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Stock market reaction to COVID-19: Evidence from U.S. Firms' International exposure

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ABSTRACT

We examine the U.S. stock market reaction to the World Health Organization's announcement declaring COVID-19 a global health emergency, with a focus on firms' international exposure. We find that while international exposure through foreign sales, foreign assets, imports and exports are significant and negatively associated with standardized cumulative abnormal returns in the short-run, the effect reverses in the long-run. In the long-run, internationalization contributes to multinational firms being more resilient to economic shocks caused by COVID-19.

1. Introduction

Over the past few decades, countries around the world have enjoyed tremendous economic growth brought about by international trade, foreign investment and globalization. The spread of COVID-19 from early 2020 was an unexpected external shock to the global economy. Unlike the 1997 Asian Financial Crisis and the 2008 Global Financial Crisis, the COVID-19 pandemic did not start off as a financial crisis but its effect on financial markets and economies is more far reaching than previous financial crises. In order to slow the spread of COVID-19, the public health responses of many countries have been to shut international borders, introduce quarantine measures and restrict movement of their residents. These measures however have economic consequences.

Take the manufacturing industry for example, many companies flourished from the utilization of global supply chains and just-in-time technology to minimize costs. The ability to export their products for foreign sales offer customers more choices of goods and services. These companies are likely to be significantly impacted by disruptions in global trade. According to the current forecasts, there will approximately be a 13%–32% decline in the merchandise trade and a 30%–40% reduction in foreign direct investment in 2020 resulting from COVID-19 (Altman, 2020). Multinational firms may also cut their international investment by a third in 2020 (The Economist, 2020). The push by governments to bring supply chain back home is likely to increase these estimated figures.[1]

These observations call into question the costs of globalization. Some researchers, practitioners and policy makers suggest that COVID-19 marks the end of globalization as it highlights the costs of significant reliance on other economies, leading to the spill-over effect that we are now observing (The Economist, 2020). Others suggest that the impact of COVID-19 is likely to be temporary and turning trade inwards will not help countries to ride out the effect of the crisis (Baldwin & Evenett, 2020).

Have countries around the world gone too far in terms of internationalization? Should countries be more self-reliant for sales and funding? Will we observe a delinking of the global economy going forward? Employing COVID-19 as a natural and unexpected shock that is not of a financial nature, we investigate the market reaction to the impact of

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[1] Some examples of these are where "On May 12th Narendra Modi, India's prime minister, told the nation that a new era of economic self-reliance has begun. Japan's COVID-19 stimulus includes subsidies for firms that repatriate factories and European Union officials talk of 'strategic autonomy' and are creating a fund to buy stakes in firms. America is urging Intel to build plants at home" (The Economist, 2020).

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COVID-19 from the perspective of firm's international exposure and multinationality. The findings will provide an early indication of the impact of COVID-19 to researchers and practitioners as well as adding to the debate of whether firm's internationalization is a desirable feature.

Accordingly, the aim of this paper is to investigate the stock market reaction to COVID-19 from the perspective of firm's international exposure and multinationality. We investigate an event date that has international significance, the 30th January 2020, on which the World Health Organization (WHO) declared COVID-19 a global health emergency of international concern (World Health Organization, 2020a). It is expected that the market will have a stronger reaction to this event with respect to firms' international exposure and multinationality given that this signals the probability of COVID-19 spreading more widely to countries around the world. We measure international exposure and multinationality from a multi-dimensional perspective. Firstly, we measure a firm's international exposure proxied by foreign sales, foreign assets, and number of COVID-affected economies in the Top 3 geographic segments based on the level of foreign sales and assets. Secondly, we examine the firm's four offshore activities variables (based on Hoberg and Moon (2017)) in the Top 5 COVID-affected economies. Thirdly, we employ the multinationality classification system of Aggarwal, Berrill, Hutson, & Kearney (2011); hereafter ABHK) to examine the impact of having the physical presence of subsidiaries across six regions of the world.

We investigate the following research questions: (1) What is the short-run and long-run stock market reactions of the impact of COVID-19? (2) Are the short-run and long-run standardized cumulative abnormal returns (SCARs) associated with firm's international exposure and multinationality?

We contribute to the literature in several important ways. First, we investigate an event that has international significance, the 30th January 2020, on which the World Health Organization (WHO) declared COVID-19 as a worldwide health emergency of international concern. This event date is well suited to the focus of our study and has not been investigated in prior literature. Second, we compare the short-run and long-run stock market reactions with a focus on their association with firm-level international exposure. Prior literature on the costs and benefits of internationalization presents mixed findings. Our study contributes to the literature by reinvestigating this issue in the context of the COVID-19 crisis. In particular, we test whether firms with international exposure are more susceptible to negative market reaction in the short-run and whether multinational firms are more resilient in the long-run due to the benefits of geographical diversification.

Third, we provide a very thorough examination by capturing multiple dimensions of firms' internationalization while prior studies typically only control for foreign sales and Chinese exposure. The dimensions of international exposure examined in this paper include foreign presence via foreign sales, foreign assets, number of COVID-affected economies in a firm's Top 3 geographic segments based on the level of foreign sales and assets, the four Hoberg and Moon (2017) offshore activities variables in the Top 5 COVID-affected economies, as well as physical presence of subsidiaries around the world proxied by the ABHK multinationality index based on Aggarwal et al. (2011).

We find that while international exposure through foreign sales, foreign assets, imports and exports are significant and negatively associated with standardized cumulative abnormal returns in the short-run, the effect reverses in the long-run. Our findings show that firms with international exposure (or are more multinational) are more robust against economic shocks due to COVID-19 in the long-run. Hence, our findings support the view that firm's internationalization and economic globalization is a desirable feature of the modern economy despite the COVID-19 setback.

The remainder of this paper is organised as follows. Section 2 outlines the recent literature with respect to the financial and economic impact of COVID-19. Section 3 presents the data and methodology. Section 4 discusses the results and robustness tests and section 5 concludes.

2. Literature review

2.1. COVID-19 and market reactions

On the 31st December 2019, a pneumonia of unknown cause detected in Wuhan, China was first reported to the World Health Organization (WHO) country office.[2] Throughout January 2020, the virus spread rapidly to other provinces in China. During the same period, similar cases emerged overseas as well. In the United States, the first case of COVID-19 was reported on the 20th January 2020. By the 30th January 2020, cases have been reported in 18 countries including Asian countries (China,[3] Japan, South Korea, Vietnam, Singapore, Malaysia, Cambodia, The Philippines, Thailand, Nepal, Sri Lanka and India), North America (United States and Canada), European countries (France, Finland and Germany) and the United Arab Emirates. Due to the speed and severity of the outbreak in five WHO regions[4] in one month, COVID-19 was declared by the WHO as a public health emergency of international concern on the 30th January 2020, which is the event date of this study. By mid-June 2020, the number of confirmed cases around the world is approximately 7.82 million with 2 million of these cases in the United States (World Health Organization, 2020b).

Due to the strength and spread of the virus, international borders have been closed and residents were ordered to stay home to limit the spread of COVID-19. The closure of businesses and decrease in productivity due to decreased labour forces has led to a shock in global supply chains especially for the manufacturing industry where inputs are sourced from and products exported overseas. These policies are likely to result in losses and liquidity issues for businesses, leading to negative impacts in the financial market and economic growth. Thus, academic researchers and policy makers have been keen to study the effect of COVID-19 on the stock market.

Focusing on the Chinese market, Huo and Qiu (2020) investigate the market reaction to the pandemic lockdown announcement during the Chinese New Year period due to the COVID-19 outbreak in China. They find that 22 out of 28 industries have negative cumulative abnormal returns (CARs) in the event window, with the leisure services industry being most affected. On the other hand, the pharmaceutical and biotechnology industry has the greatest positive CARs. However, most of the industries that initially suffered negative CARs recovered after one month with positive CARs. Huo and Qiu (2020) conclude that reversals observed both at the industry and firm levels are due to investors' overreaction to the event of pandemic lockdown. Their findings attribute the overreaction to firms with higher levels of retail ownerships.

Baker et al. (2020) find that COVID-19 has impacted the U.S. stock market volatility more powerfully than any other infectious diseases outbreak since 1900 including the Spanish Flu. In fact, market volatility during the initial outbreak of COVID-19 in the United States surpassed levels seen in the great stock market crashes of 1929 and 1987, and the 2008 global financial crisis. This can be attributed to the severity and high speed of the pandemic spread, greater information availability, and the interconnectedness of the global economy. This explanation is consistent with Baldwin (2020) who highlights that COVID-19 and its containment policies has hit the global supply chains and labour supply significantly leading to a massive reduction of outputs in the form of goods and services, all of which will lead to stock market uncertainty. Baker, Bloom, Davis, and Terry (2020) estimated the effect of the

[2] https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen.

[3] The number of cases reported for China by the World Health Organization includes cases in Hong Kong, Macau and Taipei.

[4] The five WHO regions are Western Pacific, South-East Asia, Regions of Americas, European Region and Eastern Mediterranean.

COVID-19 shock in an empirical model of disaster effect. They estimated that the implied contraction in U.S. real gross domestic product will be 9% in quarter 2 of 2020 and will experience a peak contraction of 11% two quarters later.

Ramelli and Wagner (2020) conduct a short-run cross-sectional analysis of U.S. stock price reactions to COVID-19 across three periods of the COVID-19 crisis, that is, the incubation period, outbreak period and fever period. Using COVID-19 as a natural experiment, they also examine the timing of stock price reactions and analyst inquiries on corporate conference calls in the U.S. Ramelli and Wagner's (2020) short-run event study only measures international exposure based on non-U.S. revenues, and exposure to China. They found that foreign revenue (especially from China) during the incubation and outbreak period, corporate cash debt and cash holdings explains the stock market exposure to the COVID-19 crisis. In summary, they find early evidence that a health crisis can be amplified through financial channels.

Liu, Manzoor, Wang, Zhang, and Manzoor (2020) is one of the early international event studies that examine the short-term impact of COVID-19 on 21 stock market indices around the world. These countries include the U.S., U.K., Italy, Germany, Japan, Korea and Singapore. They find that the stock markets in these countries fell significantly after the outbreak of COVID-19, especially for the Asian stock market. The analysis suggests that investors' pessimism and fear of uncertainty contributed to the negative abnormal returns. Pandey and Kumari (2021) find similar results when extending the analysis to 49 stock market indices around the world. They show that the early lockdown or restriction efforts by some countries have led to improvement in investors' confidence as evidenced by the reversal in stock market returns. In addition, Heyden and Heyden (2020) investigate short-term reaction of U.S., U.K. and 15 European stock markets during different stages of the COVID-19 pandemic. These include the first case of COVID-19, first death from the virus and initial announcement of fiscal and monetary policies. They find that in general, there is no significant reaction to the first case of COVID-19 but the first related death normally triggers significant negative abnormal returns. Fiscal policy announcements that are country specific negatively affect stock returns but monetary policy calms the markets. At the firm-level liquidity, tangible asset levels and institutional holdings explain higher CARs. Investigating the stock markets' reaction to daily COVID-19 confirmed cases and deaths across 64 countries, Ashraf (2020) finds a negative association between growth in confirmed cases and stock market returns. He concludes that stock markets' responses to the COVID-19 pandemic varies according to the stages of outbreak. Lyocsa, Baumohl, Vyrost, and Molnar (2020) use Google abnormal search volume activity on corona-related terms to proxy for panic and fear. They examine the predictive power of this Google search based proxy on stock market volatility of the 10 largest stock markets in the world. The evidence shows that high Google abnormal search volume is associated with high stock market volatility, which is consistent with the view that stock market volatility from COVID-19 being attributed to short-term investors' sentiment.

Investigating more broadly on the impact of pandemics, David, Inacio Jr, and Tenrero Machado (2021) analyze the dynamic coupling between various pandemics (COVID-19, Ebola, MERS and SARS) and 11 key stock market indices by employing the vector error correction model (VECM). They find that stock market volatility is significantly affected by the shocks from these diseases. Relative to other diseases, the impact of COVID-19 shock displays a slower recovery in stock market volatility, especially in countries with greater economic and social fragility.

2.2. Costs and benefits of international diversification

Internationalization allows firms to diversify their cash flow sources and, in the process, diversify their systematic risk compared to their domestic counterparts (Shapiro, 1978). In addition, it enables firms to enjoy economies of scale in operations beyond the domestic market and to exploit foreign market opportunities. However, when firms expand internationally, they will also be exposed to additional risk factors such as foreign exchange, political factors, agency problems with monitoring overseas operations and asymmetric information (Reeb, Kwok, & Baek, 1998).

To date, prior literature examining the costs and benefits of firm's international diversification has been mixed. Markides and Ittner (1994) investigate U.S. firms' international acquisitions between 1975 and 1988 and find that international acquisitions create value for the acquiring firms. The magnitude of value creation depends on the nature of acquisition, characteristics of the bidding firm's industry, characteristics of the acquiring firms and the macroeconomic environment. Bodnar, Weintrop, and Tang (1999) investigates the effect of industrial and geographic diversifications for U.S. firms between 1984 and 1997. They find that firms with international operations (through foreign incomes and related income tax disclosure) have a 2.7% higher value than comparable single-activity domestic firms. Similarly, Gande, Schenzler, and Senbet (2009) documents that global diversification (via foreign sales) by U.S. firms between 1994 and 2002 enhances firm value, as proxied by Tobin's Q. The valuation benefits are more prominent for firms that diversify into countries with stronger creditor rights.

From an asset management perspective, studies have found value investing in multinational corporations as they provide additional diversification benefits. Comparing a multinational portfolio and a purely domestic portfolio in the U.S., Fatemi (1984) finds that the monthly returns are similar for both portfolios. However, the multinational portfolio has lower total and systematic risks. Fatemi (1984) also documents abnormal returns 14 months prior to initial foreign diversification, suggesting that the market positively anticipates the benefits associated with becoming a multinational firm. From the perspective of G7 countries' investors, Rowland and Tesar (2004) also find evidence of a gain from international diversification when investing in foreign market indices.

In contrast, Denis, Denis, and Yost (2002) document a valuation discount for global diversification in U.S. firms between 1984 and 1997. Kim and Mathur (2008) further study the economic effects of corporate industrial and geographic diversification for U.S. firms between 1990 and 1998. Relative to industrially diversified firms, geographically diversified firms are found to have higher operating income, return on equity (ROE), return on assets (ROA) but also exhibit greater levels of research and development expenditures and advertising expenses. Consistent with Denis et al. (2002), they conclude that costs of corporate diversification may outweigh the benefits leading to a decline in firm value.

Another strand of literature investigates the risk effect of international diversification and results are similarly mixed. Zhao, Jiang, and Li (2015) investigates the impact of the 2008 Global Financial Crisis and the Euro Crisis on the financial performance of multinational corporations. They find that firms which relocated their sales internationally to Asia experienced lower adverse effects from the crisis and higher return on assets compared to domestic firms.

Conversely, Olibe, Michello, and Thorne (2008) examine the relation between internationalization and systematic risk. They find that international diversification increased firms' systematic risk. Firm's information on internationalization such as the number of foreign countries and segments that a firm operates in seemed to be used by market participants in their firm's risk exposure assessment. Consistent with Olibe et al. (2008), Krapl (2015) find a positive association between corporate international diversification (proxied by foreign sales, foreign assets, geographical segments and foreign exchange exposure) and equity risk. This association is stronger for firms that are in more advanced stages of internationalization when they expand into riskier countries.

Given the costs and benefits of international diversification, Qian, Khoury, Peng, and Quan (2010) aim to determine the appropriate geographic diversification for multinational firms. They investigate whether it matters if the diversification is intra-regional, inter-regional or total geographical diversification for 123 U.S. multinational firms

from 1999 to 2005. They find that firms have better performance if the diversification is intra-regional. For inter-regional and total geographic diversification, the association with firm performance exhibits an inverted-U relation. Our study contributes to the literature by examining the costs and benefits of internationalization in the context the COVID-19 crisis, a crisis that has international impact. Accordingly, we measure international exposure from a multi-dimensional perspective and explore the short-run and long-run association between international exposure and market reaction to the WHO's announcement that COVID-19 is a global health emergency.

3. Data and methodology

3.1. Data

We include all listed U.S. firms excluding the financial industry as at the 1st January 2020 in our analysis.[5] The daily stock market data is collected from CRSP, while firm characteristic data is obtained from Compustat. The final sample based on the available data is 2836 firms. We used the 5-year average value of the firm characteristics before the year 2020, winsorized at the 1% and 99% level.

Table 1 Panel A reports the summary statistics of our sample. The average sample firm is USD 6.93 billion (median of 0.81 billion) in size, has a quick ratio of 2.10 and leverage ratio of 21.11. On average, our sample firms experience negative performance before being hit by COVID-19, with ROE of −4.88%. Our sample firms invest significantly with an average capital expenditure/total asset (Capex) of 3.91 prior to the event.

We measure multinationality from a number of dimensions. To proxy international exposure, we collect the five-year average foreign sales/total sales ratio and foreign assets/total assets ratio from Worldscope as at 2019 to proxy for the amount of international exposure for the firm. On average, the foreign sales/total sales and foreign asset/total assets of our sample firms are 19.15% and 5.29%, respectively. We also obtain the geographical segment data for 2019 from Worldscope to construct the number of COVID-19 affected economies in each sample firm's Top 3 geographic segments based on foreign sales and assets. On average, the number of COVID-affected economies in firm's Top 3 geographic segments is 0.23.

We also measure international exposure using Hoberg and Moon's (2017) four offshore activities variables with a focus on the Top 5 COVID-affected economies (i.e., China, Hong Kong, Thailand, Japan and Singapore; World Health Organization, 2020a).[6] Hoberg and Moon (2017) created four offshore activities variables based on textual analysis of the number of mentions of the firm selling goods to or purchasing inputs from a given nation. We tailored our four offshore activities variables to the Top 5 COVID affected economies at the event date. These variables are: (1) T5 OUTPUT (number of mentions of the firm selling goods to Top 5 COVID-affected economies), (2) T5 INPUT (number of mentions of the firms purchasing inputs from Top 5 COVID-affected economies), (3) Offshore External Input (T5 EXIN) – a subset of input where the importing firm does not hold assets in the same Top 5 COVID-affected economies, (4) Offshore Internal Input (T5 ININ) – a subset of INPUT where the importing firm also hold assets in the same Top 5 COVID-affected economies. On average, the number of mentions of the Top 5 COVID-affected economies in the 10-K reports of our sample firms are 4.71 for imports, 4.81 for exports, 0.50 for EXIN and 2.62 for ININ, respectively.

In further subsample analysis,[7] we create an ABHK multinationality index based on firms' foreign subsidiaries location ranging from 1 (Domestic) to 7 (Global), being the count of the number of regions that a firm has subsidiaries located across the world. According to the multinationality classification system of Aggarwal et al. (2011) (hereafter ABHK), the world is divided into six regions, namely, Africa, Asia, Europe, North America (including Central America), South America, and Oceania (Australia, New Zealand and the Pacific Islands). A firm with activities only in the home country is classified as domestic (D), a firm with activities in the same region that its headquarters are located is classified as regional (R). A firm with activities in more than one region is considered trans-regional (T) and this is then subdivided into T2 (two regions), T3 (three regions), T4 (four regions) and T5 (five regions). A firm that operates in all six regions is considered global (G). The ABHK multinationality index has also been used as a measure of operational hedging in prior literature (Hutson & Laing, 2014). The average ABHK index for our subsample is 4.20 out of 7. The average proportion of subsidiaries operating in the Top 5 COVID-affected economies is 12% while 7% of our sample firms' subsidiaries are in China.

Table 1 Panel B reports the correlation between the variables. Large firms are more likely to have greater ROE (0.48) and leverage (0.43). They are also more likely to have foreign sales (0.15) and be multinational according to ABHK (0.19). Firms that have foreign sales also tend to have foreign assets (0.59) and are more likely to import from Top 5 COVID-affected economies (0.47 correlation with T5 INPUT). Importing firms (T5 INPUT) are more likely to also exports (T5 OUTPUT)(0.73), have more subsidiaries in China (0.54) and in Top 5 COVID-19 affected economies (0.59). Due to the relatively high correlation between these international exposure variables, we run them in alternative models in subsequent regression analyses.

3.2. Methodology

3.2.1. Event study methodology

We employ the event study method to examine the market reaction around the WHO announcement of COVID-19 being a global health emergency of international concern on the 30th January 2020. The event study is conducted using *Eventus* to estimate the cumulative abnormal returns (CARs) across various event window (0,0), (−1,+1), (−3,+3), (−5,+5), (0,+30) and (0,+42),[8] where 0 represents the day of WHO announcement. The market model is used to estimate abnormal returns, with an estimation period for normal returns commencing 255 days and ending 46 days before announcement day (day −255 to −46), as to avoid incorporating leaked information or insider trading (Asquith, 1983). The market proxy used is the CRSP value-weighted market index returns.

For longer event windows beyond the event day, Coutts, Mills, and Roberts (1995) and Aybar and Ficici (2009) noted that CARs should be standardized by its standard deviation to account for serial correlation of daily abnormal returns for the same firm. We follow Coutts et al. (1995) and Aybar and Ficici (2009) in reporting standardized CARs (SCARs) where each firm's CAR is standardized using its standard deviation (SD_i), estimated as follows:

[5] We exclude the financial industry firms as per the two-digit standard industry classification (SIC) codes 60–67.

[6] We use the data from Hoberg and Moon Data Library website (http://faculty.marshall.usc.edu/Gerard-Hoberg/HobergMoonDataSite/index.html) for the year 2017 as this is the latest available data as of the writing of this paper.

[7] We hand collected the ABHK multinationality index data from the 10-K annual reports for a sub-sample of 500 large and mid-capitalization stocks listed firms, of which 90% firms are classified as multinational. We created the ABHK index from the 2010 data as we need the sample to include long-established multinational firms with strong foundations.

[8] Our quarterly data subscription for *Eventus* only had data availability up to 31 March 2020 as of the writing of this paper.

Table 1
Summary statistics.
Panel A presents summary statistics of the sample firm characteristics. *SIZE* is the log of market capitalization, *QUICK* is cash and short-term investments and receivables divided by total assets, *CAPEX* is total capital expenditure divided by total assets, *LEVERAGE* is total debt divided by total assets and *ROE* is return on equity as a proxy of firm's profitability. These variables are 5-year average values before the event year, winsorized at the 1% and 99% level. Various measures of international exposure are included in this study. These include Foreign Sales (*FSales*), Foreign Assets (*FAssets*), number of COVID-affected economies in the Top 3 geographic segments (*COVID T3*), the four Hoberg and Moon (2017) offshore activities variables in the Top 5 COVID-affected economies (*T5 OUTPUT, T5 INPUT, T5 ININ* and *T5 EXIN*), Multinationality Index based on Aggarwal et al. (2011) (*ABHK*), proportion of subsidiaries in the Top 5 COVID-19 affected economies (*PROP T5*) and the proportion of subsidiaries in China (*CHINA*). Panel B presents the correlation table for these variables.

Panel A: Summary statistics

	SIZE (USD Bn)	QUICK	CAPEX	LEVERAGE	ROE	FSALES	FASSETS	COVIDT3	T5 INPUT	T5 OUTPUT	T5 EXIN	T5 ININ	ABHK	PROP T5	CHINA
Minimum	0.00038	0.00	0.00	0.00	−220.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Mean	6.93	2.10	3.91	21.11	−4.88	19.15	5.29	0.23	4.71	4.81	0.50	2.62	4.20	0.12	0.07
Median	0.81	1.12	2.25	15.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.08	0.03
Maximum	126.00	17.54	30.76	100.16	55.87	100.00	76.84	3.00	138.00	174.00	26.00	89.00	7.00	1.00	1.00
Std. dev	19.00	3.05	5.28	22.64	40.20	29.17	13.69	0.48	11.54	11.22	1.87	7.05	1.99	0.15	0.12
N	2836	2836	2836	2836	2836	2836	2836	2756	2464	2464	2464	2464	498	498	498

Panel B: Correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	SIZE	1.00													
2	QUICK	−0.02	1.00												
3	CAPEX	0.18*	0.09*	1.00											
4	LEVERAGE	0.43*	−0.13*	0.30*	1.00										
5	ROE	0.48*	0.06	0.14*	0.22*	1.00									
6	FSALES	0.15*	0.17*	−0.12*	−0.09	0.03	1.00								
7	FASSETS	0.05	0.01	0.04	0.01	−0.04	0.59*	1.00							
8	COVID T3	0.00	0.11*	−0.03	−0.06	0.06	0.37*	0.20*	1.00						
9	T5 INPUT	0.06	0.12*	−0.05	−0.05	−0.04	0.47*	0.38*	0.31*	1.00					
10	T5 OUTPUT	0.15*	0.13*	−0.09	−0.02	0.00	0.43*	0.28*	0.23*	0.73*	1.00				
11	T5 EXIN	−0.02	0.09*	−0.01	−0.05	−0.02	0.17*	0.09*	0.15*	0.52*	0.40*	1.00			
12	T5 ININ	0.04	0.07	−0.03	−0.07	−0.04	0.46*	0.39*	0.32*	0.92*	0.66*	0.38*	1.00		
13	ABHK	0.19*	−0.05	−0.15*	0.07	0.06	0.39*	0.31*	0.14*	0.36*	0.36*	0.12*	0.36*	1.00	
14	PROP T5	0.13*	0.21*	−0.07	−0.11*	0.08	0.42*	0.22*	0.27*	0.59*	0.55*	0.29*	0.60*	0.50*	1.00
15	CHINA	0.09*	0.13*	−0.06	−0.06	0.09	0.35*	0.21*	0.25*	0.54*	0.49*	0.26*	0.54*	0.51*	0.88*

* Indicates significance at the 5% level.

Table 2

Event study results.

Panel A presents the mean standardized value weighted cumulative abnormal returns (SCARs) for various event windows, estimated using the market model and market-adjusted model. Panel B presents the SCARs by industry based on 2 digit SIC code for the (−5,+5) and (0,+30) event windows. Panel C presents the SCARs by sample firms' international exposure. The various samples are firms with and without foreign sales, foreign assets, COVID-affected economies in the Top 3 geographic segments (*COVID T3*), T5 INPUT, T5 OUTPUT, T5 EXIN, T5 ININ. Using the ABHK multinationality classification index we divide the sample by domestic and multinational firms based on the location of their foreign subsidiaries, firms with and without subsidiaries located in the Top 5 COVID-19 affected economies *(PROP T5)* and firms with and without subsidiaries located in China *(CHINA)*. Panel C, Column (2) reports the proportion of firms located in each group. The *t*-test statistic indicates if the mean standardized cumulative abnormal returns between the two groups are statistically significantly different from zero. The nonparametric Wilcoxon rank-sum tests that the two independent samples are from populations having the same distribution.

Panel A: Event study results.

	Market-model SCARs	Market-adjusted SCARs
(0,0)	−0.252***	−0.260***
	(0.019)	(0.018)
(−1, +1)	−0.276***	−0.294***
	(0.020)	(0.021)
(−3, +3)	−0.243***	−0.266***
	(0.019)	(0.021)
(−5, +5)	−0.250***	−0.283***
	(0.020)	(0.021)
(0, +30)	−0.104***	−0.881***
	(0.005)	(0.037)
(0, +42)	−0.051***	−0.547***
	(0.007)	(0.037)

Panel B: Standardized cumulative abnormal returns by industry

Industry	Prop.	Market-model SCARs		Market-adjusted SCARs	
		(−5,+5)	(0,+30)	(−5,+5)	(0,+30)
Mining	0.067	−0.524***	−0.282***	−0.690***	−2.163***
		(0.068)	(0.043)	(0.069)	(0.214)
Construction	0.015	−0.436**	−0.226***	−0.311*	−1.528***
		(0.177)	(0.031)	(0.185)	(0.222)
Food production	0.023	−0.442***	−0.060***	−0.478***	0.097
		(0.116)	(0.021)	(0.108)	(0.196)
Manufacturing	0.499	−0.248***	−0.076***	−0.276***	−0.740***
		(0.031)	(0.008)	(0.031)	(0.044)
Transport & Utility	0.108	−0.372***	−0.103***	−0.433***	−0.791***
		(0.155)	(0.082)	(0.015)	(0.079)
Wholesale	0.033	−0.567***	−0.190***	−0.587***	−1.591***
		(0.113)	(0.027)	(0.116)	(0.266)
Retail	0.054	−0.278***	−0.142***	−0.339***	−1.091***
		(0.074)	(0.025)	(0.072)	(0.179)
Health	0.015	−0.003	−0.081	−0.014	−0.619*
		(0.099)	(0.059)	(0.107)	(0.315)
Services	0.187	−0.101**	−0.073***	−0.083*	−0.806***
		(0.048)	(0.013)	(0.049)	(0.089)

Panel C: Standardized cumulative abnormal returns by international exposure and multinationality

	Prop.	Market-model SCARs		Market-adjusted SCARs	
		(1)	(2)	(3)	(4)
		(−5,+5)	(0,+30)	(−5,+5)	(0,+30)
Foreign sales	0.42	−0.310***	−0.091	−0.329***	−0.926***
No foreign sales	0.58	−0.206***	−0.114	−0.249***	−0.847***
Difference		−0.104	0.023	−0.08	−0.079
T-test statistic		2.51**	−1.87*	1.91*	1.05
Wilcoxon z-statistic		2.59***	−3.93***	1.65*	0.96
Foreign assets	0.32	−0.329***	−0.090***	−0.338***	−0.973***
No foreign assets	0.68	−0.214***	−0.111***	−0.258***	−0.838***
Difference		−0.115	0.021	−0.08	−0.135
T-test statistic		2.61***	−1.64*	1.81*	1.68
Wilcoxon z-statistic		2.91***	−3.39***	1.89*	1.55
COVID T3	0.23	−0.418***	−0.116***	−0.440***	−0.998***
No COVID T3	0.77	−0.200***	−0.100***	−0.236***	−0.845***
Difference		−0.218	−0.016	−0.204	−0.153
T-test statistic		4.38***	1.23	3.89***	2.24**
Wilcoxon z-statistic		4.58***	−0.161	4.02***	2.04**
T5 INPUT	0.54	−0.296***	−0.093***	−0.319***	−0.743***
No T5 INTPUT	0.46	−0.196***	−0.118***	−0.239***	−1.045***
Difference		−0.100	0.025	−0.080	0.302

(*continued on next page*)

Table 2 (*continued*)

Panel C: Standardized cumulative abnormal returns by international exposure and multinationality

	Prop.	Market-model SCARs		Market-adjusted SCARs	
		(1)	(2)	(3)	(4)
		(−5,+5)	(0,+30)	(−5,+5)	(0,+30)
T-test statistic		2.41**	−3.34***	1.76*	−3.53***
Wilcoxon z-statistic		2.75***	−4.52***	1.91*	−2.03**
T5 OUTPUT	0.58	−0.307***	−0.094***	−0.329***	−0.788***
No T5 OUTPUT	0.42	−0.174***	−0.117***	−0.220***	−1.007***
Difference		−0.133	0.023	−0.109	0.219
T-test statistic		3.29***	−2.99***	2.54**	−2.28**
Wilcoxon z-statistic		3.60***	−4.45***	2.52**	−1.42
T5 EXIN	0.34	−0.314***	−0.111***	−0.344***	−0.782***
No T5 EXIN	0.66	−0.218***	−0.101***	−0.252***	−0.931***
Difference		−0.096	−0.010	−0.092	0.149
T-test statistic		2.55**	−0.64	2.24**	−0.78
Wilcoxon z-statistic		3.29***	−1.42	2.87***	0.37
T5 ININ	0.47	−0.302***	−0.091***	−0.327***	−0.742***
No T5 ININ	0.53	−0.205***	−0.116***	−0.245***	−1.002***
Difference		−0.097	0.025	−0.082	0.260
T-test statistic		2.34**	−3.67***	1.85*	−2.89***
Wilcoxon z-statistic		2.528**	−4.49***	1.74*	−1.547
Multinational ABHK	0.98	−0.254***	−0.104***	−0.287***	−0.880***
Domestic ABHK	0.02	−0.047	−0.113***	−0.078	−0.922***
Difference		−0.207	0.009	−0.209	0.042
T-test statistic		1.89*	−1.47	1.65*	−0.561
Wilcoxon z-statistic		2.39**	−2.01**	2.09**	−0.80
PROP T5	0.93	−0.253***	−0.103***	−0.287***	−0.864***
No PROP T5	0.07	−0.219***	−0.121***	−0.232***	−1.101***
Difference		−0.034	0.018	−0.055	0.237
T-test statistic		1.728*	−4.31***	1.45	−3.006***
Wilcoxon z-statistic		3.60***	−4.45***	2.52**	−1.422
CHINA	0.92	−0.256***	−0.104***	−0.290***	−0.866***
No CHINA	0.08	−0.193**	−0.111***	−0.201***	−1.043***
Difference		−0.063	0.007	−0.089	0.177
T-test statistic		2.51**	−3.95***	2.28**	−2.85***
Wilcoxon z-statistic		2.78***	−4.41***	2.47**	−2.44**

Please refer to the text for detailed variable definitions. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

$$SD_i = S_i \sqrt{k + \frac{k}{T} + \frac{\sum_{t=1}^{k} R_{mt} - k\left(\overline{R_m}\right)^2}{\sum_{t=1}^{T}\left(R_{mt} - \overline{R_m}\right)^2}} \quad (1)$$

where S_i is the standard error of the market model regression, k is the number of days in the event window, T is the number of observations in the estimation period, R_m is the return on the market for day t and R_{mt} is the average return of the market portfolio for the estimation period. The corresponding Z statistics is estimated as:

$$Z = \frac{1}{\sqrt{N}} \sum_{t=1}^{N} SCAR_i \quad (2)$$

3.2.2. Cross sectional analysis

We analyze the determinants of short- and long-run SCARs using the OLS cross-sectional regression model as follows:

$$SCARs(-5,+5) = \beta_0 + \beta_1(INTEXP) + \beta_2(SIZE) + \beta_3(QUICK) + \beta_4(CAPEX) + \beta_5(LEVERAGE) + \beta_6(ROE) + \beta_7(IND\ DUMMIES) + \varepsilon \quad (3)$$

Where *SCARs* is the standardized cumulative abnormal returns within the event window (−5,+5), *INTEXP* is international exposure as proxied by the various international exposure and multinationality variables, *SIZE* is the log of market capitalization, *QUICK* is cash and short-term investments and receivables divided by total assets, *CAPEX* is total capital expenditure divided by total assets, *LEVERAGE* is total debt divided by total assets and *ROE* is return on equity as a proxy of firm's profitability.[9] We also for control for industry dummies in the regression.[10] We then rerun the same regression replacing SCARs (−5,+5) with SCARs (0,+30) to examine the drivers of long-run SCARs.

Our main variable of interest *INTEXP* is investigated from multiple dimensions, including: (1) international exposure variables (foreign sales, foreign assets and number of economies that are affected by COVID-19 in firm's top 3 geographic segment), (2) location of firm's offshoring activities as per Hoberg and Moon (2017) (T5 INPUT, T5

[9] The inclusion of these control variables is motivated by prior event study literature. Ramelli and Wagner (2020) included firm size, profitability and leverage in their investigation of firm's abnormal returns from COVID-19 related announcement. Florio and Manzoni (2004) control for firm size, leverage and quick ratio in their analysis of abnormal returns of U.K. firm's privatisation while Chung, Wright, and Charoenwong (1998) find that capital expenditure announcements affect stock prices of firms.

[10] Our sample firms span nine industries based on 2 digits standard industry classification code including mining, construction, food, manufacturing, transport and utility, wholesale, retail, health and services. The greatest industry representation in the sample is from the manufacturing industry, followed by services and transport and utility.

Table 3
Multivariate analysis: International exposure.
This table reports the results of the cross-sectional regression: $SCARs\ (-5,+5) = \beta_0 + \beta_1(INTEXP) + \beta_2(SIZE) + \beta_3(QUICK) + \beta_4(CAPEX) + \beta_5(LEVERAGE) + \beta_6(ROE) + \beta_7(IND\ DUMMIES) + \varepsilon$, where the dependent variable in Columns (1) to (3) is, *SCARs* is the standardized value weighted cumulative abnormal returns within the event window (−5,+5), *INTEXP* is international exposure as proxied by Foreign Sales *(FSales)*, Foreign Assets *(FAssets)* and *COVID T3* (number of COVID-19 affected economies in firm's top 3 geographical segments). *SIZE* is the log of market capitalization, *QUICK* is cash and short-term investments and receivables divided by total assets, *CAPEX* is total capital expenditure divided by total assets, *LEVERAGE* is total debt divided by total assets and *ROE* is return on equity as a proxy of firm's profitability. We also control for industry dummies *(IND DUMMIES)*. We then rerun the same regression replacing SCARs (−5, +5) with SCARs (0, +30) in Columns (4) to (6). Robust standard errors are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
	SCARs	SCARs	SCARs	SCARs	SCARs	SCARs
	(−5,+5)	(−5,+5)	(−5,+5)	(0,+30)	(0,+30)	(0,+30)
FSales	−0.208***			0.024		
	(0.073)			(0.139)		
FAssets		−0.304**			−0.570*	
		(0.141)			(0.315)	
COVID T3			−0.159***			−0.129*
			(0.040)			(0.069)
Size	0.002	−0.002	−0.002	0.038**	0.042**	0.052***
	(0.011)	(0.011)	(0.011)	(0.017)	(0.017)	(0.017)
Quick	−0.002	−0.002	−0.000	0.052***	0.050***	0.053***
	(0.007)	(0.007)	(0.007)	(0.010)	(0.010)	(0.011)
Capex	−0.002	−0.001	−0.001	−0.008	−0.008	−0.012
	(0.004)	(0.004)	(0.004)	(0.008)	(0.008)	(0.008)
Leverage	0.000	0.000	0.000	−0.008***	−0.008***	−0.009***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
ROE	−0.000	−0.000	−0.000	−0.002**	−0.002**	−0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	−0.109	−0.049	−0.035	−1.403***	−1.474***	−1.655***
	(0.216)	(0.214)	(0.216)	(0.342)	(0.340)	(0.341)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2836	2836	2756	2836	2836	2756
Adjusted R^2	0.015	0.014	0.017	0.050	0.052	0.058

Please refer to the text for detailed variable definitions. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

OUTPUT, T5 EXIN and T5 ININ) in Top 5 COVID-affected economies, and (3) firm's multinationality based on the physical location of firm's subsidiaries as per the ABHK classification. We expect firms with more international exposure to react more negatively to the effect of COVID-19 announcement than firms with less international exposure in the short-run. We also expect that firms with higher international exposure and multinationality to be more robust to the effect of COVID-19 in the long-run, due to the benefit of geographical diversification.

We include firm size, quick ratio, leverage, capital expenditure and return on equity as control variables. Firm size, liquidity (proxied by *QUICK*) and firm's profitability (proxied by *ROE*) are expected to be positively associated with SCARs. This is because larger firms with higher levels of liquidity will more likely be resilient to economic shocks. Firms with greater leverage and capital expenditure levels are likely to be negatively hit by this economic shock as COVID-19 is expected to affect the level of funds available to sustain future expenditure and growth.

4. Results and discussions

4.1. Event study

Table 2 Panel A presents the results from the event study of WHO's announcement on the 30th January 2020 that COVID-19 is now a global health emergency of international concern. Overall, the market reaction of this announcement is significantly negative. Following Coutts et al. (1995) and Aybar and Ficici (2009), we report the standardized CARs (SCARs) to correct for serial correlation of daily abnormal returns for the same firm. On day 0, the mean SCARs are −0.252 which is significant at the 1% level according to the test statistic. The significant negative reactions remain after day 0, with mean SCARs for the (−1, +1), (−3, +3) and (−5, +5) event windows of (−0.276), (−0.243) and (−0.250), respectively. The findings of negative abnormal returns are consistent with early studies such as Ramelli and Wagner (2020), Liu et al. (2020), and Heyden and Heyden (2020) although the exact event dates investigated are different.

In the long-run, SCARs for the (0, +30) and (0, +42) event windows remain negative and statistically significant. However, the SCARs (0, +30) of (−0.104) have reduced to (−0.051) at the event window of (0, +42) which suggest a reversal in the negative market reaction in the long-run. Our findings of the reversal are consistent with Huo and Qiu (2020) who investigate the impact of COVID-19 lockdown on the Chinese stock market. The market may have overreacted initially to the announcement. The uncertainties surrounding the spread of the virus coupled with the fear of spill over effect to the global economy may have contributed to this overreaction.

Panel B reports the SCARs analysis by the 2-digit industry SIC codes. In the short-run (−5,+5) event window, the wholesale trade industry experienced the greatest negative mean SCARs of (−0.567), followed by the mining industry exhibiting mean SCARs of (−0.524). This is not surprising given the nature of the announcement. These industries are highly exposed to the global economy due to reliance on the global supply chains for imports and exports. For the mining industry, the price of the commodity depends critically on the global supply and demand of the commodity. On the other hand, the sector with the least negative mean SCARs of (−0.101) is the services industry which are primarily domestic and relies less on the global supply chain.

In the longer run (0,+30), the mean SCARs remain negative for all industries. The more negative SCARs are concentrated in mining (−0.282) and construction industries (−0.226) as demand for these industries have been dampened by the effect of COVID-19 in the long-run. Interestingly, the manufacturing industry has the second least negative

Table 4
Additional analysis: Offshoring network.
This table reports the results of the cross-sectional regression: *SCARs* (−5,+5) = $\beta_0 + \beta_1(INTEXP) + \beta_2(SIZE) + \beta_3(QUICK) + \beta_4(CAPEX) + \beta_5(LEVERAGE) + \beta_6(ROE) + \beta_7(IND\ DUMMIES) + \varepsilon$, where the dependent variable in Columns (1) to (4) is, *SCARs* is the standardized cumulative abnormal returns within the event window (−5,+5), *INTEXP* is international exposure as proxied by the four Hoberg and Moon (2017) offshore activities variables tailored to the Top 5 Covid-affected economies (T5 OUTPUT, T5 INPUT, T5 ININ and T5 EXIN). *SIZE* is the log of market capitalization, *QUICK* is cash and short-term investments and receivables divided by total assets, *CAPEX* is total capital expenditure divided by total assets, *LEVERAGE* is total debt divided by total assets and *ROE* is return on equity as a proxy of firm's profitability. We also for control for industry dummies. We then rerun the same regression replacing SCARs (−5,+5) with SCARs (0,+30) in Columns (5) to (8). Robust standard errors are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SCARs	SCARs	SCARs	SCARs	SCARs	SCARs	SCARs	SCARs
	(−5,+5)	(−5,+5)	(−5,+5)	(−5,+5)	(0,+30)	(0,+30)	(0,+30)	(0,+30)
T5 INPUT	−0.007***				0.006***			
	(0.002)				(0.002)			
T5 OUTPUT		−0.004***				0.004		
		(0.002)				(0.003)		
T5 ININ			−0.011***				0.005	
			(0.003)				(0.004)	
T5 EXIN				−0.025***				0.032**
				(0.009)				(0.016)
Size	−0.028**	−0.028**	−0.028**	−0.029**	0.051***	0.050***	0.051***	0.052***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.018)	(0.018)	(0.018)	(0.018)
Quick	0.000	0.001	0.000	0.001	0.060***	0.059***	0.059***	0.059***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.011)	(0.011)	(0.011)	(0.011)
Capex	−0.004	−0.004	−0.003	−0.004	−0.016**	−0.016**	−0.016**	−0.016**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.007)	(0.007)	(0.007)	(0.007)
Leverage	0.002	0.002	0.002	0.002	−0.008***	−0.008***	−0.008***	−0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
ROE	−0.000	−0.000	−0.000	−0.000	−0.002***	−0.002***	−0.002***	−0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.440*	0.429*	0.438*	0.449*	−1.704***	−1.694***	−1.699***	−1.719***
	(0.230)	(0.231)	(0.230)	(0.231)	(0.355)	(0.355)	(0.355)	(0.354)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2464	2464	2464	2464	2464	2464	2464	2464
Adjusted R^2	0.018	0.015	0.019	0.015	0.048	0.047	0.047	0.048

Please refer to the text for detailed variable definitions. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

long-run mean SCARs (−0.076) suggesting that the market views the negative effect from COVID-19 as temporary and has a more positive outlook of the recovery for this industry in the long-run. We rerun the analysis using market adjusted model and we find that the results remain robust.

Panel C examines the SCARs by international exposure and multi-nationality with a short-run (−5,+5) and a long-run (0,+30) window. In the short-run, firms with foreign sales or foreign assets have significantly larger negative mean SCARs (difference of −0.104 and -0.115, respectively) than firms without. When we extend the event window to SCARs (0,+30), we observe the opposite effect. We find that firms with foreign sales or foreign assets exhibit less negative long-run SCARs than those without. This highlights that while firms with international exposure are susceptible to international shock triggered by COVID-19, the outlook of these firms becomes less negative in the long-term due to the geographical diversification of these countries. It is interesting to note that the magnitude of mean SCARs is similar for both firms with foreign sales or foreign assets although owning foreign assets would signify more tangible international involvement.

Next, we split the sample into two groups, that is, firms with sales and/or assets in COVID-19 affected economies[11] in their Top 3 geographical segments and those without. We find that firms with sales and/or assets in COVID-19 affected economies have more negative mean (difference of −0.218) SCARs at the 1% level than their counterpart. The magnitude of the SCARs for firms with sales and/or assets in COVID-19 affected economies (−0.418) is also greater than foreign sales (−0.310) and foreign assets (−0.329) that are not specific to COVID-19 affected economies. This suggests that the geographical diversification benefits are limited if firms have most of their operations in COVID-19 affected economies. The geographical diversification benefits will have greater weight if firms also have sales or assets in non-COVID-19 affected economies in their Top 3 geographical segments prior to the event date.

Next, we analyze the SCARs by Hoberg and Moon's (2017) four offshore activities variables. We create four offshore activity variables based on whether the sample firms have import activities (T5 INPUT), export activities (T5 OUTPUT), have both import activities and assets (T5 ININ), have import activities but not assets (T5 EXIN) in the Top 5 COVID-19 affected economies as at the 30th January 2020 (namely, China, Hong Kong, Thailand, Japan and Singapore) based on number of mentions of these economies in their 10-K reports. Consistent with our previous findings with foreign sales and foreign assets, the results show that firms that import more from or export to the Top 5 COVID-19 affected economies have significantly more negative SCARs in the short- run but less negative SCARs in the long-run relative to their counterparts. In the further subsample of T5 EXIN and T5 ININ, we find that firms with both imports and assets in the same Top 5 COVID-19 affected economies (T5 ININ) display less negative SCARs in the long-run while the SCARs of those without foreign assets in the same

[11] As reported in Section 2 of this paper, the COVID-19 affected economies on 30th January 2020 based on WHO report are China (including Hong Kong, Macau, Taipei), Japan, South Korea, Vietnam, Singapore, Malaysia, Cambodia, The Philippines, Thailand, Nepal, Sri Lanka, India, United States of America, Canada, France, Finland, Germany and the United Arab Emirates.

Table 5
Additional analysis: ABHK Index and foreign subsidiaries.
This table reports the results of the cross-sectional regression: $SCARs\ (-5,+5) = \beta_0 + \beta_1(INTEXP) + \beta_2(SIZE) + \beta_3(QUICK) + \beta_4(CAPEX) + \beta_5(LEVERAGE) + \beta_6(ROE) + \beta_7(IND\ DUMMIES) + \varepsilon$, where the dependent variable, *SCARs* is the standardized cumulative abnormal returns within the event window (−5,+5), *INTEXP* is international exposure as proxied by a multinationality classification system of Aggarwal et al. (2011), hereafter, ABHK Index. According to this Index, the world is divided into six regions, namely, Africa, Asia, Europe, North America (including Central America), South America, and Oceania (Australia, New Zealand and the Pacific islands). a firm with activities in the same region that its headquarters are located is classified as regional (R). A firm with activities in more than one region is considered trans-regional (T) and this is then subdivided into T2 (two regions), T3 (three regions), T4 (four regions) and T5 (five regions). The ABHK Index ranges from 1 (Domestic) to 7 (Global). In Column 2 and 3, the international exposure proxies are the proportion of subsidiaries in Top 5 COVID-19 affected economies (PROP T5) and the proportion subsidiaries in China (CHINA), respectively. *SIZE* is the log of market capitalization, *QUICK* is cash and short-term investments and receivables divided by total assets, *CAPEX* is total capital expenditure divided by total assets, *LEVERAGE* is total debt divided by total assets and *ROE* is return on equity as a proxy of firm's profitability. We also for control for industry dummies. We then rerun the same regression replacing SCARs (−5,+5) with SCARs (0,+30) in Columns (4) to (6). Robust standard errors are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
	SCARs	SCARs	SCARs	SCARs	SCARs	SCARs
	(−5,+5)	(−5,+5)	(−5,+5)	(0,30)	(0,30)	(0,30)
ABHK	−0.029			0.101**		
	(0.028)			(0.046)		
PROP T5		−0.791***			1.109**	
		(0.283)			(0.534)	
CHINA			−0.780**			0.715
			(0.303)			(0.650)
Size	−0.006	0.001	−0.004	0.078*	0.078*	0.089*
	(0.026)	(0.027)	(0.027)	(0.046)	(0.047)	(0.046)
Quick	−0.006	0.010	0.003	0.224***	0.188***	0.198***
	(0.027)	(0.023)	(0.025)	(0.061)	(0.054)	(0.056)
Capex	−0.010	−0.005	−0.004	−0.006	−0.016	−0.016
	(0.013)	(0.013)	(0.013)	(0.025)	(0.025)	(0.025)
Leverage	0.003	0.002	0.002	−0.007	−0.006	−0.007
	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)
ROE	0.002	0.001	0.001	0.005	0.006	0.005
	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.006)
Constant	0.034	−0.185	−0.085	−4.059***	−3.804***	−4.013***
	(0.619)	(0.626)	(0.626)	(1.161)	(1.180)	(1.177)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	498	498	498	498	498	498
Adjusted R^2	0.040	0.049	0.046	0.087	0.085	0.080

Please refer to the text for detailed variable definitions. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

economy (T5 EXIN) remain more negative.[12] The benefit of operational hedging from ININ, that is, having income and expenses in the same economies and currencies, seem to be viewed more favourably by the market in the long-run.

Finally, we investigate a subsample based on the physical location of sample firms' subsidiaries, that is the ABHK index. We create two groups of firms – one with ABHK Index greater than one (Multinational ABHK) and one with ABHK Index equal to one (Domestic ABHK). Consistent with previous findings, we find that multinational ABHK firms initially have more negative SCARs in the short-run (−0.207) but less negative SCARs in the long-run (0.009), relative to domestic firms. When we divide the sample into (1) firms with subsidiaries in Top 5 COVID-19 affected economies and (2) firms with subsidiaries in China versus those without. We find robust evidence that the market reactions are significantly more negative in the short-run but less negative in the long-run. This could be due to the decreasing COVID-19 cases in China by the end of February signalling better economic recovery in the longer term. Overall, the univariate analysis suggests that firms with international exposures or are multinational are negatively affected by the effect of COVID-19 in the short-run but appear more resilient in the long-run.

4.2. Cross-sectional analysis

Table 3 reports the cross-sectional regression results examining the association between international exposure and SCARs. We find that firms with greater proportions of foreign sales or foreign assets experience more negative SCARs (−5,+5), significant at the 1% level, in columns (1) and (2), respectively. Consistent with our univariate evidence, this suggests that as COVID-19 spreads, investors are more concerned about the performance of firms with international exposures. In column (3), we also find negative association with SCARs (−5,+5) when firms have sales and/or assets in more COVID-19 affected economies in their Top 3 geographic segments. This negative association is likely due to the lack of geographic diversification when it comes to COVID-19. We also run the regression over different event windows, that is, SCARs (−1,+1) and SCARs (−3,+3), and the results remain robust.[13]

In the longer run foreign assets and firms with sales or assets in COVID-19 affected economies (in their Top 3 geographical segments) remain negative and significantly associated with SCARs (0, +30) at the 10% level. However, foreign sales have a positive magnitude and are no longer significant. This could be due to foreign assets being harder to dispose compared to the re-direction of foreign sales to another country. As for control variables, we find that firm size (log market value) and liquidity (quick) are positively associated with long-run SCARs. Leverage (debt/assets) is negatively associated with long-run SCARs, this result is expected as highly levered firms are more susceptible to

[12] Hoberg and Moon (2017) noted that INPUT may not equal to EXIN plus ININ as there are some observations where the sources (internal or external) of input cannot be determined.

[13] Tables unreported but available upon request.

Table 6

Robustness analysis.

We repeat the regression analyses reported in Tables 3 to 5 by employing the *SCARs* estimated using equal-weighted market returns: *SCARs* (−5,+5) or *SCARs (0,+30)* $= \beta_0 + \beta_1(INTEXP) + \beta_2(SIZE) + \beta_3(QUICK) + \beta_4(CAPEX) + \beta_5(LEVERAGE) + \beta_6(ROE) + \beta_7(IND\ DUMMIES) + \varepsilon$, where the dependent variable, *SCARs* is the standardized cumulative abnormal returns within the event window (−5,+5) or (0,+30). In Panel A, *INTEXP* is proxied by Foreign Sales (FSales), Foreign Assets (FAssets) and number of Covid-affected economies in Top 3 geographic segments (Covid T3), respectively. In Panel B, *INTEXP* is proxied by the four Hoberg and Moon (2017) offshore activities variables, tailored to the Top 5 Covid-affected economies (*T5 OUTPUT, T5 INPUT, T5 ININ* and *T5 EXIN*). In Panel C, *INTEXP* is proxied by ABHK Multinationality Index, proportion of subsidiaries in Top 5 COVID-19 affected economies and the proportion of subsidiaries in China, respectively. The control variables included are as per Tables 3–5. Robust standard errors are reported in parentheses.

Panel A: Foreign sales & assets

	(1)	(2)	(3)	(4)	(5)	(6)
	SCARs	SCARs	SCARs	SCARs	SCARs	SCARs
	(−5,+5)	(−5,+5)	(−5,+5)	(0,+30)	(0,+30)	(0,+30)
FSales	−0.157**			0.124		
	(0.073)			(0.140)		
FAssets		−0.255*			−0.389	
		(0.143)			(0.322)	
Covid T3			−0.140***			−0.091
			(0.040)			(0.071)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2836	2836	2756	2836	2836	2756
Adjusted R^2	0.012	0.012	0.015	0.045	0.046	0.053

Panel B: Offshoring activities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SCARs	SCARs	SCARs	SCARs	SCARs	SCARs	SCARs	SCARs
	(−5,+5)	(−5,+5)	(−5,+5)	(−5,+5)	(0,+30)	(0,+30)	(0,+30)	(0,+30)
T5 INPUT	−0.006***				0.007***			
	(0.002)				(0.003)			
T5 OUTPUT		−0.004**				0.003		
		(0.002)				(0.003)		
T5 ININ			−0.011***				0.006	
			(0.003)				(0.004)	
T5 EXIN				−0.026***				0.030*
				(0.009)				(0.017)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2464	2464	2464	2464	2464	2464	2464	2464
Adjusted R^2	0.012	0.009	0.012	0.009	0.052	0.051	0.051	0.051

Panel C: ABHK and foreign subsidiaries

	(1)	(2)	(3)	(4)	(5)	(6)
	SCARs	SCARs	SCARs	SCARs	SCARs	SCARs
	(−5,+5)	(−5,+5)	(−5,+5)	(0,+30)	(0,+30)	(0,+30)
ABHK	−0.024			0.100**		
	(0.028)			(0.046)		
PROP T5		−0.700**			1.181**	
		(0.278)			(0.549)	
CHINA			−0.729**			0.755
			(0.291)			(0.657)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	498	498	498	498	498	498
Adjusted R^2	0.038	0.046	0.044	0.099	0.099	0.093

Please refer to the text for detailed variable definitions. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

economic shocks.

We further include the four offshore activity variables based on Hoberg and Moon (2017) as proxies for the location of international exposure, namely, T5 INPUT, T5 OUTPUT, T5 EXIN and T5 ININ. These variables capture the number of mentions of the Top 5 COVID-affected economies in relation to their offshore activities, as defined in Section 4.1. Table 4 reports the results of the regressions. In the short-run (−5,+5), we find that firms with T5 INPUT, T5 OUTPUT, T5 ININ, and T5 EXIN in the Top 5 COVID-affected economies are significant (at the 1% level) and negatively associated to SCARs in columns (1) to (4), respectively. These results suggest that firms with offshore activities are negatively affected by the effect of COVID-19 pandemic. Conversely, we

observe an opposite effect in the longer run (0,+30), where the positive association between T5 INPUT and T5 EXIN are significant at the 5% level. These findings are consistent with our results reported in Table 3.

Finally, we rerun the analysis by ABHK foreign subsidiary location. The results are reported in Table 5. We find that firms that are more multinational (with higher ABHK Index) are more resilient to market shock in the short-run SCARs (−5,+5) where the negative association is not statistically significant (Column 1). In the longer run, the association between ABHK Index and SCARs (0,+30) is positive and statistically significant at the 5% level (Column 4). This shows that the more multinational the firm, the more resilient they are to market shocks such as COVID-19. We further rerun the analysis investigating (i) Proportion of subsidiaries in Top 5 COVID-19 affected economies *(PROP T5)* and (ii) Proportion of subsidiaries in China *(CHINA)*. We again find a negative association between these variables in the short-run in Columns (2) and (3) and positive association between proportion of subsidiaries in Top 5 COVID-19 affected economies in the long-run (as shown in Column 5). The proportion of Chinese subsidiaries becomes positive in the long-run (Column 6) as the Chinese government improves measures to counter the effect of COVID-19, however, the association is not statistically significant. Our findings for this sub-sample are largely consistent with our international exposure analysis reported in Table 3 and offshore activities analysis in Table 4.

Taken together, the negative associations between the various international exposure proxies (namely, FSALES, FASSETS, COVID T3, T5 INPUT, T5 OUTPUT, T5 ININ, T5 EXIN, Prop T5 and CHINA) and short-run SCARs (−5,+5) of U.S. firms is consistent with the findings of Olibe et al. (2008) and Krapl (2015) where they find that internationalization has exposed firms to more systematic risks. However, in the long-run, we observe a reversal of such effects where the association between international exposure (namely, T5 INPUT, T5 EXIN, ABHK and PROP T5) and long-run SCARs (0, +30) become positive. These findings are more in line with Zhao et al. (2015) where firms with operations in multiple countries benefit from the geographic diversification.

4.3. Robustness tests

For robustness tests, we repeat the regression analyses reported in Tables 3 to 5 by employing the SCARs estimated using equal-weighted market returns with the event windows of (−5, +5) and (0,+30). The results are reported in Table 6. We find that the results are similar to those reported in the main analysis. In Panel A, foreign sales and foreign assets are significant and negatively associated with SCARs (−5,+5). When firms have more foreign sales or foreign assets in COVID-19 affected economies in their Top 3 geographical segments, we similarly find a negative association with SCARs (−5,+5). Unlike the main analysis, the association between these international exposure variables with the long-run SCARs (0,+30) are not significant.

As for the four Hoberg and Moon (2017) offshoring activity variables, tailored to the Top 5 COVID-affected economies (T5 OUTPUT, T5 INPUT, T5 ININ and T5 EXIN), we find evidence consistent with our main analysis (both in the short-run and long-run). The results are reported in Table 6 Panel B. Firms' offshore activities in the Top 5 COVID-19 affected economies are found to be negatively associated with SCARs in the short-run and for T5 INPUT and T5 EXIN positive in the long-run.

In Panel C, we observe that although firms' multinationality as captured by ABHK index is not associated with short-run SCARs, the associations between SCARs (−5,+5) and (i) the proportion of subsidiaries in the Top 5 COVID-19 affected economies, and (ii) the proportion of Chinese subsidiaries are negative and significant. This shows the benefit of geographical diversification where firms are only impacted negatively when they have subsidiaries in COVID-19 affected economies. In the long-run, we find that both ABHK and proportion of subsidiaries in the Top 5 COVID-19 affected economies are positive and significant, indicating that being multinational is beneficial in the long-run when recovering from economic crisis.

Finally, we repeat our analysis using (i) SCARs estimated from the market-adjusted model and (ii) Value-weighted non-standardized CARs.[14] We find that the results from these analyses are largely similar to the main analysis. Overall, our robust results suggest that international exposures proxied by various measures are generally negatively (positively) associated with SCARs in the short-run (long-run).

5. Conclusion

In this paper, we investigate stock market reaction to the WHO's announcement of COVID-19 being a global health emergency by employing an event study methodology. We further examine the association between firm's international exposure and multinationality in this context. Our findings show that while international exposure through foreign sales, foreign assets, imports and exports are significant and negatively associated with SCARs in the short-run, the effect reverses in the long-run. In our subsample analysis, firms that are more multinational in their foreign operations (proxied by location of physical subsidiaries) are more resilient to global shocks of this nature. In the short-run, multinationality is not significantly associated with SCARs but in the long-run multinationality is significantly positive in explaining SCARs. This paper highlights the importance of geographical diversification in the context of international economic shocks in the long-run (Bodnar et al., 1999; Gande et al., 2009; Zhao et al., 2015). Our findings also support the argument that globalization and international trade makes multinational firms more resilient to economic shocks from the COVID-19 pandemic.

The COVID-19 outbreak has brought uncertainty into the financial markets and beyond. From an economic and financial perspective, it has resulted in the slowing of the flow of trade and investment in the short-run. On one hand it highlights the downside of global integration and how vulnerable a globalised economy can be, but we need to be reminded that openness to international trade and investment have also contributed to decades of global economic growth and higher standards of living. The longer-term effect of COVID-19 remains to be seen. Global diversification and economic cooperation are perhaps what is needed to ride out the crisis and achieve financial stability.

References

Aggarwal, R., Berrill, J., Hutson, E., & Kearney, C. (2011). What is a multinational corporation? Classifying the degree of firm-level multinationality. *International Business Review, 20*, 557–577.

Altman, S. A. (2020). Will Covid-19 have a lasting impact on globalization? *Harvard Business Review*. Retrieved from https://hbr.org/2020/05/will-covid-19-have-a-lasting-impact-on-globalization (20 May 2020).

Ashraf, B. N. (2020). Stock markets' reaction to COVID-19: Cases or fatalities? *Research in International Business and Finance, 54* (forthcoming).

Asquith, P. (1983). Merger bids, uncertainty, and stockholder returns. *Journal of Financial Economics, 11*(1–4), 51–83.

Aybar, B., & Ficici, A. (2009). Cross-border acquisitions and firm value: An analysis of emerging-market multinationals. *Journal of International Business Studies, 40*, 1317–1338.

Baker, S. R., Bloom, N., Davis, S. J., Kost, K. J., Sammon, M. C., & Viratyosin, T. (2020). The unprecedented stock market impact of COVID-19. In *NBER Working Paper No. 26945*. Retrieved from https://www.nber.org/papers/w26945.pdf.

Baker, S. R., Bloom, N., Davis, S. J., & Terry, S. J. (2020). COVID-induced economic uncertainty. In *NBER Working Paper No. 26983*. Retrieved from https://www.nber.org/papers/w26983.

Baldwin, R. (2020). The supply side matters: Guns versus butter, COVID-style. *VOX CEPR Policy Portal* (22 March 2020). Retrieved from https://voxeu.org/article/supply-side-matters-guns-versus-butter-covid-style.

Baldwin, R., & Evenett, S. (2020). COVID-19 and trade policy: Why turning inward won't work. *VOX Centre of Economic Policy Research (CEPR)* (29 April 2020). Retrieved from https://voxeu.org/content/covid-19-and-trade-policy-why-turning-inward-won-t-work.

Bodnar, G. M., Weintrop, J., & Tang, C. (). *Both sides of corporate diversification: The value impacts of geographic and industrial diversification (December 1999)*. Available at SSRN: https://ssrn.com/abstract=217869 https://doi.org/10.2139/ssrn.217869.

[14] These additional results tables are available upon request.

Chung, K. H., Wright, P., & Charoenwong, C. (1998). Investment opportunities and market reaction to capital expenditure decisions. *Journal of Banking & Finance, 22*(1), 41–60.
Coutts, J. A., Mills, T. C., & Roberts, J. (1995). Testing cumulative prediction errors in event study methodology. *Journal of Forecasting, 14*(2), 107–115.
David, S. A., Inacio, C. M. C., Jr., & Tenrero Machado, J. A. (2021). The recovery of global stock markets indices after impacts due to pandemics. *Research in International Business and Finance, 55* (forthcoming).
Denis, D. J., Denis, D. K., & Yost, K. (2002). Global diversification, industrial diversification, and firm value. *Journal of Finance, 57*, 1951–1979.
Fatemi, A. M. (1984). Shareholder benefits from corporate international diversification. *Journal of Finance, 39*(5), 1325–1344.
Florio, M., & Manzoni, K. (2004). Abnormal returns of UK privatizations: From underpricing to outperformance. *Applied Economics, 36*, 119–136.
Gande, A., Schenzler, C., & Senbet, L. W. (2009). Valuation effects of global diversification. *Journal of International Business Studies, 40*(9), 1515–1532.
Heyden, K. J., & Heyden, T.. Market reactions to the arrival and containment of COVID-19: An event study. Available at SSRN: https://ssrn.com/abstract=3587497.
Hoberg, G., & Moon, S. K. (2017). Offshore activities and financial vs. operational hedging. *Journal of Financial Economics, 125*, 217–244.
Huo, X., & Qiu, Z.. How does China's stock market react to the announcement of the COVID-19 pandemic lockdown? (May 23, 2020). Available at SSRN: https://ssrn.com/abstract=3594062.
Hutson, E., & Laing, E. (2014). Foreign exchange exposure and multinationality. *Journal of Banking & Finance, 43*, 97–113.
Kim, Y. S., & Mathur, I. (2008). The impact of geographic diversification in firm performance. *International Review of Financial Analysis, 17*, 747–766.
Krapl, A. A. (2015). Corporate international diversification and risk. *International Review of Financial Analysis, 37*, 1–13.
Liu, H. Y., Manzoor, A., Wang, C. Y., Zhang, L., & Manzoor, Z. (2020). The COVID-19 outbreak and affected countries stock markets response. *International Journal of Environmental Research and Public Health, 17*, 2800.
Lyocsa, S., Baumohl, E., Vyrost, T., & Molnar, P. (2020). Fear of the coronavirus and the stock markets. *Finance Research Letters, 36* (forthcoming).
Markides, C. C., & Ittner, C. D. (1994). Shareholder benefits from corporate international diversification: Evidence from US international acquisitions. *Journal of International Business Studies, 25*(2), 343–366.
Olibe, K. O., Michello, F. A., & Thorne, J. (2008). Systematic risk and international diversification: An empirical perspective. *International Review of Financial Analysis, 17*, 681–698.
Pandey, D. K., & Kumari, V. (2021). Event study on the reaction of the developed and emerging stock markets to the 2019-nCoV outbreak. *International Review of Economics and Finance*, 467–483.
Qian, G., Khoury, T. A., Peng, M. W., & Quan, Z. (2010). The performance implications of intra- and inter-regional geographic diversification. *Strategic Management Journal, 31*, 1018–1030.
Ramelli S and Wagner, A.F. (2020). Feverish stock price reactions to COVID-19. Review of Corporate Finance Studies, Forthcoming. Available at SSRN: https://ssrn.com/abstract=3550274.
Reeb, D. M., Kwok, C. C. Y., & Baek, H. Y. (1998). Systematic risk of the multinational corporation. *Journal of International Business Studies, 29*, 263–279.
Rowland, P. F., & Tesar, L. L. (2004). Multinationals and the gains from international diversification. *Review of Economic Dynamics, 7*(4), 789–826.
Shapiro. (1978). Financial structure and cost of capital in multinational corporation. *Journal of Financial and Quantitative Analysis, 13*, 211–226.
The Economist (2020). Has COVID-19 killed globalization? (14 May 2020). Retrieved from https://www.economist.com/leaders/2020/05/14/has-covid-19-killed-globalisation.
World Health Organization (2020a). Novel Coronavirus(2019-nCoV) Situation Report – 10, (30 January 2020). Retrieved from https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200130-sitrep-10-ncov.pdf?sfvrsn=d0b2e480_2.
World Health Organization (2020b). Novel Coronavirus(2019-nCoV) Situation Report – 147, (15 June 2020). Retrieved from https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200615-covid-19-sitrep-147.pdf?sfvrsn=2497a605_4.
Zhao, X., Jiang, X., & Li, Z. (2015). The impact of economic crisis on the financial performance of multinational corporations. *International Review of Economics and Finance, 37*, 55–68.