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Exploring the Impact of the COVID-19 Pandemic on Firms' Financial Performance and Cash Holding: New Evidence from China's Agri-food Sector

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Abstract: The objective of this paper is to investigate the impact of coronavirus disease 2019 (COVID-19) on the financial performance and cash holdings of Chinese agri-food companies. We also examine whether or not company ownership, the affected areas, and leverage level affect this relationship. The empirical results show that the COVID-19 outbreak has had no significant impact on financial performance and the cash-holding level of agri-food companies. In addition, the financial performance of state-owned companies is enhanced during such a crisis, whereas COVID-19 reduced the financial performance and cash-holding level of privately owned companies. In middle- and high-risk areas, the pandemic has had a negative impact on financial performance, while it has had a positive impact on financial performance in low-risk areas. The negative impact of COVID-19 on cash holding is greater in highly leveraged companies than it has been in low-leveraged companies. This paper may provide some new insights for managers to ensure smooth operation and improve firms' performance in order to overcome this crisis.

Keywords: COVID-19; financial performance; cash holding; agri-food sector; company ownership; COVID-19-affected area; leverage level



Citation: Xu, J.; Jin, Z. Exploring the Impact of the COVID-19 Pandemic on Firms' Financial Performance and Cash Holding: New Evidence from China's Agri-food Sector. *Agronomy* **2022**, *12*, 1951. <https://doi.org/10.3390/agronomy12081951>

Academic Editor: Gabriel Ondrasek

Received: 18 July 2022

Accepted: 17 August 2022

Published: 18 August 2022

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1. Introduction

The outbreak of coronavirus disease 2019 (COVID-19) brought exceptional uncertainty in terms of business operation [1–4], which led to the depression of the global economy, the disruption of the supply chain, and a decrease in consumption and investment [5]. According to the World Health Organization (WHO), there have been about 583 million cases of COVID-19 around the world, causing over 6 million deaths. Because of its high infection rate, people have been required to change their working styles by switching to operating from home, and a large number of companies were forced to cease production [6]. At the firm level, the COVID-19 outbreak also affected stock prices [7], cash flows [8], asset management [9], and other aspects, causing worse firm performance and even some bankruptcies. Our main interest is to investigate how the COVID-19 pandemic has impacted firms' financial performance and cash-holding levels.

The agri-food supply chain has its own special characteristics; that is, agri-foods of good quality do not always sell at a good price [10]. In the early stages of COVID-19, many grocery stores, restaurants, and shopping malls were closed, which led to the disruption of the demand and supply of the agri-food system in most countries [11]. This crisis also changed the patterns of food production and consumption worldwide [12]. It was reported that this crisis left about 2.37 billion people without access to sufficient food supplies worldwide [13], while the prices of some agricultural products increased due to the pandemic [14]. Agri-food companies in developing countries were heavily affected by COVID-19 since many companies rely too much on labor for their activities [15]. China is one of a few countries that has successfully prevented the spread of COVID-19, and the government has issued a series of policies to help businesses to recover faster from the

COVID-19 economic fallout [16]. Agriculture and the agri-food industry are an important part of the Chinese economy [17]. The COVID-19 pandemic negatively affected agri-food companies in terms of logistics disruption, input shortages, and delivery problems [17]. Based on the data from the National Bureau of Statistics, added agricultural value decreased by 3.2% year-on-year in the first quarter of 2020. However, agri-food companies took various measures to ensure the sufficient supply and stable pricing of various products during the COVID-19 crisis. Up until now, what has not yet become clear is the impact of COVID-19 on financial performance and cash holding in China's agri-food sector. Therefore, in order to mount a quick response to the impact of COVID-19, it is necessary to understand the status of agri-food companies.

In this paper, we take several agri-food companies listed on the Shanghai and Shenzhen stock exchanges during 2016–2021 as the research sample and investigate the impact of COVID-19 on the firms' financial performance and cash-holding level. We also examine whether company ownership, COVID-19-affected areas, and amount of leverage impacted this relationship.

The contributions of this paper are as follows. First, the literature on the impact of COVID-19 at the firm level is limited. This paper enriches the extant literature by analyzing the impact of COVID-19 on financial performance and cash-holding levels in China's agri-food sector for the first time. Second, very little is currently known about whether company ownership, the affected areas, and leverage level affect the relationship between COVID-19, financial performance, and cash holding, and this paper attempts to fill this gap. Finally, this paper can serve as a guideline for corporate managers to improve firm profitability and relieve cash flow pressures during this crisis. It can also enable government policymakers to have a deeper understanding of the impact of COVID-19 and issue preferential policies to help agri-food companies lift their financial burdens.

The remainder of this paper is organized as follows. Section 2 presents the literature review and hypotheses. Section 3 explains the research methodology. Section 4 reports the empirical results, and Section 5 discusses these results. Finally, Section 6 concludes the paper.

2. Literature Review and Hypotheses Development

2.1. The Impact of COVID-19 on Financial Performance

The impact of the COVID-19 global pandemic is still a black box that attracts the attention of many scholars [18]. For instance, Shen et al. [3] reported a negative relationship between the COVID-19 epidemic and firm performance, measured through net return on assets. A study by Achim et al. [19] showed that the net income of the overall market decreased by about 37 percent in Romania during the COVID-19 crisis. Cho and Saki [20] suggested that U.S. firms in the textile and apparel industries suffered a sharp drop in firm performance, and COVID-19's impact was greater than the 2008 recession. Based on a DuPont analysis, Jin et al. [21] pointed out that the COVID-19 crisis reduced the firm performance of high-tech companies in China. For Malaysian non-financial firms, COVID-19 affected firm performance, governance structure, dividends, liquidity, and leverage level [22]. Another study conducted by Kubiczek and Derej [23] revealed that most industries in Poland witnessed a decline in revenues, while some branches did not report negative changes. Chabossou et al. [24] found that exporting companies had a 53.308% drop in quarterly turnover during the COVID-19 pandemic. In the banking industry, the adverse impact of this crisis varied across banks and countries [25]. Almutairi [26] also found that COVID-19 had a detrimental impact on the financial performance of banks in Kuwait. From a macro perspective, Ren et al. [27] observed that the negative effect of a COVID-19 outbreak in a province on firm value was temporary. However, Atayah et al. [28] examined the quarterly data from 2010 to 2020 and found that the financial performance of the listed logistic firms was significantly elevated during 2020. Therefore, we put forward the first hypothesis:

Hypothesis 1 (H1). *COVID-19 has a negative impact on the financial performance of agri-food companies in China.*

2.2. *The Impact of COVID-19 on Cash Holding*

Cash, as the “blood” of a company, is important to its daily operations [29]. Companies need sufficient cash to maintain adequate liquidity. The reasons that businesses need to hold cash are driven by transactions and precautionary or speculative motivations. During the COVID-19 pandemic, substantial changes in the supply chain led to the disruption of the company’s operations, which reduced company revenue [30,31]. At the same time, some fixed expenditures (such as depreciation) increased. These factors can worsen the cash flows of companies during such a crisis.

For any company, managers must maintain the necessary liquidity conditions to cover fixed costs and expenses, due to the operational uncertainties brought by COVID-19. Adequate cash flow can enable companies to maintain liquidity for emergencies, thereby reducing external financing needs [29]. In addition, companies must increase their cash-holding level to prevent the cash gap caused by financing restrictions. Increasing cash holding can reduce refinancing risks [32]. Using the data from Vietnamese firms, Nguyen et al. [33] observed that cash holding is particularly important for companies that are more vulnerable to the impacts of COVID-19. Based on a UK survey, Cowling et al. [34] found that 61 percent of small businesses were at severe risk because they exhausted their cash holdings during the COVID-19 crisis. De Vito and Gómez [35] argued that firms would run out of cash in nearly two years during the COVID-19 crisis and that they would resort to the debt market to prevent a cash crunch. Turnea et al. [36] pointed out that obtaining sufficient cash flow for the company’s necessary functions is a major challenge faced by Romanian companies at the beginning of the COVID-19 pandemic. Vinod [37] suggested that airline companies were strapped for cash in a COVID-19 world. However, the findings of Qin et al. [38] revealed that the COVID-19 outbreak has had a positive impact on cash holding in serious-impact industries. Therefore, we come to the second hypothesis:

Hypothesis 2 (H2). *COVID-19 has a negative impact on the cash holding of agri-food companies in China.*

3. Research Methodology

3.1. *Sample Selection and Data Collection*

The original sample included agri-food companies listed on the Shanghai and Shenzhen stock exchanges. Companies with missing data, companies that issued other kinds of shares, delisted companies, and special-treatment (ST) companies were excluded from our sample. Finally, 779 observations for 42 agri-food companies remained for analysis. Therefore, we collected the 2016Q1–2021Q1 quarterly data from the China Stock Market and Accounting Research (CSMAR) database. The analysis was carried out with the aid of Stata 14.

3.2. *Variables*

(1) Dependent variables. According to Shen et al. [3], Jin et al. [21], Almutairi [26], Fu and Shen [39], Buallay [40], Xu et al. [41], and Xu and Wang [42], the return on assets (ROA) and return on equity (ROE) are two commonly used financial indicators for measuring a firm’s financial performance. ROA is an indicator used to measure the net profit created by each unit of the assets invested, while ROE reflects the income level of shareholders’ equity [42]. Cash holding is measured according to the ratio of cash and cash equivalents to operating income.

(2) Independent variable. In December 2019, COVID-19 was identified in Wuhan, China. Later, it spread quickly around the globe. The WHO declared a global emergency in January 2020, due to its rapid spread. After that time, people’s lives and work and the global economy were seriously affected by the pandemic. Guided by Shen et al. [3],

Jin et al. [21], and Fu and Shen [39], we defined a dummy variable (COVID) that takes the value of 1 for 2020–2021.

(3) Control variables. Following the example set by Shen et al. [3], Jin et al. [21], Bose et al. [43], Gazi et al. [44], and Nguyen [45], firm size (SIZE), debt ratio (LEV), current ratio (CR), and sales growth rate (GROW) are used as controls. In addition, a year dummy (YEAR) is also included in the regression models.

All variables and their measurements are shown in Table 1.

Table 1. Variable definition.

| Variable | Symbol | Measurement |
|-------------------|--------|--|
| Return on assets | ROA | Net income/Total assets |
| Return on equity | ROE | Net income/Shareholders' equity |
| Cash holding | CASH | Cash and cash equivalents/Operating income |
| COVID-19 pandemic | COVID | Dummy variable that takes 1 for the quarters of 2020 and 2021, 0 otherwise |
| Firm size | SIZE | Natural logarithm of total assets |
| Debt ratio | LEV | Total liabilities/Total assets |
| Current ratio | CR | Current assets/Current liabilities |
| Sales growth rate | GROW | (Current year's sales-last year's sales)/Last year's sales |
| Year | YEAR | Dummy variable that takes 1 for the test year, 0 otherwise |

3.3. Model Specification

To test H1, which predicts a negative relationship between COVID-19 and firms' financial performance, we used Models (1) and (2).

$$ROA_{i,t} = \beta_0 + \beta_1 COVID_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 CR_{i,t} + \beta_5 GROW_{i,t} + YEAR_i + \varepsilon_{i,t} \quad (1)$$

$$ROE_{i,t} = \beta_0 + \beta_1 COVID_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 CR_{i,t} + \beta_5 GROW_{i,t} + YEAR_i + \varepsilon_{i,t} \quad (2)$$

Model (3) was used to examine the impact of COVID-19 on the cash-holding level of agri-food companies.

$$CASH_{i,t} = \beta_0 + \beta_1 COVID_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 CR_{i,t} + \beta_5 GROW_{i,t} + YEAR_i + \varepsilon_{i,t} \quad (3)$$

where i is the firm; t is the year; β is the presumed parameter; ε is the error term.

4. Empirical Results

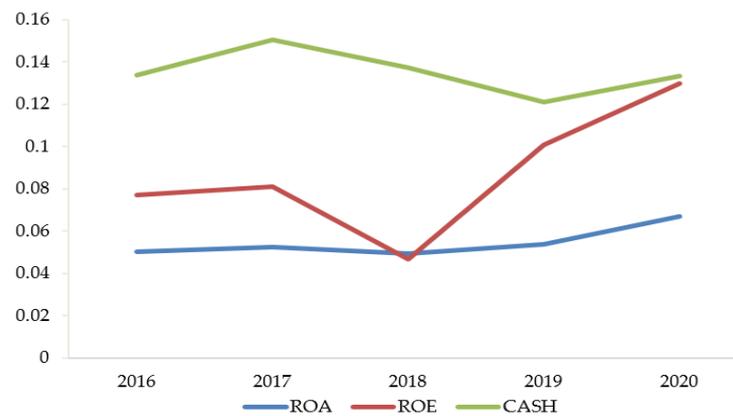
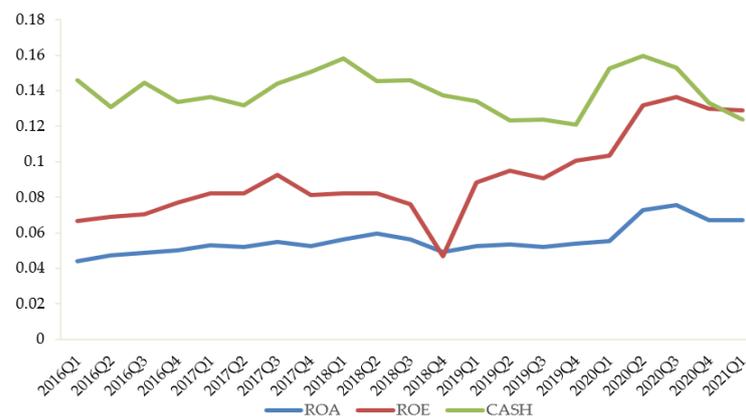
4.1. Descriptive Statistics

The descriptive statistics are shown in Table 2. The mean values of ROA and ROE suggest that Chinese agri-food companies can gain profits during the observed period. The mean CASH value of 0.1394 suggests that, on average, these companies hold 13.94 percent of their operating income. In the sample, the maximum value is 0.6068, and the minimum value is 0.0081. The SIZE variable has a mean value of 22.2559, and its standard deviation is 1.0871, indicating that there is a large variation between the sampled companies in terms of firm scale. The mean value of LEV is 0.3989, which implies that such companies have lower liabilities and maintain a reasonable leverage level. The mean CR of 2.2824 indicates that agri-food companies have the financial resources to remain solvent in the short term. The average GROW is 0.2578, indicating that the revenue of agri-food companies showed an upward trend during the observed period.

Table 2. Descriptive statistics.

| Variable | N | Mean | Median | Max | Min | SD |
|----------|-----|---------|---------|---------|---------|--------|
| ROA | 779 | 0.0565 | 0.0559 | 0.3746 | −0.2094 | 0.0598 |
| ROE | 779 | 0.0928 | 0.0888 | 0.6505 | −1.9081 | 0.1348 |
| CASH | 779 | 0.1394 | 0.1099 | 0.6068 | 0.0081 | 0.0993 |
| COVID | 779 | 0.2657 | 0 | 1 | 0 | 0.4420 |
| SIZE | 779 | 22.2559 | 22.1481 | 25.5859 | 20.2720 | 1.0871 |
| LEV | 779 | 0.3989 | 0.3948 | 0.9943 | 0.0215 | 0.1697 |
| CR | 779 | 2.2824 | 1.5026 | 36.7954 | 0.4477 | 3.1117 |
| GROW | 779 | 0.2578 | 0.1390 | 24.3954 | −0.8163 | 1.0519 |

Figures 1 and 2 depict the changing trends of financial performance (ROA and ROE) and the cash-holding level of agri-food companies over the observed period. The fluctuation of ROA was stable. The cash-holding level of agri-food companies had a downward trend from 2017 to 2019. It is worth noting that all indicators showed an increasing trend during the COVID-19 outbreak.

**Figure 1.** Financial performance and cash holding in 2016–2020.**Figure 2.** Financial performance and cash holding during 2016Q1–2021Q1.

4.2. Correlation Analysis

Table 3 shows the results of Pearson's correlation analysis. ROA and ROE positively correlate with COVID. CASH does not show a significant correlation with COVID. We computed the variance inflation factors (VIFs) and found that all values were less than 2, suggesting that multi-collinearity was not a major issue in our study.

Table 3. Correlation matrix.

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----------|------------|-----------|-----------|-----------|------------|------------|----------|---|
| 1 ROA | 1 | | | | | | | |
| 2 ROE | 0.821 *** | 1 | | | | | | |
| 3 CASH | 0.295 *** | 0.210 *** | 1 | | | | | |
| 4 COVID | 0.111 *** | 0.149 *** | 0.030 | 1 | | | | |
| 5 SIZE | 0.281 *** | 0.280 *** | −0.034 | 0.117 *** | 1 | | | |
| 6 LEV | −0.240 *** | −0.060 * | −0.085 ** | 0.105 *** | 0.455 *** | 1 | | |
| 7 CR | 0.012 | −0.044 | 0.034 | −0.063 * | −0.276 *** | −0.494 *** | 1 | |
| 8 GROW | 0.044 | 0.105 *** | −0.010 | 0.011 | 0.038 | 0.096 *** | −0.064 * | 1 |

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4.3. Regression Results

Table 4 shows the results of the regression analysis. Based on the Hausman test, the fixed effect (FE) model was used in Models (1) and (2), while the random effect (RE) model was employed in Model (3). The R^2 in Models (1) and (2) is higher than that in Model (3). It can be inferred that cash activities are more complex and might be determined by various factors. In Models (1) and (2), which report the influence of COVID-19 on financial performance, the coefficients of COVID-19 were negative but statistically insignificant, which leads to our rejection of H1. In Model (3), the coefficient of COVID was -0.023 , which is not significant at the 5% level. This value does not support H2. In addition, firm size (SIZE) had a positive impact on financial performance and cash holding, while debt ratio (LEV) exerted a negative impact. The current ratio (CR) had no significant impact on ROA, ROE, and CASH. GROW positively influenced only the performance indicators.

Table 4. Regression results of Models (1), (2), and (3).

| Variable | Model (1) | Model (2) | Model (3) |
|--------------|------------------------|------------------------|-----------------------|
| | FE | FE | RE |
| Constant | −1.377 *** (−8.22) | −3.661 *** (−7.76) | −0.299 (−1.54) |
| COVID | −0.003 (−0.25) | −0.031 (−1.04) | −0.023 (−1.59) |
| SIZE | 0.069 *** (8.86) | 0.178 *** (8.08) | 0.022 ** (2.38) |
| LEV | −0.271 *** (−12.09) | −0.4573 *** (−7.25) | −0.089 *** (−2.83) |
| CR | −0.0004 (−0.69) | −0.0001 (−0.04) | −0.0005 (−0.50) |
| GROW | 0.004 *** (2.98) | 0.014 *** (3.40) | 0.0005 (0.24) |
| YEAR | Included | Included | Included |
| N | 779 | 779 | 779 |
| R^2 | 0.2200 | 0.1532 | 0.0054 |
| F (Wald) | 8.38 *** | 5.37 *** | 44.93 *** |
| Hausman test | Prob > chi2 = 0.0033 | Prob > chi2 = 0.0000 | Prob > chi2 = 0.9063 |

Notes: ** $p < 0.05$, *** $p < 0.01$. t -values are in parentheses.

4.4. Further Analyses

We also investigated whether company ownership, COVID-19-affected areas, and level of leverage affected the relationship between this pandemic and financial performance and cash holding. The regression results are shown in Tables 5–7.

Table 5. Regression results of Models (1), (2), and (3) by ownership.

| Variable | State-Owned Companies | | | Privately Owned Companies | | |
|----------------|-----------------------|-----------------------|----------------------|---------------------------|------------------------|-----------------------|
| | Model (1) | Model (2) | Model (3) | Model (1) | Model (2) | Model (3) |
| | RE | RE | FE | FE | FE | RE |
| Constant | −0.555 *** (−3.05) | −1.110 ** (−2.48) | −0.468 (−0.65) | −1.522 *** (−7.75) | −3.965 *** (−10.13) | −0.308 (−1.60) |
| COVID | 0.054 *** (3.68) | 0.164 * (1.89) | −0.019 (−0.56) | −0.019 (−1.46) | −0.074 *** (−2.89) | −0.029 * (−1.84) |
| SIZE | 0.030 *** (3.36) | 0.066 *** (2.94) | 0.024 (0.71) | 0.076 *** (8.37) | 0.192 *** (10.53) | 0.023 ** (2.54) |
| LEV | −0.186 *** (−4.65) | −0.643 *** (−4.11) | 0.135 (1.31) | −0.297 *** (−11.23) | −0.457 *** (−8.66) | −0.132 *** (−3.91) |
| CR | −0.004 (−0.49) | −0.038 (−1.34) | 0.006 (0.29) | −0.001 (−1.00) | 0.00002 (0.02) | −0.001 (−1.19) |
| GROW | 0.004 *** (3.09) | 0.012 * (1.84) | −0.001 (−0.40) | 0.003 (0.75) | 0.017 * (1.81) | −0.006 (−0.95) |
| YEAR | Included | Included | Included | Included | Included | Included |
| N | 168 | 168 | 168 | 611 | 611 | 611 |
| R ² | 0.5347 | 0.3180 | 0.2639 | 0.2290 | 0.2395 | 0.0180 |
| F (Wald) | 89.24 *** | 52.45 *** | 2.02 *** | 6.85 *** | 7.27 *** | 54.60 *** |
| Hausman test | Prob > chi2 = 0.2242 | Prob > chi2 = 0.6310 | Prob > chi2 = 0.0002 | Prob > chi2 = 0.0025 | Prob > chi2 = 0.0000 | Prob > chi2 = 0.7909 |

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. t -values are in parentheses.

Table 6. Regression results of Models (1), (2), and (3) by COVID-19-affected area.

| Variable | Middle- and High-Risk Areas | | | Low-Risk Areas | | |
|----------------|-----------------------------|------------------------|-----------------------|-----------------------|-----------------------|----------------------|
| | Model (1) | Model (2) | Model (3) | Model (1) | Model (2) | Model (3) |
| | FE | FE | RE | FE | RE | FE |
| Constant | −1.469 *** (−7.55) | −3.944 *** (−10.25) | −0.313 (−1.53) | −0.947 *** (−3.21) | −1.576 ** (−2.02) | 0.285 (0.50) |
| COVID | −0.010 (−0.81) | −0.058 ** (−2.36) | −0.015 (−0.92) | 0.029 * (1.81) | 0.104 (0.98) | −0.048 (−1.55) |
| SIZE | 0.074 *** (8.08) | 0.190 *** (10.59) | 0.022 ** (2.33) | 0.052 *** (3.82) | 0.090 *** (2.61) | −0.009 (−0.33) |
| LEV | −0.270 *** (−10.45) | −0.430 *** (−8.42) | −0.109 *** (−3.16) | −0.287 *** (−6.12) | −0.738 *** (−5.70) | 0.094 (1.03) |
| CR | −0.0004 (−0.62) | 0.0004 (0.27) | −0.001 (−0.86) | −0.027 ** (−2.49) | −0.036 * (−1.73) | 0.023 (1.12) |
| GROW | 0.004 (0.97) | 0.018 ** (1.97) | −0.005 (−0.80) | 0.004 *** (3.62) | 0.013 * (1.84) | 0.001 (0.24) |
| YEAR | Included | Included | Included | Included | Included | Included |
| N | 644 | 644 | 644 | 135 | 135 | 135 |
| R ² | 0.1990 | 0.2259 | 0.0003 | 0.5188 | 0.9334 | 0.3283 |
| F (Wald) | 6.06 *** | 7.11 *** | 44.45 *** | 4.67 *** | 64.29 *** | 2.12 *** |
| Hausman test | Prob > chi2 = 0.0030 | Prob > chi2 = 0.0000 | Prob > chi2 = 0.7715 | Prob > chi2 = 0.0002 | Prob > chi2 = 0.8911 | Prob > chi2 = 0.0143 |

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. t -values are in parentheses.

Table 7. Regression results of Models (1), (2), and (3) by leverage level.

| Variable | Highly Leveraged Companies | | | Low-Leveraged Companies | | |
|----------------|----------------------------|-----------------------|----------------------|-------------------------|-----------------------|----------------------|
| | Model (1) | Model (2) | Model (3) | Model (1) | Model (2) | Model (3) |
| | FE | FE | FE | RE | FE | RE |
| Constant | −1.464 *** (−6.82) | −4.722 *** (−5.50) | −0.516 * (−1.72) | −0.870 *** (−5.99) | −3.232 *** (−6.36) | −0.784 ** (−2.53) |
| COVID | −0.023 (−1.35) | −0.103 (−1.50) | −0.061 ** (−2.52) | 0.013 (0.94) | −0.020 (−0.95) | −0.036 * (−1.90) |
| SIZE | 0.073 *** (7.25) | 0.232 *** (5.77) | 0.021 (1.50) | 0.046 *** (6.85) | 0.158 *** (6.65) | 0.043 *** (2.98) |
| LEV | −0.228 *** (−5.93) | −0.612 *** (−3.99) | 0.131 ** (2.44) | −0.283 *** (−7.26) | −0.424 *** (−7.29) | 0.002 (0.04) |
| CR | −0.006 (−0.70) | −0.032 (−0.89) | 0.096 *** (7.57) | −0.002 ** (−2.19) | −0.001 (−1.33) | −0.001 (−0.63) |
| GROW | 0.004 *** (2.75) | 0.013 ** (2.34) | 0.001 (0.51) | −0.013 ** (−2.20) | −0.020 ** (−2.41) | 0.0003 (0.03) |
| YEAR | Included | Included | Included | Included | Included | Included |
| N | 389 | 389 | 389 | 390 | 390 | 390 |
| R ² | 0.2512 | 0.1782 | 0.2226 | 0.3675 | 0.2400 | 0.0049 |
| F (Wald) | 4.64 *** | 3.00 *** | 3.96 *** | 105.82 *** | 4.39 *** | 44.88 *** |
| Hausman test | Prob > chi2 = 0.0228 | Prob > chi2 = 0.0189 | Prob > chi2 = 0.0010 | Prob > chi2 = 0.1152 | Prob > chi2 = 0.0197 | Prob > chi2 = 0.1909 |

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. t -values are in parentheses.

We divided the full sample into state-owned companies and privately owned companies according to company ownership. As shown in Table 5, COVID-19 had a positive and significant impact on financial performance in state-owned companies, while it had a negative and significant impact on only the ROE indicator in privately owned companies. The COVID-19 pandemic caused a decrease in the cash holdings of privately owned companies. Table A1 shows that there was a great difference in cash-holding levels between the two types of agri-food companies. State-owned companies tend to hold more cash than privately owned companies.

Following the example of Shen et al. [3], according to the number of infected people as of 31 March 2021, our sample was divided into two subgroups, namely, companies in middle- and high-risk areas and companies in low-risk areas. In Table 6, the COVID-19 outbreak had a negative and significant impact on the ROE indicator of companies in middle- and high-risk areas, while it positively affected the ROA indicators in low-risk areas. Regardless of the affected areas, although the coefficient of COVID-19 on cash holding was negative, it was not significant at the 5% level. Table A2 shows that there is a great difference in cash holding behavior in both types of areas.

We divided our sample into highly leveraged companies and little-leveraged companies, based on corporate leverage. Table 7 reveals that the COVID-19 pandemic has had no significant impact on financial performance in the two subgroups. In addition, the COVID-19 pandemic had a greater negative impact on the cash levels of companies with greater debts. In other words, low-debt companies may choose to borrow a certain amount of money to ensure the company's smooth operation during the COVID-19 pandemic. Table A3 shows that low-leveraged companies are likely to have superior performance and maintain sufficient cash because of smaller payments.

4.5. Robustness Check

The gross profit margin and net profit margin were used to replace ROA and ROE, and Models (1) and (2) were re-estimated. In addition, guided by Haj-Salem and Hussainey [46] and Suherman et al. [47], the ratio of cash and cash equivalents to total assets was chosen instead of CASH to re-estimate Model (3). The results are similar to our previous findings, which suggests that our conclusion is robust.

5. Discussion

The current study shows that the COVID-19 outbreak has had no significant impact on financial performance and the cash holdings of Chinese agri-food companies. In China, most agri-food companies are small in scale and are located at the lowest end of the industrial chain; it is difficult for them to build their own brand advantages [48]. In agricultural food production, the COVID-19 pandemic negatively affected food production because farmers had limitations in terms of accessing agricultural inputs [49]. However, there is other research that shows conflicting results. For example, Chen and Yang [50] argued that COVID-19 reduced the sales of agri-food companies. Corchuelo Martínez-Azúa et al. [12] found that COVID-19 had a negative impact on agri-food companies, while a positive impact for COVID-19 was detected in some branches. Shen et al. [3] confirmed that actual corporate performance in agriculture, forestry, animal husbandry, and the fishery industry showed lower performance than expected. Zhang and Zheng [18] found that the COVID-19 pandemic made the firms' performance worse by extending the operation cycle, increasing the costs, and reducing potential cash flows. Analyzing the effect of other diseases, such as the African swine fever virus (ASFV), Chen and Zhang [51] also found that it has a negative impact on the stock prices of Chinese food companies. In addition, the findings of Sun and Li [52] showed that firms' financial performance in the travel and entertainment industry decreased greatly, while financial performance in the medical industry improved because of the COVID-19 outbreak. In terms of cash management, accelerating cash receipts and postponing cash disbursements are two commonly used methods in financial management. Companies that have more cash are likely to carry out risk-taking behaviors during this

type of crisis [53]. Accumulated cash holdings can reduce the adverse effect of COVID-19 on corporate investment [54]. The accounts-receivable turnover of agri-food companies significantly decreased during the COVID-19 pandemic [48], which caused a delay in cash receipts. In order to reduce their cash expenditure, Nguyen et al. [55] carried out a survey and pointed out that Vietnamese companies selected cost-cutting strategies to tackle economic uncertainty during the COVID-19 pandemic.

We tested the influence of company ownership on the relationship between COVID-19 and the firms' financial performance and cash holding behaviors and found a positive impact of COVID-19 on financial performance in state-owned companies but a negative impact in their privately owned counterparts. Compared with privately owned companies, state-owned companies can access government support more easily because of their close political connection [56]. However, Xu et al. [57] concluded that the negative relationship between the COVID-19 crisis and cash dividend payments is more pronounced in state-owned companies, while privately owned companies depend more on cash dividends to release positive signals to outside investors, in order to deal with the uncertainty caused by this pandemic.

The COVID-19 crisis positively affected these firms' financial performance in low-risk areas, but it had a negative impact in middle- and high-risk areas. Its impact on cash holding was not significant, regardless of the affected areas. Similar to our results, Shen et al. [3] found that COVID-19 had a negative impact on corporate performance in serious-impact regions in China. Sun and Li [52] confirmed that Chinese companies in high-risk areas experienced more financial losses during the COVID-19 pandemic. The findings of Bose et al. [43] showed that firms in countries where the COVID-19 situation was direr show a greater decrease in firm value. In addition, Hu and Zhang [58] concluded that the negative effect of COVID-19 on firm performance was weakened in countries with better healthcare systems and more advanced financial systems.

The negative impact of COVID-19 on cash holding is found to be greater in highly leveraged companies. This pandemic was not observed to influence firms' financial performance, regardless of leverage level. Chu et al. [59], taking Chinese real estate firms as their sample, confirmed that firms with higher leverage had lower returns during the COVID-19 pandemic, while larger firms could lessen COVID-19's negative impact by adopting diversified strategies. Nguyen [45] suggested that during the COVID-19 crisis, the leverage ratio increased while the profitability ratio decreased in the Vietnamese logistics industry.

In addition, Jin et al. [21] concluded that research and development (R&D) investment could alleviate the adverse impact of COVID-19. Clampit et al. [60] confirmed that riskier firms with higher R&D intensity showed better performance in the era of COVID-19, especially when cash-to-inventory levels were low. However, the innovation ability of agri-food companies in China is still low [61]. During this crisis, agri-food companies should effectively allocate resources to make more innovations in marketing and distribution.

6. Conclusions

This study is motivated by the need to explore the impact of COVID-19 on financial performance and cash holdings in China's agri-food system by using the quarterly data from 2016 to 2021. We also examine whether company ownership in COVID-19-affected areas and leverage level influence this relationship. The main conclusions are as follows. First, the COVID-19 crisis had no significant impact on firms' financial performance and cash-holding levels. Second, the financial performance of state-owned companies is enhanced during such a crisis, whereas the COVID-19 reduces financial performance and cash-holding level of privately owned companies. Third, there is a positive relationship between the COVID-19 crisis and firms' financial performance in low-risk areas, while this relationship is positive in middle and high-risk areas. Finally, COVID-19 had a greater negative impact on cash holdings in highly leveraged companies than in low-leveraged companies.

The theoretical contributions of this paper are as follows. First, our study is the first to provide evidence of the impact of the COVID-19 crisis on firms' financial performance

and cash holdings in the agri-food sector in China, a country that has effectively controlled the spread of COVID-19. In addition, it extends our understanding of the roles of company ownership, COVID-19-affected areas, and leverage level in the relationship between COVID-19 and firm performance. Second, this study could become a basis for other developing countries to guide their agri-food industry to overcome the impact of COVID-19.

This study has some practical implications. Firstly, agri-food companies should stabilize their working position during the COVID-19 era. Companies that are facing difficulties in production and operation can make salary adjustments, implement job rotation, and shorten working hours under the strict COVID-19 prevention and control measures. Secondly, such companies should build a sound internal control system [62], strengthen cash flow management, reduce operation costs, and achieve marketing innovation by optimizing the supply chain configuration and making full use of the Internet to carry out procurement and sales. What is more, agri-food companies should adopt the asset-heavy business model, improve the proportion of equity financing, and optimize their corporate capital structure [63]. Thirdly, banks and financial institutions should increase financial credit support and provide low-cost capital guarantees for agri-food companies, especially those seriously affected by the COVID-19 pandemic [64]. Finally, the government should provide agri-food companies with more financial sources or support and issue certain policies, such as tax reduction, to help them to alleviate the negative impacts of COVID-19.

The current study has some limitations. First, this study is only limited to the agri-food sector, while a cross-sector analysis will be needed to establish more specific suggestions for different industries in future studies. Second, this study focuses on China, which is among the first countries to recover from the COVID-19 pandemic, and future research could be carried out in other countries or regions to explore the impact of COVID-19 elsewhere. Third, future research could take other control variables that influence financial performance and cash-holding levels into consideration.

Author Contributions: Conceptualization, J.X. and Z.J.; methodology, J.X. and Z.J.; software, J.X.; validation, J.X. and Z.J.; formal analysis, J.X.; data curation, J.X.; writing—original draft preparation, J.X. and Z.J.; writing—review and editing, J.X. and Z.J.; supervision, J.X.; project administration, J.X.; funding acquisition, J.X. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Shandong Provincial Humanities and Social Sciences Research Project (grant number 2021-YYGL-09), the Social Science Planning Research Program of Shandong Province (grant number 18CKJJ01), and the Qingdao Agricultural University Doctoral Start-Up Fund (grant number 6631120701).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request.

Acknowledgments: We would like to thank the editors and the anonymous reviewers for their valuable comments and suggestions on earlier drafts.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Descriptive statistics by company ownership.

| Variable (Mean) | State-Owned Companies | Privately Owned Companies | Difference <i>t</i> -Statistic |
|-----------------|-----------------------|---------------------------|--------------------------------|
| ROA | 0.0391 | 0.0613 | −4.313 |
| ROE | 0.0576 | 0.1024 | −3.856 |
| CASH | 0.1786 | 0.1287 | 5.893 *** |
| COVID | 0.2500 | 0.2700 | −0.520 |
| SIZE | 22.1398 | 22.2878 | −1.564 * |
| LEV | 0.4756 | 0.3778 | 6.802 * |

Table A1. Cont.

| Variable (Mean) | State-Owned Companies | Privately Owned Companies | Difference <i>t</i> -Statistic |
|-----------------|-----------------------|---------------------------|--------------------------------|
| CR | 1.7164 | 2.4380 | −2.673 *** |
| GROW | 0.4414 | 0.2073 | 2.564 *** |

Notes: * $p < 0.10$, *** $p < 0.01$.

Table A2. Descriptive statistics by COVID-19-affected areas.

| Variable (Mean) | Middle and High-Risk Areas | Low-Risk Areas | Difference <i>t</i> -Statistic |
|-----------------|----------------------------|----------------|--------------------------------|
| ROA | 0.0571 | 0.0538 | 0.580 |
| ROE | 0.0953 | 0.081 | 1.149 |
| CASH | 0.1296 | 0.1865 | −6.203 *** |
| COVID | 0.2717 | 0.2370 | 0.082 * |
| SIZE | 22.1913 | 22.5638 | −3.648 *** |
| LEV | 0.3838 | 0.4711 | −5.539 |
| CR | 2.3705 | 1.8622 | 1.728 ** |
| GROW | 0.2009 | 0.5292 | −3.318 *** |

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A3. Descriptive statistics by leverage level.

| Variable (Mean) | Highly Leveraged Companies | Low-Leveraged Companies | Difference <i>t</i> -Statistic |
|-----------------|----------------------------|-------------------------|--------------------------------|
| ROA | 0.0450 | 0.0681 | −5.484 |
| ROE | 0.0918 | 0.0937 | −0.192 *** |
| CASH | 0.1274 | 0.1514 | −3.399 *** |
| COVID | 0.3162 | 0.2154 | 3.202 *** |
| SIZE | 22.7287 | 21.7842 | 13.455 ** |
| LEV | 0.5379 | 0.2603 | 39.685 ** |
| CR | 1.2918 | 3.2704 | −9.354 *** |
| GROW | 0.3612 | 0.1547 | 2.752 *** |

Notes: ** $p < 0.05$, *** $p < 0.01$.

References

- Mahdi, O.R.; Nassar, I.A. The Business Model of Sustainable Competitive Advantage through Strategic Leadership Capabilities and Knowledge Management Processes to Overcome COVID-19 Pandemic. *Sustainability* **2021**, *13*, 9891. [CrossRef]
- Gu, X.; Ying, S.; Zhang, W.; Tao, Y. How Do Firms Respond to COVID-19? First Evidence from Suzhou, China. *Emerg. Mark. Financ. Trade* **2020**, *56*, 2181–2197. [CrossRef]
- Shen, H.; Fu, M.; Pan, H.; Yu, Z.; Chen, Y. The Impact of the COVID-19 Pandemic on Firm Performance. *Emerg. Mark. Financ. Trade* **2020**, *56*, 2213–2230. [CrossRef]
- Angelidou, S.; Lisboa, A.C.C.; Saridakis, C. Expanding into new product lines in response to COVID-19: The interplay between firm age and performance aspirations. *Ind. Mark. Manag.* **2022**, *104*, 167–181. [CrossRef]
- Zou, P.; Huo, D.; Li, M. The impact of the COVID-19 pandemic on firms: A survey in Guangdong Province, China. *Glob. Health Res. Policy* **2020**, *5*, 41. [CrossRef] [PubMed]
- Narayanamurthy, G.; Tortorella, G. Impact of COVID-19 outbreak on employee performance—Moderating role of industry 4.0 base technologies. *Int. J. Prod. Econ.* **2021**, *234*, 108075. [CrossRef]
- Kasim, M.Y.; Muslimin; Dwijaya, I.K.B. Market reaction to the COVID-19 pandemic: Events study at stocks listed on LQ45 index. *Cogent Bus. Manag.* **2022**, *9*, 2024979. [CrossRef]
- Shaharuddin, S.N.; Mahmud, R.; Azhari, N.K.M.; Perwitasari, W. Company Performance during COVID-19: Impact of Leverage, Liquidity and Cash Flows. Available online: <https://ebpj.e-iph.co.uk/index.php/EBProceedings/article/download/2878/1572/13137> (accessed on 5 July 2022).
- Rizvi, S.K.A.; Mirza, N.; Naqvi, B.; Rahat, B. COVID-19 and asset management in EU: A preliminary assessment of performance and investment styles. *J. Asset Manag.* **2020**, *21*, 281–291. [CrossRef]
- Xu, J.; Cai, J.; Yao, G.; Dai, P. Strategy Optimization of Quality Improvement and Price Subsidy of Agri-Foods Supply Chain. *Foods* **2022**, *11*, 1761. [CrossRef]
- Arumugam, S.; Ozkan, B.; Jayaraman, A.; Mockaisamy, P. Impacts of COVID-19 Pandemic on Global Agriculture, Livelihoods and Food Systems. *J. Agric. Sci.* **2021**, *37*, 239–246.

12. Corchuelo Martínez-Azúa, B.; López-Salazar, P.E.; Sama-Berrocal, C. Impact of the COVID-19 Pandemic on Agri-Food Companies in the Region of Extremadura (Spain). *Agronomy* **2021**, *11*, 971. [[CrossRef](#)]
13. Lu, Y.; Zhang, Y.; Hong, Y.; He, L.; Chen, Y. Experiences and Lessons from Agri-Food System Transformation for Sustainable Food Security: A Review of China's Practices. *Foods* **2022**, *11*, 137. [[CrossRef](#)]
14. Gonzalez-Martinez, A.R.; Jongeneel, R.; Salamon, P.; Zezza, A.; De Maria, F.; Potori, N. The COVID-19 pandemic and the EU agri-food sector: Member State impacts and recovery pathways. *Stud. Agric. Econ.* **2021**, *123*, 153–158.
15. Abu Hatab, A.; Lagerkvist, C.-J.; Esmat, A. Risk perception and determinants in small- and medium-sized agri-food enterprises amidst the COVID-19 pandemic: Evidence from Egypt. *Agribusiness* **2021**, *37*, 187–212. [[CrossRef](#)]
16. Zhuang, W.; Wu, Q.; Jiang, M.; Ichiro, N.; Zhang, T.; Yu, X. Game Analysis on Epidemic Prevention and Resuming Production: Based on China's Experience with COVID-19. *Front. Psychol.* **2021**, *12*, 747465. [[CrossRef](#)]
17. Zhang, Y.; Diao, X.; Chen, K.Z.; Robinson, S.; Fan, S. Impact of COVID-19 on China's macroeconomy and agri-food system—An economy-wide multiplier model analysis. *China Agric. Econ. Rev.* **2020**, *12*, 387–407. [[CrossRef](#)]
18. Zhang, D.; Zheng, W. Does COVID-19 make the firms' performance worse? Evidence from the Chinese listed companies. *Econ. Anal. Policy* **2022**, *74*, 560–570. [[CrossRef](#)]
19. Achim, M.V.; Safta, I.L.; Văidean, V.L.; Mureșan, G.M.; Borlea, N.S. The impact of COVID-19 on financial management: Evidence from Romania. *Econ. Res.-Ekonomiska Istraživanja* **2022**, *35*, 1807–1832. [[CrossRef](#)]
20. Cho, B.; Saki, Z. Firm performance under the COVID-19 pandemic: The case of the US textile and apparel industry. *J. Text. Inst.* **2022**, *113*, 1637–1647. [[CrossRef](#)]
21. Jin, G.; Xu, J.; Liu, F.; Haris, M.; Weqar, F. Does R&D investment moderate the relationship between the COVID-19 pandemic and firm performance in China's high-tech industries? Based on DuPont components. *Technol. Anal. Strateg. Manag.* **2021**, 1–15. [[CrossRef](#)]
22. Khatib, S.F.A.; Nour, A.N.I. The Impact of Corporate Governance on Firm Performance During The COVID-19 Pandemic: Evidence from Malaysia. *J. Asian Financ. Econ. Bus.* **2021**, *8*, 943–952.
23. Kubiczek, J.; Derej, W. Financial performance of business in the COVID-19 pandemic conditions—Comparative Study. *Pol. J. Manag. Stud.* **2021**, *24*, 183–201.
24. Chabossou, A.F.C.; Nonvide, G.M.A.; Lokonon, B.O.K.; Amegnaglo, C.J.; Akpo, L.G. COVID-19 and the Performance of Exporting Companies in Benin. *Eur. J. Dev. Res.* **2022**, *34*, 828–842. [[CrossRef](#)]
25. Demirgüç-Kunt, A.; Pedraza, A.; Ruiz-Ortega, C. Banking sector performance during the COVID-19 crisis. *J. Bank. Financ.* **2021**, *133*, 106305. [[CrossRef](#)]
26. Almutairi, H.A. COVID-19 and Its Impact on the Financial Performance of Kuwaiti Banks: A Comparative Study Between Conventional and Islamic Banks. *J. Asian Financ. Econ. Bus.* **2022**, *9*, 249–257.
27. Ren, Z.; Zhang, X.; Zhang, Z. New evidence on COVID-19 and firm performance. *Econ. Anal. Policy* **2021**, *72*, 213–225. [[CrossRef](#)]
28. Atayah, O.F.; Dhiab, M.M.; Najaf, K.; Frederico, G.F. Impact of COVID-19 on financial performance of logistics firms: Evidence from G-20 countries. *J. Glob. Oper. Strateg. Sourc.* **2022**, *15*, 172–196. [[CrossRef](#)]
29. Opler, T.; Pinkowitz, L.; Stulz, R.; Williamson, R. The determinants and implications of corporate cash holdings. *J. Financ. Econ.* **1999**, *52*, 3–46. [[CrossRef](#)]
30. Chari, F.; Muzinda, O.; Novukela, C.; Ngcamu, B.S. Pandemic outbreaks and food supply chains in developing countries: A case of COVID-19 in Zimbabwe. *Cogent Bus. Manag.* **2022**, *9*, 2026188. [[CrossRef](#)]
31. Din, A.U.; Han, H.; Ariza-Montes, A.; Vega-Muñoz, A.; Raposo, A.; Mohapatra, S. The Impact of COVID-19 on the Food Supply Chain and the Role of E-Commerce for Food Purchasing. *Sustainability* **2022**, *14*, 3074. [[CrossRef](#)]
32. Harford, J.; Klasa, S.; Maxwell, W.F. Refinancing risk and cash holdings. *J. Financ.* **2014**, *69*, 975–1012. [[CrossRef](#)]
33. Nguyen, C.K.; Nguyen, A.Q.; Nguyen, N.Q.; Nguyen, T.T.M.; Chu, A.N.; Nguyen, L.T.M. Cash Holding and Financial Stability during a Crisis: A Case Study of Vietnamese Firms in COVID-19 Pandemic. *Forum Soc. Econ.* **2021**. [[CrossRef](#)]
34. Cowling, M.; Brown, R.; Rocha, A. Did you save some cash for a rainy COVID-19 day? The crisis and SMEs. *Int. Small Bus. J. Res. Entrep.* **2020**, *38*, 593–604. [[CrossRef](#)] [[PubMed](#)]
35. De Vito, A.; Gómez, J.-P. Estimating the COVID-19 cash crunch: Global evidence and policy. *J. Acc. Public Policy* **2020**, *39*, 106741. [[CrossRef](#)]
36. Turnea, E.-S.; Neșțian, Ș.A.; Tiță, S.M.; Vodă, A.I.; Guță, A.L. Dismissals and temporary leaves in Romanian companies in the context of low demand and cash flow problems during the COVID-19 economic lockdown. *Sustainability* **2020**, *12*, 8850. [[CrossRef](#)]
37. Vinod, B. The COVID-19 pandemic and airline cash flow. *J. Revenue Pricing Manag.* **2020**, *19*, 228–229. [[CrossRef](#)]
38. Qin, X.; Huang, G.; Shen, H.; Fu, M. COVID-19 Pandemic and Firm-level Cash Holding-Moderating Effect of Goodwill and Goodwill Impairment. *Emerg. Mark. Financ. Trade* **2020**, *56*, 2243–2258. [[CrossRef](#)]
39. Fu, M.; Shen, H. COVID-19 and Corporate Performance in the Energy Industry. Available online: <https://erl.scholasticahq.com/api/v1/articles/12967-covid-19-and-corporate-performance-in-the-energy-industry.pdf> (accessed on 16 July 2022).
40. Buallay, A. Sustainability reporting in food industry: An innovative tool for enhancing financial performance. *Br. Food J.* **2022**, *124*, 1939–1958. [[CrossRef](#)]
41. Xu, J.; Haris, M.; Irfan, M. The Impact of Intellectual Capital on Bank Profitability during COVID-19: A Comparison with China and Pakistan. *Complexity* **2022**, *2022*, 2112519. [[CrossRef](#)]

42. Xu, J.; Wang, B. Intellectual Capital, Financial Performance and Companies' Sustainable Growth: Evidence from the Korean Manufacturing Industry. *Sustainability* **2018**, *10*, 4651. [CrossRef]
43. Bose, S.; Shams, S.; Ali, M.J.; Mihret, D. COVID-19 impact, sustainability performance and firm value: International evidence. *Acc. Financ.* **2022**, *62*, 597–643. [CrossRef]
44. Gazi, M.A.I.; Nahiduzzaman, M.; Harymawan, I.; Masud, A.A.; Dhar, B.K. Impact of COVID-19 on Financial Performance and Profitability of Banking Sector in Special Reference to Private Commercial Banks: Empirical Evidence from Bangladesh. *Sustainability* **2022**, *14*, 6260. [CrossRef]
45. Nguyen, H.T.X. The Effect of COVID-19 Pandemic on Financial Performance of Firms: Empirical Evidence from Vietnamese Logistics Enterprises. *J. Asian Financ. Econ. Bus.* **2022**, *9*, 177–183.
46. Haj-Salem, I.; Hussainey, K. Risk Disclosure and Corporate Cash Holdings. *J. Risk Financ. Manag.* **2021**, *14*, 328. [CrossRef]
47. Suherman, S.; Usman, B.; Mahfirah, T.F.; Vesta, R. Do female executives and CEO tenure matter for corporate cash holdings? Insight from a Southeast Asian country. *Corp. Gov.-Int. J. Bus. Soc.* **2021**, *21*, 939–960. [CrossRef]
48. Zeng, J.; Kang, Y. Research on accounts receivable management of food enterprises in the post-epidemic era—A study on ZD food company. *Financ. Manag. Res.* **2022**, *6*, 64–69. (In Chinese)
49. Mthembu, B.E.; Mkhize, X.; Arthur, G.D. Effects of COVID-19 Pandemic on Agricultural Food Production among Smallholder Farmers in Northern Drakensberg Areas of Bergville, South Africa. *Agronomy* **2022**, *12*, 531. [CrossRef]
50. Chen, J.; Yang, C.-C. How COVID-19 Affects Agricultural Food Sales: Based on the Perspective of China's Agricultural Listed Companies' Financial Statements. *Agriculture* **2021**, *11*, 1285. [CrossRef]
51. Chen, Y.-H.; Zhang, Z. Effects of ASFV concern on stock yield: An empirical study based on evidence from listed food companies. *J. Wuhan Bus. Univ.* **2021**, *35*, 45–52. (In Chinese)
52. Sun, Y.; Li, Y. COVID-19 Outbreak and Financial Performance of Chinese Listed Firms: Evidence from Corporate Culture and Corporate Social Responsibility. *Front. Public Health* **2021**, *9*, 710743. [CrossRef]
53. Le, V.H.; Nguyen, M.H. The role of cash holdings during COVID-19 pandemic: Evidence from corporate risk-taking behavior of non-financial listed firms in Vietnam. *J. East. Eur. Cent. Asian Res.* **2022**, *9*, 462–470. [CrossRef]
54. Tawiah, B.K.; O'Connor Keefe, M. Cash Holdings and Corporate Investment: Evidence from COVID-19. Available online: <https://ssrn.com/abstract=3712767> (accessed on 12 July 2022).
55. Nguyen, H.H.; Ngo, V.M.; Tran, A.N.T. Financial performances, entrepreneurial factors and coping strategy to survive in the COVID-19 pandemic: Case of Vietnam. *Res. Int. Bus. Financ.* **2021**, *56*, 101380. [CrossRef]
56. Jin, Z.; Shang, Y.; Xu, J. The Impact of Government Subsidies on Private R&D and Firm Performance: Does Ownership Matter in China's Manufacturing Industry? *Sustainability* **2018**, *10*, 2205.
57. Xu, X.; Lin, C.; Yan, Y. COVID-19 crisis and corporate cash dividend policies: Evidence from Chinese listed companies. *Appl. Econ. Lett.* **2021**, 1–7. [CrossRef]
58. Hu, S.; Zhang, Y. COVID-19 pandemic and firm performance: Cross-country evidence. *Int. Rev. Econ. Financ.* **2021**, *74*, 365–372. [CrossRef]
59. Chu, X.; Lu, C.; Tsang, D. Geographic Scope and Real Estate Firm Performance during the COVID-19 Pandemic. *J. Risk Financ. Manag.* **2021**, *14*, 309. [CrossRef]
60. Clampit, J.; Hasija, D.; Dugan, M.; Gamble, J. The Effect of Risk, R&D Intensity, Liquidity, and Inventory on Firm Performance during COVID-19: Evidence from US Manufacturing Industry. *J. Risk Financ. Manag.* **2021**, *14*, 499.
61. Xu, J.; Li, J. Performance comparison of food processing and manufacturing companies in China. *Custos Agronegocio Line* **2020**, *16*, 290–308.
62. Zhu, P.; Song, J. The Role of Internal Control in Firms' Coping with the Impact of the COVID-19 Pandemic: Evidence from China. *Sustainability* **2021**, *13*, 6294. [CrossRef]
63. Lai, Y.; Wang, W.; Zeng, Q.; Zhang, B. Research on the choice of asset mode of pig breeding industry under sudden epidemic situation. *Times Econ. Trade* **2021**, *18*, 30–33. (In Chinese)
64. Wang, S. How to promote development of small and medium-sized agricultural enterprise under "Novel Coronavirus Pneumonia" epidemic. *China Anim. Ind.* **2020**, *11*, 87–88. (In Chinese)