0.500	0.000	1.000	-0.007	-2.000
NPM	235.902	672.053	-4,764.090	4,975.000	2.577	13.986
SIZE	8.721	1.398	4.673	13.418	0.421	-0.176
LEV	1.191	1.833	-24.851	29.145	4.249	81.994
NCF	48.625	923.256	-9,360.000	9,837.810	1.310	34.729

Note: Table A1 in the Appendix provides the variable definitions.

Table 2 shows that the COVID-19 variable is negative significant at a 1% level; therefore, COVID-19 negatively affects total business performance. Table A2 in the Appendix presents the industry code descriptions. While other important variables influencing firm performance are also significant at a 1% level, such as net profit margin and firm size, and the net cash flow is positive and significant at 10% except for the leverage ratio, they do not significantly impact overall firm performance. However, if we consider the impact by industry, the services, resource, property and construction, and manufacturing industries suffered a severe negative impact from the COVID-19 outbreak at a 1% level. Meanwhile, the agricultural industry, consumer goods, home decoration, personal care, and technological goods and services were not significantly hit by the COVID-19 outbreak. Furthermore, the net profit margin and firm size were the most significantly impacted among listed Thai companies, even during the pandemic period.

Table 2. The impact of COVID-19 on firm performance (*ROA*).

Variable	Agro	Consump	Indus	Propcon	Resource	Service	Tech	Overall
COVID-19	0.600	0.386	-0.934***	-1.213***	-1.319***	-3.754***	-0.127	-1.614***
	(0.500)	(0.833)	(0.349)	(0.269)	(0.397)	(0.382)	(0.808)	(0.173)
NPM	0.001***	0.003***	0.001***	0.001***	0.016***	0.001***	0.001***	0.001***
	(0.0001)	(0.001)	(0.0001)	(0.0008)	(0.002)	(0.000)	(0.0001)	(0.001)
SIZE	1.938	1.123***	4.298***	-1.720	0.001	5.439***	1.789***	2.722***
	(2.616)	(0.377)	(0.862)	(1.371)	(0.054)	(1.360)	(0.613)	(0.605)
LEV	0.004	0.993	0.003	-0.011	-0.043	-0.006	-0.067	0.003
	(0.004)	(0.964)	(0.030)	(0.025)	(0.035)	(0.009)	(0.176)	(0.003)
NCF	0.0001	-0.0005	0.000	0.000	0.001	0.000	-0.000	0.001*
	(0.0001)	(0.0004)	(0.001)	(0.0001)	(0.002)	(0.000)	(0.0001)	(0.000)
N	544	396	914	995	524	1,134	353	4,336
Adjusted R^2	0.401	0.123	0.348	0.064	0.159	0.35	0.343	0.37

Note: Table A1 in the Appendix contains the variable definitions and Table A2 presents the industry code descriptions. Significance levels of 10% and 1% are denoted by * and ***, respectively, and the standard errors are in parentheses.

Table 3. The impact of COVID-19 on firm performance (*ROE*).

Variable	Agro	Consump	Indus	Propcon	Resource	Service	Tech	Overall
COVID-19	-0.572	-0.507	-2.201***	-2.667***	-6.739***	-8.378***	-1.568	-3.088***
	(1.607)	(0.554)	(1.259)	(0.0003)	(0.002)	(0.001)	(0.487)	(1.237)
NPM	0.003***	0.005***	0.001*	0.003***	0.001***	0.001	0.004***	0.001***
	(0.0004)	(0.001)	(0.0002)	(0.0003)	(0.0002)	(0.001)	(0.0005)	(0.001)
SIZE	19.257	1.389***	10.153***	-2.718	39.906***	16.743***	6.222	3.622***
	(16.059)	(0.503)	(3.113)	(6.293)	(11.477)	(5.241)	(7.172)	(4.327)
LEV	-1.793***	3.568***	0.707**	-1.367***	-1.194	-5.230***	5.572	-2.244
	(0.117)	(1.286)	(0.109)	(0.114)	(0.881)	(0.036)	(0.740)	(0.023)
NCF	-0.000	0.001	0.0001	0.0002	0.0001	0.001	0.0006	0.000
	(0.0002)	(0.0.001)	(0.0004)	(0.0002)	(0.0001)	(0.0004)	(0.0004)	(0.002)
N	544	396	914	995	524	1,134	353	4,336
Adjusted R^2	0.941	0.134	0.384	0.159	0.258	0.900	0.363	0.706

Note: Table A1 in the Appendix provides the variable definitions and Table A2 presents the industry code descriptions. Significance levels of 10%, 5%, and 1% are denoted by *, **, and ***, respectively, and the standard errors are in parentheses.

Another popular approach to measure firm performance is to check the resulting robustness with the *ROE*. Our finding is still consistent with the base case (*ROA*) that the outbreak significantly negatively impacts the listed Thai companies overall, especially in services, resources, real estate, and manufacturing. As a result, the net profit margin and firm size influence firm performance, represented by *ROE*. Meanwhile, the COVID-19 outbreak has not significantly impacted other industries (see Table 3).

In our modified model, both results are consistent with the previous model which shows that the performance of listed Thai firms deteriorated during the COVID-19 outbreak, especially service industries including tourism and

air travel, which were severely affected by lockdowns and flight restrictions. In addition, the energy and mining, property and construction, and manufacturing industries were hit hard during COVID-19 (see Tables 4 and 5).

Table 4. The impact of COVID-19 on firm performance (*ROA*) with the DID model.

Variable	Agro	Consump	Indus	Propcon	Resource	Service	Tech	Overall
COVID-19	-0.637	0.707	-0.781***	-1.240***	-1.623***	-3.630***	-0.120	-1.678***
	(0.512)	(0.885)	(0.358)	(0.331)	(0.422)	(0.376)	(0.615)	(0.176)
NPM	0.001*	-0.001	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.0001)	(0.001)	(0.0001)	(0.0008)	(0.0001)	(0.0001)	(0.0001)	(0.001)
SIZE	0.107	1.178***	0.290**	1.720	0.195	0.176***	0.011	0.134***
	(0.287)	(0.403)	(0.134)	(0.135)	(0.161)	(0.060)	(0.334)	(0.025)
LEV	-0.001	1.752	0.080	-0.058	0.225	-0.020**	-0.023	-0.004
	(0.004)	(1.021)	(0.031)	(0.029)	(0.135)	(0.009)	(0.163)	(0.003)
NCF	-0.0001	-0.0001	0.000	0.000	-0.001	0.001	-0.0001	0.001
	(0.0001)	(0.0004)	(0.001)	(0.0001)	(0.001)	(0.000)	(0.0001)	(0.000)
N	540	392	910	991	520	1,130	349	4,332
Adjusted R^2	0.014	0.004	0.027	0.038	0.045	0.589	0.343	0.148

Note: Table A1 in the Appendix provides the variable definitions and Table A2 presents the industry code descriptions. Significance levels of 10%, 5%, and 1% are denoted by *, **, and ***, respectively, and the standard errors are in parentheses.

Table 5. The impact of COVID-19 on firm performance (*ROE*) with the DID model.

Variables	Agro	Consump	Indus	Propcon	Resource	Service	Tech	Overall
COVID-19	-12.294	0.783	-1.620	-3.393***	-3.059***	-13.123**	-1.259	-5.498***
	(11.441)	(1.184)	(1.292)	(1.328)	(2.203)	(6.654)	(2.466)	(2.240)
NPM	0.001*	0.0001	0.0003	0.001	0.001***	0.001***	0.002***	0.001***
	(0.0001)	(0.001)	(0.0004)	(0.003)	(0.0001)	(0.0001)	(0.0005)	(0.0004)
SIZE	1.439	1.152**	1.397*	0.109	0.450	0.159	2.656	1.493***
	(7.114)	(0.539)	(0.770)	(0.672)	(0.678)	(2.152)	(1.535)	(0.083)
LEV	-0.007	-3.216*	-0.373***	-1.999	1.212	-0.142	-1.987***	-0.004
	(0.083)	(1.366)	(0.019)	(0.130)	(0.631)	(0.1604)	(0.736)	(0.003)
NCF	0.0003	-0.0003	0.0001	0.0001	-0.001	0.001	0.003***	0.001
	(0.002)	(0.0005)	(0.0004)	(0.0001)	(0.001)	(0.000)	(0.0005)	(0.000)
N	540	392	910	991	520	1,130	349	4,336
Adjusted R^2	0.028	0.039	0.040	0.010	0.019	0.047	0.103	0.018

Note: Table A1 in the Appendix provides the variable definitions and Table A2 presents the industry code descriptions. Significance levels of 10%, 5%, and 1% are denoted by *, **, and ***, respectively, and the standard errors are in parentheses.

5. DISCUSSION AND CONCLUSION

The results of this study indicate that the pandemic has harmed the net profit margins of listed Thai companies. The results are similar to previous research (Fu & Shen, 2021; Shen et al., 2020), which has shown that tourism, energy, and transportation in China were severely impacted by the COVID-19 pandemic. The net return on assets deteriorated due to decreased supply and demand caused by the implementation of a wide range of policies to control the spread of the virus, and lockdowns, quarantine, and travel bans led to a drop in people's mobility as they were required to stay at home as much as possible. The COVID-19 outbreak has worsened the economy's outlook, generating more uncertainty for businesses and consumers. When people are faced with reduced mobility and economic uncertainty, they reduce their consumption, and companies reduce the production of goods and services, especially in the tourism and hospitality industries, while the energy industry suffers from a large stock of oil and high costs due to high fixed assets. These results are consistent with previous studies, such as Shear and Ashraf (2022), who observed the negative COVID stock price reaction to the 19 confirmed cases in Pakistan. The negative influence of the disease outbreaks was also found by García-Gómez et al. (2021), who examined the effect of the COVID-19 outbreak on the market performance of the hotel industry in the US; the results indicated a negative influence of the disease outbreak on the stock returns of hotels in the US.

Moreover, the real estate sector experienced a noticeable drop in residential sales because of economic uncertainty and labor income during the crisis. Additionally, some manufacturing industries faced supply disruption and reduced domestic and foreign demand during the peak of the COVID-19 pandemic from the first quarter through to the second quarter of 2020. Finally, the linked effects between businesses across the manufacturing industry accelerated the negative impact on business performance more than expected.

The pandemic had no significant adverse effect on agricultural industries, such as sugar and cassava starch. Companies in the rubber and plastics industry saw increased growth opportunities in medical devices and equipment, especially due to the tremendous consumption of medical gloves in hospitals, as well as companies in the fashion, home decoration, personal care, and technological goods and services, such as software and information technology services. Some reasons for this are that businesses focused on the online channels during the crisis, while technological industries took opportunities to support people working from home and carrying out online activities during the COVID-19 peak. The lack of influence of net cash flow in this pandemic implies that most businesses did not experience liquidity shortages because most listed firms are relatively prominent. However, if the pandemic continues for longer than expected, the results will differ amid several risks. Additionally, the size of a business positively correlates with the net profit and return on assets – the larger the enterprise, the higher the economy of scale.

Compared to previous crises and the similar SARS outbreak in 2003, which was initially detected in China and spread to nearby countries similar to COVID-19, the impact of SARS on firm performance is partly due to the spread being limited to specific areas and less globalization in terms of trade and financials compared to COVID-19, so the government could control the spread of the disease in the short run. In the case of COVID-19, this outbreak has spread more quickly and has spread worldwide, thus presenting more uncertainty than SARS with regard to health, economy, and businesses. Currently, the Thai government is still challenged to control the spread of the COVID-19 outbreak due to uncertain vaccine delivery schedules, allocation, and enhancing public trust in the COVID-19 vaccines.

Based on the results, more support should be given to the industries severely suffering from fiscal and financial effects to boost the demand for goods and services. Moreover, it is difficult to predict when COVID-19 will end, thus the more uncertainty, the more suffering industries will endure. The government should take care of these industries by facilitating the infrastructure to support firms in the long run. Investors should invest in the stock market in these industries during tough times and carefully predict firm performance when health care shocks such as COVID-19 occur. Finally, the COVID-19 situation in Thailand continues to spread in new waves. Therefore, the results of this study will be slightly different if the second wave is more severe than the first.

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study.

REFERENCES

Abdullah, A., & Achsani, N. A. (2020). Bankruptcy analysis of National airlines companies in regional Asia after COVID-19 Pandemic. *Journal of Business and Management Applications*, *6*(3), 691-691.

Adyaningrum, O. M., & Soenarno, Y. N. (2022). Intellectual capital and financial performance measured by CAMELS perspective. *Journal of Financial Studies*, *7*(12), 11-24. https://doi.org/10.55654/jfs.2022.7.12.01

Altig, D., Baker, S., Barrero, J. M., Bloom, N., Bunn, P., Chen, S., . . . Mihaylov, E. (2020). Economic uncertainty before and during the COVID-19 pandemic. *Journal of Public Economics*, *191*, 104274. https://doi.org/10.1016/j.jpubeco.2020.104274

Ardiyono, S. K. (2022). COVID-19 pandemic, firms' responses, and unemployment in the ASEAN-5. *Economic Analysis and Policy*, *76*, 337-372. https://doi.org/10.1016/j.eap.2022.08.021

Ashraf, B. N. (2020). Economic impact of government interventions during the COVID-19 pandemic: International evidence from financial markets. *Journal of Behavioral and Experimental Finance, 27*, 100371. https://doi.org/10.1016/j.jbef.2020.100371

Atayah, O. F., Dhiaf, M. M., Najaf, K., & Frederico, G. F. (2021). Impact of COVID-19 on financial performance of logistics firms: Evidence from G-20 countries. *Journal of Global Operations and Strategic Sourcing, 15*(2). https://doi.org/10.1108/JGOSS-03-2021-0028

Baker, S. R., Bloom, N., Davis, S. J., & Terry, S. J. (2020). *Covid-induced economic uncertainty (26983) [Working Paper]*. Retrieved from National Bureau of Economic Research.

Ben, H., Agouram, J., & Lakhnati, G. (2022). Impact of COVID-19 pandemic on Moroccan sectoral stocks indices. *Scientific African, 17*, e01321. https://doi.org/10.1016/j.sciaf.2022.e01321

Brahmana, R. K., Setiawan, D., & Trinugroho, I. (2022). The impact of government nonmarket policy on a firm's financial performance: A lesson from COVID-19 pandemic lockdown's policy. *Asia-Pacific Journal of Business Administration*. https://doi.org/10.1108/APJBA-05-2021-0204

Bretscher, L., Hsu, A., Simasek, P., & Tamoni, A. (2020). COVID-19 and the cross-section of equity returns: Impact and transmission. *The Review of Asset Pricing Studies, 10*(4), 705-741. https://doi.org/10.1093/rapstu/raaa017

Caggiano, G., Castelnuovo, E., & Kima, R. (2020). The global effects of COVID-19-induced uncertainty. *Economics Letters, 194*, 109392. https://doi.org/10.1016/j.econlet.2020.109392

Chancharat, S., & Chancharat, N. (2019). Board structure, ownership structure, and performance of Thai listed companies. *Australasian Accounting, Business and Finance Journal, 13*(3), 53-70. https://doi.org/10.14453/aabfj.v13i3.4

Chancharat., S., Detthamrong, U., & Chancharat, N. (2019). Board structure, political connection and firm performance: Evidence from Thailand. *International Journal of Business and Society, 20*(3), 1096-1111.

Chen, C.-D., Su, C.-H. J., & Chen, M.-H. (2022). Understanding how ESG-focused airlines reduce the impact of the COVID-19 pandemic on stock returns. *Journal of Air Transport Management, 102*, 102229. https://doi.org/10.1016/j.jairtraman.2022.102229

Costa, A., da Silva, C., & Matos, P. (2022). The Brazilian financial market reaction to COVID-19: A wavelet analysis. *International Review of Economics & Finance, 82*, 13-29. https://doi.org/10.1016/j.iref.2022.05.010

El-Chaarani, H., Ismail, T. H., El-Abiad, Z., & El-Deeb, M. S. (2022). The impact of COVID-19 on financial structure and performance of Islamic banks: A comparative study with conventional banks in the GCC countries. *Journal of Economic and Administrative Sciences*. https://doi.org/10.1108/JEAS-07-2021-0138

El Khoury, R., Nasrallah, N., Harb, E., & Hussainey, K. (2022). Exploring the performance of responsible companies in G20 during the COVID-19 outbreak. *Journal of Cleaner Production, 354*, 131693. https://doi.org/10.1016/j.jclepro.2022.131693

Faulkner, P., Feduzi, A., & Runde, J. (2017). Unknowns, Black Swans and the risk. *Cambridge Journal of Economics, 41*(5), 1279-1302.

Fernández-González, R., Pérez-Pérez, M. I., & Garza-Gil, M. D. (2022). COVID-19 and the Spanish Celtic Sea fishery: An economic analysis. *Marine Policy, 143*, 105204. https://doi.org/10.1016/j.marpol.2022.105204

Fishman, J. (2020). This is different"—the coronavirus pandemic as a "transforming event". *Israel Journal of Foreign Affairs, 14*(1), 3-7. https://doi.org/10.1080/23739770.2020.1763028

Flage, R., & Aven, T. (2015). Emerging risk–Conceptual definition and a relation to black swan type of events. *Reliability Engineering & System Safety, 144*, 61-67. https://doi.org/10.1016/j.ress.2015.07.008

Fontanet-Pérez, P., Vázquez, X. H., & Carou, D. (2022). The impact of the COVID-19 crisis on the US airline market: Are current business models equipped for upcoming changes in the air transport sector? *Case Studies on Transport Policy, 10*(1), 647-656. https://doi.org/10.1016/j.cstp.2022.01.025

Fu, M., & Shen, H. (2021). COVID-19 and corporate performance in the energy industry. *Energy Research Letters, 1*(1), 1-4. https://doi.org/10.46557/001c.12967

García-Gómez, C. D., Demir, E., Díez-Esteban, J. M., & Bilan, Y. (2021). The impact of COVID-19 outbreak on hotels' value compared to previous diseases: the role of ALFO strategy. *Heliyon*, *7*(8), e07836. https://doi.org/10.1016/j.heliyon.2021.e07836

Ghosh, S., & Bhattacharya, M. (2022). Analyzing the impact of COVID-19 on the financial performance of the hospitality and tourism industries: An ensemble MCDM approach in the Indian context *International Journal of Contemporary Hospitality Management*, *34*(8), 3113-3142. https://doi.org/10.1108/IJCHM-11-2021-1328

Hu, S., & Zhang, Y. (2021). COVID-19 pandemic and firm performance: Cross-country evidence. *International Review of Economics & Finance*, *74*, 365-372. https://doi.org/10.1016/j.iref.2021.03.016

Khanthavit, A. (2020). Foreign investors' abnormal trading behavior in the time of COVID-19. *The Journal of Asian Finance, Economics and Business*, *7*(9), 63-74. https://doi.org/10.13106/jafeb.2020.vol7.no9.063

Mzoughi, H., Amar, A. B., Belaid, F., & Guesmi, K. (2022). The Impact of COVID-19 pandemic on Islamic and conventional financial markets: International empirical evidence. *The Quarterly Review of Economics and Finance*, *85*, 303-325. https://doi.org/10.1016/j.qref.2022.04.007

Nguyen, N. T. H., Kim-Duc, N., & Freiburghaus, T. L. (2021). Effect of digital banking-related customer experience on banks' financial performance during COVID-19: A perspective from Vietnam. *Journal of Asia Business Studies*, *16*(1), 200-222. https://doi.org/10.1108/JABS-09-2020-0366

Njomane, L., & Telukdarie, A. (2022). Impact of COVID-19 food supply chain: Comparing the use of IoT in three South African supermarkets. *Technology in Society*, *71*, 102051. https://doi.org/10.1016/j.techsoc.2022.102051

Pan-ngum, W., Poomchaichote, T., Peerawaranun, P., Kulpijit, N., Osterrieder, A., Waithira, N., . . . Cheah, P. (2021). Perspectives on public health interventions in the management of the COVID-19 pandemic in Thailand. *Wellcome Open Research*, *5*(245), 1-25. https://doi.org/10.12688/wellcomeopenres.16293.3

Papadopoulos, T., Baltas, K. N., & Balta, M. E. (2020). The use of digital technologies by small and medium enterprises during COVID-19: Implications for theory and practice. *International Journal of Information Management*, *55*, 102192. https://doi.org/10.1016/j.ijinfomgt.2020.102192

Pellegrino, G., Ravenna, F., & Züllig, G. (2021). The impact of pessimistic expectations on the effects of COVID-19-induced uncertainty in the Euro area. *Oxford Bulletin of Economics and Statistics*, *83*(4), 841-869. https://doi.org/10.1111/obes.12431

Phan, D. H. B., & Narayan, P. K. (2020). Country responses and the reaction of the stock market to COVID-19—A preliminary exposition. *Emerging Markets Finance and Trade*, *56*(10), 2138-2150. https://doi.org/10.1080/1540496X.2020.1784719

Ren, Z., Zhang, X., & Zhang, Z. (2021). New evidence on COVID-19 and firm performance. *Economic Analysis and Policy*, *72*, 213-225. https://doi.org/10.1016/j.eap.2021.08.002

Shear, F., & Ashraf, B. N. (2022). The performance of Islamic versus conventional stocks during the COVID-19 shock: Evidence from firm-level data. *Research in International Business and Finance*, *60*, 101622. https://doi.org/10.1016/j.ribaf.2022.101622

Shen, H., Fu, M., Pan, H., Yu, Z., & Chen, Y. (2020). The impact of the COVID-19 pandemic on firm performance. *Emerging Markets Finance and Trade*, *56*(10), 2213-2230. https://doi.org/10.1080/1540496X.2020.1785863

Sudeshna, G. (2020). Asymmetric impact of COVID-19 induced uncertainty on inbound Chinese tourists in Australia: Insights from nonlinear ARDL model. *Quantitative Finance and Economics*, *4*(2), 343-364. https://doi.org/10.3934/qfe.2020016

Taleb, N. N. (2007). *The Black Swan: The impact of the highly improbable*. New York: Random House.

Tantrakarnapa, K., Bhopdhornangkul, B., & Nakhaapakorn, K. (2022). Influencing factors of COVID-19 spreading: A case study of Thailand. *Z Gesundh Wiss*, *30*(3), 621-627.

Topcu, M., & Gulal, O. S. (2020). The impact of COVID-19 on emerging stock markets. *Finance Research Letters*, *36*, 101691. https://doi.org/10.1016/j.frl.2020.101691

Vrontis, D., El Chaarani, H., El Abiad, Z., El Nemar, S., & Yassine Haddad, A. (2022). Managerial innovative capabilities, competitive advantage and performance of healthcare sector during COVID-19 pandemic period. *Foresight*, *24*(3/4), 504-526. https://doi.org/10.1108/FS-02-2021-0045

Wang, Z., Dong, Y., & Liu, A. (2022). How does China's stock market react to supply chain disruptions from COVID-19? *International Review of Financial Analysis*, *82*, 102168. https://doi.org/10.1016/j.irfa.2022.102168

Westfall, P. H., & Hilbe, J. M. (2007). The black swan: Praise and criticism. *The American Statistician*, *61*(3), 193-194. https://doi.org/10.1198/000313007X219383

WHO. (2022). WHO coronavirus disease (COVID-19) dashboard. Retrieved from: https://covid19.who.int.

World Bank. (2022). World Bank open data. Retrieved from: https://data.worldbank.org.

Xu, L. (2021). Stock return and the COVID-19 pandemic: Evidence from Canada and the US. *Finance Research Letters*, *38*, 101872. https://doi.org/10.1016/j.frl.2020.101872

APPENDIX

Table A1. Variable definitions.

Variable	Definition
ROA	Return on assets: Net profit/total assets
ROE	Return on equity: Net profit/total equity
COVID-19	Dummy variable that equals one if during the COVID-19 outbreak and zero otherwise
NPM	Net profit margin: Net profit/revenue
SIZE	Corporate size: Logarithm of total assets
LEV	Leverage ratio: Total liabilities/total assets
NCF	Net cash flow

Table A2. Industry code descriptions.

Code	Description
Agro	Agriculture, and food and beverage
Consump	Fashion, home decoration, and personal products and pharmaceuticals
Indus	Automotive, industrial materials and machinery, packaging, paper and printing materials, petrochemicals and chemicals, and steel and metal products
Propcon	Construction materials, construction services, property development, property funds, and real estate investment trusts
Resource	Energy and utilities, and mining
Service	Commerce, health care services, media and publishing, professional services, tourism and leisure, and transportation and logistics
Tech	Electronic components, and information and communication technology

Note: This table describes the industry codes in many sectors and are issued by the Stock Exchange of Thailand.