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Corporate immunity, national culture and stock returns: Startups amid the COVID-19 pandemic

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\textbf{A B S T R A C T}

Small and medium-sized firms, particularly startups, are highly vulnerable to the COVID-19 pandemic because of their financial instability. Using a sample of listed startups across four countries, we investigate whether a startup's built-up capacity pre-COVID-19 can stimulate corporate immunity to endure the impact of the COVID-19 pandemic, reflected via stock performance. We find that the increase in the accumulated COVID-19 confirmed cases worsens stock returns and that the negative effect is alleviated if startups are greater in size as well as have low debt, large board size and CEO duality. Moreover, national cultural dimensions significantly moderate the relationship between stock returns and COVID-19. The COVID-19 negative impact is relieved in societies where people are more collectivistic and cooperative, less tolerant towards uncertainty, and more long-term oriented. Overall, our results support the consolidation of corporate capacities and suggest policymakers consider national culture when formulating COVID-19 or similar infectious pandemic strategies.

\textbf{1. Introduction}

The world has been witnessing a large-scale economic depression under the effect of the COVID-19 pandemic caused by a type of coronavirus firstly discovered in China's Hubei province. By the end of June 2020, over 10 million people had been infected and over 500,000 lives had been lost (WHO, 2020). As of October 2021, the pandemic continues and still shows no sign of being suppressed in the near future. Along with other studies focusing on the economic impacts of the pandemic, a handful of papers have examined the effect of the pandemic on stock returns (Al-Awadhi, Al-Saifi, Al-Awadhi, & Alhamadi, 2020). The literature shows that by the time an infectious disease spreads, stock returns are negatively affected (Chen, Chen, Tang, & Huang, 2009; Ichev & Marinc, 2018). Recent empirical evidence suggests that the COVID-19 outbreak has caused stock markets to either fall (Topcu & Gulal, 2020) or experience increasing volatility (Zhang, Hu, & Ji, 2020). Baker et al. (2020) even assert that stock markets react to the COVID-19 pandemic to a much greater extent than any previous infectious disease.

The COVID-19 outbreak and strict actions from different nations (such as regional and national lockdowns) have dragged down economic activity on a global scale, in which small businesses are taking fatal hits. Bartik et al. (2020), from their survey of over 5800 U.S. small businesses in March 2020, find that businesses underwent an average personnel cut of 40% compared to January, and 43% of businesses are temporarily shut down. The lack of corporate preparedness for crisis scenarios and their effects (Bartik et al., 2020; Muñoz, Kimmitt, Kibler, & Farny, 2019) is a sad fact. In this paper, we pay exclusive attention to startup businesses, given their rapidly increasing contribution to global economic growth and their susceptibility to economic adversities. Indeed, from 2017 to the first half of 2019, worldwide startups created roughly $3 trillion in value, which is equivalent to a G7 economy's GDP (Startup Genome, 2020). They are also major drivers of job creation (e.g., Fairlie, Miranda, & Zolas, 2019; Kane, 2010) and account for productivity and output growth (e.g., Haltiwanger, Jarmin, Kulick, & Miranda, 2016).

On the flip side, it is equally important to note that startups are young and usually have small revenue, operating deficits, constrained equity, and low survival chances (Damodaran, 2009). They are also perceived to be risk-takers and depend on small founder teams, thus escalating their exit threat in the face of a crisis (OECD, 2020). Due to the COVID-19 pandemic, rising uncertainty combined with global-scale
physical disruption give rise to financial distancing, further deepening startups' capital struggle (Howell, Lerner, Nanda, & Townsend, 2020; Kaplan & Stromberg, 2001). This difficult financial access threatens startups' survivability in consequence of capital shortage and discourages entrepreneurial intentions in the United States, Australia and European countries (Cole & Sokolyk, 2018; OECD, 2020; Startup Genome, 2020). Although many governments have taken short-term measures to protect the economy, there are concerns that policymakers focus on established corporations as the protection target during the COVID-19 pandemic rather than startups, i.e., trading-off future growth for present economic activity (Kückertz et al., 2020). Startups, therefore, are highly vulnerable during economic downturns.

The magnitude of the COVID-19 impact on each national economy may also be influenced by cultural variation. Previous studies show that societies characterized by strict social norms and a community-driven mindset respond better to adverse circumstances (Gelfand et al., 2011; Kitayama, Park, Sevincer, Karasawa, & Uskul, 2009). A systematic literature review on multiple facets of social and behavioral science pertinent to the COVID-19 pandemic by Van Bavel et al. (2020) also shows that culture shapes human mindset and behaviors, thus COVID-19 strategy should vary with cultural contexts.

This study examines the immunity of listed startups towards COVID-19 through the behavior of their weekly stock returns from the period from 31 January 31 to 29 May 2020, where the pandemic started to spread around the world. Corporate immunity is defined as the capacity of a firm before the contagion of the COVID-19 virus (Ding, Levine, Lin, & Xie, 2021). Using data of startups listed in the NASDAQ, CHINEXT, JASDAQ and KOSDAQ exchanges, we find that the wider the spread of COVID-19, the lower startups' stock returns. This effect is less severe in startups with greater size, lower debt-to-asset ratio, CEO duality, and rather larger board size during the pre-COVID-19 period. We also investigate the role of national culture in moderating the COVID-19 impact. In our setting, all six national cultural dimensions of Hofstede, Hofstede, and Minkov (2010) have significant moderating effects on the relationship between stock returns and COVID-19, suggesting that governments should take national culture into account when countering COVID-19 adversity. Our results are robust to different measures of COVID-19 impact and fixed effects.

Our study contributes to the existing literature in two main aspects. First, it is the first to view corporate immunity against the COVID-19 pandemic from startups' perspective. Although corporate immunity against the COVID-19 pandemic has been documented by Ding et al. (2021), their study targeted a much broader sample, including all active listed stocks in 56 countries. Other studies, such as Al-Awadhi et al. (2020) and Ramelli and Wagner (2020), address the direct impact of financial indicators such as cash holdings, leverage, market-to-book value, on stock returns without considering corporate immunity in their context. Second, our study sheds light on the role of national culture as a moderator of the COVID-19 impact. As national culture is a driver of human behavior (Karahanna, Evaristo, & Srite, 2005), it may, to some extent, predict the pattern of reactions of the society to the COVID-19 adversity and, thus, influence stock market returns.

The remainder of this paper is organized as follows. The next section reviews the literature on the impact of the pandemic and formulates the hypotheses. Section 3 presents the methodology and data used. Section 4 discusses the empirical results. Section 5 provides some concluding remarks.

2. Theoretical background

Infectious diseases, such as SARS and Ebola, are documented in the finance literature as having a negative impact on stock markets (Chen et al., 2009; Chou, Kuo, & Peng, 2004; Ichev & Marinčić, 2018). An increasing volume of research focusing on the impact of the COVID-19 pandemic on stock markets yields similar results. Al-Awadhi et al. (2020) find a negative relationship between the COVID-19 outbreak in China and stock returns of firms included in Hang Seng Index and Shanghai Stock Exchange Composite Index during the two months from 10 January 2020. The authors show a stronger effect of the pandemic on stocks with higher market capitalization. Stock value volatility has also been amplified during the pandemic. Zhang et al. (2020) attribute this rising volatility to risks associated with COVID-19 due to its uncertainty and negative effect on the global economy. The reaction of each stock market highly depends on the outbreak situation in each country. Ashraf (2020a, 2020b) adds that stock markets strongly react to the growth in COVID-19 confirmed cases, but the growth in the number of deaths does not evoke a similar significant reaction.

Baker et al. (2020) doubt that the unprecedented reactions of the U. S. stock market to the COVID-19 pandemic can be entirely attributed to the pandemic. They propose an explanation that not only the fatality of COVID-19 but also the government’s measures to counter the spread of the coronavirus contributes to the unprecedented reactions. Baker et al. (2020) further report that the timing of stock market jumps match the government’s policy adjustments, thus strengthening their postulate on the impact of government intervention on stock movements during the COVID-19 period. Endorsing this view using a canonical epidemiological model, Eichenbaum, Rebelo, and Trabandt (2020) report that, although the most appropriate policy of virus containment aggravates the economic depression, it protects around half a million people from fatality.

Given the sensitivity of startups and the overwhelming effect of the COVID-19 pandemic, we deduce Hypothesis 1 as follows:

Hypothesis 1. The COVID-19 pandemic has a negative effect on stock returns of startups.

The pre-crisis corporate built-up resources and skills to resist crises is a topic of interest in the crisis management literature (Doern, Williams, & Vorley, 2019; Korber & McNaughton, 2018). Although firm performance and valuations are much influenced by the COVID-19 pandemic because of interrupted economic activity and tightened internal/external capital, the magnitude of the influence depends on firms’ heterogeneity of capacity, i.e., corporate immunity (Ding et al., 2021).

First, we argue that corporates that have built-up financial capacity could guide startups through the COVID-19 pandemic. Although startups heavily depend on external capital to foster their growth, this practice is likely to harm the stock performance of startups when a crisis occurs (Ding et al., 2021; Ramelli & Wagner, 2020). Despite the fact that excessive cash holding is suspected to be a signal of agency problems, a high cash retention rate is desired when cash flow risk increases (Bates, Kahle, & Stulz, 2009). Adjusting cash holding is also a resolution by which small and medium businesses respond to economic downturns (Martinez-Sola, Garcia-Teruel, & Martinez-Solano, 2018). Small firms can either experience a shortage of resources, which drives them closer to an exit threat, or respond better to the crisis than medium and large firms thanks to their adaptability and flexibility (Smallbone, Deakins, Battisti, & Kitching, 2012).

Second, we examine whether the commitment to corporate social responsibility (CSR) helps startup stocks perform better during a pandemic. Although non-financial reporting is desired among investors (Eccles, Serafeim, & Kraus, 2011), the value of such disclosure is controversial. Dhillon, Li, Tsang, and Yang (2014) and Gao, Dong, Ni, and Fu (2016) find a positive relationship between CSR disclosure and economic benefit. Patemi, Glau, and Kaiser (2018) report a negative link between ESG disclosure and firm valuation. They also show that stock market reaction to corporate ESG disclosure reflects either investors’ appreciation for CSR transparency or their punishing for costly investments. Al-Dah, Dah, and Jizi (2018) argue that, during a crisis, firms earning a small profit and engaging in non-profitable activities are penalized by market participants.

Third, corporate governance is a useful practice to tighten corporate control and safeguard shareholders’ benefits, but it does not seem to improve firm performance and stock returns during a crisis (Gupta,
endure the pandemic, assessing the impact of this infectious disease tradeoff between their social life and communally collective effort to govern their economies from the effect in tight and interdependent societies. The prompt responses from small firms. 

kets. Using international samples, Ashraf (2021) and Fernandez-Perez, factor altering the impact of the COVID-19 pandemic on stock mar—

dimensions on stock market volatility. Studying the crash risk of stock returns has been highlighted in the literature. Aggarwal et al. 2021 ). Hence, government’s strategy to suppress the transmissible disease allows more room for individual discretion. Similarly, Van Bavel et al. (2020) suggest a greater liability of viral transmission in independent culture (e.g., North American and European societies) than interdependent culture (e.g., Asian societies) because the independent culture heavily stresses on individualism, self-expressivity and are less sensitive to unobserved situations precipitated by the viral infections. The inability to impose COVID-19 preventive measures in a timely manner among countries endorsing independent culture (e.g., the United States, the United Kingdom, and Germany) induces flatter curves and greater numbers of infection and fatality cases (Debecker & Modis, 2021). Hence, government’s strategy to suppress the transmissible disease is more timely implemented and more likely to show its expected effect in tight and interdependent societies. The prompt responses from governments should more or less shelter their economies from the negative impact of the global health crisis.

The evidence that national culture affects investors’ decisions and stock returns has been highlighted in the literature. Aggarwal et al. (2016, p. 446) emphasize that the cultural aspect influences “utilities of financial choices both at the individual level and, if frictions are present, at the firm and national levels”. Chang and Lin (2015), in their cross-country study, show stock market volatility caused by herding behavior is more common in Confucian stock markets and less sophisticated stock markets. Liu (2019) delves into the implied volatility under the impact of cultural dimensions proposed by Hofstede et al. (2010) in 15 major Western European and Asian equity markets. Using cross-sectional analysis, Liu (2019) confirms the intuitive role of all six cultural dimensions on stock market volatility. Studying the crash risk of stock price changes in multiple countries, An, Chen, Li, and Xing (2018) and Dang, Faff, Luong, and Nguyen (2019) support a significant positive association between individualism and crash risk and the amplification of this positive relationship during the 2008 financial crisis (An et al., 2018).

National culture is also viewed as an important country-specific factor altering the impact of the COVID-19 pandemic on stock markets. Using international samples, Ashraf (2021) and Fernandez-Perez, Gilbert, Indriawan, and Nguyen (2021) find that Hofstede’s cultural dimensions of individualism and uncertainty avoidance affect stock market volatility at early times of coronavirus outbreak, suggesting that cultural biases drive investor sentiment. Since members of a particular culture attach to its socially accepted behaviors, Hoang, Nguyen, & Hoang, 2021 further delve into the persistence of cultural effect on stock markets in two separate waves of COVID-19 contagion in various countries. They advocate a uniform inverse impact of the COVID-19 severity on firms’ stock returns given their pre-COVID-19 built-in immunity. Such impact in both waves of infection is moderated by the four original Hofstede’s cultural dimensions, namely power distance, individualism, masculinity, and uncertainty avoidance.

Hypothesis 3. National culture has a moderating effect on the relationship between startups’ stock returns and the COVID-19 pandemic.

All in all, it is worth examining the impact of the pandemic on startups’ stock returns to see whether corporate capacity and national culture play roles in attenuating the impact on the stock returns, thus providing implications for young firms to be prepared for such similar future events.

3. Methodology and data

3.1. Research design

To examine the corporate immunity - reflected through stock market performance - against the tremendous impact of the COVID-19 pandemic, we use the following models:

\[
Returns_{it} = \beta_0 + \beta_1 \text{Covid19}_{it} + \sum \beta_k (F_{F_{precovid} \times \text{Covid19}_{it}}) + \sum \beta_k (M_{F_{precovid} \times \text{Covid19}_{it}}) + \sum \beta_k (C_{F_{precovid} \times \text{Covid19}_{it}}) + f_i + f_{sta} + f_i + \epsilon_{it}.
\]

The dependent variable for this study is stock returns (\(\text{Returns}_{it}\)), which are computed as the percentage increase/decrease in the closing price of this week compared with last week. The variable of interest in this study is \(\text{Covid19}_{it}\), which measures the growth rate of accumulated COVID-19 confirmed cases in each country. The computation is shown below:

\[
\text{Covid19}_{it} = \ln(1 + \text{Covid19 confirmed cases}_{it}^c) - \ln(1 + \text{Covid19 confirm cases}_{it-1}^c),
\]

where \(\text{Covid19 confirmed cases}_{it}^c\) represents the number of accumulated cases in country \(c\) in week \(t\). Both \(\text{Return}_{it}\) and \(\text{Covid19}_{it}\) data are calculated from Saturday to Friday to match COVID-19 confirmed case announcements and stock price reactions.

We include three sets of variables to evaluate corporate immunity to COVID-19 and the reinforcement of macroeconomic and cultural factors to corporate immunity. The first set represents firm factors (\(F_{F_{precovid}}\)) and consists of three subsets: firm financial capacity, CSR commitment, and corporate governance practices. The subset of firm financial capacity includes four fundamental financial indicators used to capture corporate built-up immunity before the COVID-19 pandemic from the finance perspective: firm size (\(\text{Size}_{it}\)), leverage (\(\text{Leverage}_{it}\)), cash holding (\(\text{Cash}_{it}\)), and ROA (\(\text{ROA}_{it}\)). We compute \(\text{Size}_{it}\) by taking the natural logarithm of total assets by the end of the fiscal year 2019; \(\text{Leverage}_{it}\) is computed by dividing total debts to total assets; \(\text{Cash}_{it}\) equals cash and cash equivalents deflated by total assets; and \(\text{ROA}_{it}\) equals net income divided by total assets.

We do not have any prediction regarding the influence of firm size on the COVID-19 impact because although smaller firms with limited resources are more vulnerable to the health crisis, their flexibility allows them to adapt faster to ongoing circumstances (Smallbone et al., 2012). As financing activities of startups are heavily reliant on debt, reduced economic activities as a consequence of the COVID-19 crisis intensify their debt obligation, causing adverse effects on their stock performance. We thus expect a negative moderating effect of leverage on the
impact of COVID-19 transmission. High cash retention may protect startups from the crisis (Kahle & Stulz, 2013). However, it could also signify an agency problem since the building up of cash does not come from the precautionary motive given the sudden occurrence of the pandemic. For that reason, no conjecture on the effect of cash holding is made. Besides, the earnings of new and small firms are not stable and relevant to their market valuation (Balcaen & Ooghe, 2006; Garmsy, Stam, & Heffernan, 2006).

Although customer allegiance built from CSR activities seems to make CSR-active firms less susceptible to economic shocks (Albuquerque, Koskinen, & Zhang, 2019; Ding et al., 2021), the market may not pay the same appreciation if startups disclose CSR activities due to their low profitability (Al-Dah et al., 2018). This rationale guides us to the assembly of a subset of CSR commitment, comprising four indicators representing corporate commitment towards CSR. It assesses if CSR commitment could alleviate the impact of COVID-19 on stock returns. ESG precovid is the Bloomberg’s aggregate Environmental, Social and Corporate Governance disclosure score; EmDis precovid is the Bloomberg’s social disclosure score; and Ceobonus precovid is a dummy variable which takes value of one if a startup has a CSR-linked bonus policy for CEO and zero otherwise. The influence of CSR commitment on the relationship between stock returns and COVID-19 confirmed cases is unknown since market participants could either reward or punish CSR investments during the crisis (Fatemi et al., 2018).

In face of economic downturns, the implementation of recommended corporate governance principles does not necessarily insulate stock performance from the negative impact of economic downturns (Gupta et al., 2013; Van Essen et al., 2013). Since the effectiveness of corporate governance varies with firm size (Chhaochharia & Grinstein, 2007), we doubt that not all corporate governance practices are beneficial to startups during the COVID-19 pandemic due to their relatively small size. Our subset of corporate governance consists of three corporate governance variables which are employed to examine the efficacy of common governance mechanisms in maintaining stock performance during the pandemic. BS precovid equals the natural logarithm of the number of directors on board. IDOB precovid is the percentage of independent directors on board; and Duality precovid is a dummy variable which takes value of one if a startup has CEO duality and zero otherwise. As the literature does not provide apparent evidence whether strong corporate governance protects businesses from economic crises, we do not come up with any expected effect of aforementioned governance mechanisms. We, however, reckon that given the relatively small size of startups, allowing for managerial discretion during an economic recession to expedite initiative and decisive leadership would benefit startups (see, Van Essen et al., 2013).

As we measure the built-up capacities of startups before the occurrence of the COVID-19 pandemic, the value of each variable, FF precovid of each startup is unchanged during the investigation period. We use the data stated in the 2019 annual reports to compute the FF precovid Variables. To the extent that our objective is to observe the contribution of these traits to corporate immunity to withstand the pandemic, we are interested in the estimated coefficients, β, of the interactions between firm traits pre-COVID-19 and the growth rate of confirmed COVID-19 cases.

The second set, CF precovid, is to capture the national traits of each country. Using 2019 data, this set comprises two variables: GDPgrowth precovid and COVIDt precovid. A country with high GDP growth is in good development shape and has a better chance to restrain the impact of widespread COVID-19. Since the age group of 65 and above is more vulnerable to the virus, we add this demographic trait into the model and evaluate the coefficient, β, to observe whether the proportion in this age group alters the impact of COVID-19 on stock returns among startups in the sample.

The third set of variables (NC precovid) is inspired by the cultural discussion in Kitayama et al. (2009), Gelfand et al. (2011) and Van Bavel et al. (2020), who bring forth the idea that a society embedded with strict social norms is likely to deal better with (health) adversities. As a result of better responses to the adversities, the stock market would be less battered. This variable set concerns the moderating effect of national culture on the relationship between the COVID-19 pandemic and stock returns. We follow previous studies (An et al., 2018; Dang et al., 2019; Liu, 2019) and use national culture scores (Hofstede et al., 2010) as proxies for national cultural dimensions. The moderating impact of national culture is reflected via the coefficient βh.

To account for time-invariant differences among startups and time-variant differences among industries, we include time fixed effects (γt) and industry fixed effects (γiβu) in model (1). Because of distinctness in the economic conditions of each country, we add the country fixed effects (γi) to handle such distinct traits. A summary of the variables used in this study is presented in Table 1.

### 3.2. Sample selection

Stock returns and firm-level data are from the Bloomberg financial database. The macroeconomic variables data are from several sources. Weekly data of COVID-19 confirmed cases are synthesized by the Coronavirus Resource Center of Johns Hopkins University. The annual growth rate of GDP and the proportion of a population aged 65 or above are from the World Bank database; national culture dimensions, which reflect cultural aspects of the society in each country, are from Hofstede et al. (2010).

We select all listed startups on four stock exchanges: NASDAQ, CHINEXT, JASDAQ and KOSDAQ (see Table 2). NASDAQ is the largest

| Table 1 Definitions of the variables. |
|---------------------------------------|
| Variable | Definition |
| Returns | Weekly percentage change of closing stock price on Friday |
| Covid19 | Weekly growth rate of COVID-19 confirmed cases Saturday to Friday |
| Size | Natural logarithm of total assets |
| Leverage | Total debt deflated by total assets |
| Cash | Cash and cash equivalents deflated by total assets |
| ROA | Net income divided by total assets |
| ESG | Bloomberg’s ESG disclosure score |
| EmDis | Bloomberg’s Environmental disclosure score |
| SocialDis | Bloomberg’s Social disclosure score |
| Ceobonus | A dummy variable that equals 1 if a startup has a CSR-linked bonus policy for CEO and 0 otherwise |
| BS | Natural logarithm of the number of directors on board |
| IDOB | The proportion of independent directors on board |
| Duality | A dummy variable that equals 1 if a startup has CEO duality and 0 otherwise |
| GDPgrowth | Annual growth rate of Gross Domestic Product (GDP) |
| Over50popp | The proportion of people 65 years old or older in total population |
| PDI | Power distance index (Hofstede's cultural dimension) |
| IDV | Individualism index (Hofstede's cultural dimension) |
| MAS | Masculinity index (Hofstede's cultural dimension) |
| UAI | Uncertainty avoidance index (Hofstede's cultural dimension) |
| LTO | Long-term orientation index (Hofstede's cultural dimension) |
| IVR | Indulgence index (Hofstede's cultural dimension) |

Table 1 provides definitions of variables used in this study.

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1 There are two reasons that using Hofstede's national culture in our study is a good fit. First, we examine the effect of the COVID-19 pandemic on stock returns of startups across countries, which is an appropriate setting to employ Hofstede's culture. By incorporating country-fixed effects into the model (1), we separate the impact of culture from unobserved country characteristics to mitigate estimation bias. Second, since Hofstede et al. (2010) disaggregates national culture into six different dimensions, using Hofstede's culture data helps us better understand which specific cultural dimensions influence the impact of the COVID-19 pandemic on the returns.
First, GEM and CATALIST are small relative to the four selected exchange stock exchanges for startups with 2500 listed entities and the second largest stock exchange in the world by market capitalization. Over the sample period, the United States is the most affected country by COVID-19 and is still in the midst of the fight against its spread. CHINEXT, JASDAQ and KOSDAQ are three NASDAQ-like stock exchanges designed for startups in China, Japan and South Korea, respectively. Since China is the first country to impose rigorous lockdown measures to block coronavirus community transmission, CHINEXT (with 799 listed startups) should be the first startup stock exchange to react against the COVID-19 crisis. JASDAQ and KOSDAQ are, for their part, stock exchanges for startups worldwide with respectively 665 and 1419 active listed startups, which far exceeds other startup exchanges. The size and similarity to the NASDAQ of the four selected startup exchanges makes a coherent sample. We do not include GEM and CATALIST in our sample for two reasons. First, GEM and CATALIST are small relative to the four selected exchanges, and the market sizes of Hong Kong and Singapore are comparable to the United States, China, Japan and South Korea. Second, Hong Kong’s growing mass protests and violence since March 2019 could possibly generate a long-lasting effect on the stock market, which cannot be sufficiently addressed in this study.

Stock returns and COVID-19 data are from the week ending January 31, 2020 to the week ending May 29, 2020. Our sample initially consisted of 81,144 observations corresponding to 4508 firms listed on the four startup stock exchanges. Because of missing values of stock returns, 1488 observations were dropped. We also dropped 36 other observations because they have not been assigned a specific industry classification code. This leaves 79,620 observations of 4508 listed startups on NASDAQ, CHINEXT, JASDAQ and KOSDAQ in the final sample.

4. Empirical results

4.1. Descriptive statistics and correlation coefficient matrix

Table 3 reports the descriptive statistics for the variables used in this study. The period of investigation is from the week ending January 31, 2020 to the week ending May 29, 2020. All continuous variables are winsorized at 1% and 99% levels.

4.2. Tests of the impact of COVID-19 on stock returns

Table 5 lists the univariate regression of Returns on Covid19. We test this relationship with a range of fixed effects to account for unobserved heterogeneity among periods, industries and countries. There are significant, negative coefficients of Covid19 across tests with a variety of fixed effects, which suggests that growth in the number of confirmed COVID-19 cases would reduce corporate stock returns. This result is consistent with Al-Awadhi et al. (2020), Ashraf (2020a, 2020b), Ding et al. (2021) and validates Hypothesis 1.

4.3. Tests of the moderating effect of corporate immunity on the relationship between stock returns and COVID-19

4.3.1. Financial capacity

The effect of each interaction between the financial capacity variables and Covid19, on stock returns is shown in Panel A of Table 6. Separately evaluating each capacity, the interactions of Size × Covid19 and ROA × Covid19 are significantly positive, whereas the interaction between Leverage and Covid19 is significantly negative. However, in the estimates displayed in Table 6 Columns (5) and (6), only Leverage × Covid19 is robust; Size × Covid19 and ROA × Covid19 are no longer significant. This finding is different from Ding et al. (2021) who discover a significant role for cash holding and profitability, besides leverage, in building up corporate immunity against COVID-19 pandemic across 56 countries.
Table 4
Correlation coefficient matrix.

| Variables (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|
| (1) Returns  | 1.000 |     |     |     |     |     |     |     |
| (2) Covid19  | −0.202 | 1.000 |     |     |     |     |     |     |
| (3) Size     | −0.007 | 0.023 | 1.000 |     |     |     |     |     |
| (4) Leverage  | −0.012 | 0.034 | 0.226 | 1.000 |     |     |     |     |
| (5) Cash     | 0.015 | 0.045 | −0.311 | −0.288 | 1.000 |     |     |     |
| (6) ROA      | −0.010 | −0.080 | 0.390 | −0.666 | −0.371 | 1.000 |     |     |
| (7) ESG      | −0.011 | −0.013 | 0.408 | 0.052 | −0.186 | 0.222 | 1.000 |     |
| (8) EnvDis   | −0.001 | −0.027 | 0.348 | −0.016 | −0.007 | 0.179 | 0.954 | 1.000 |
| (9) SocialDis | −0.005 | −0.041 | 0.356 | 0.049 | −0.179 | 0.195 | 0.794 | 0.661 |
| (10) Credit  | −0.007 | 0.010 | 0.125 | 0.043 | −0.073 | 0.055 | 0.125 | 0.083 |
| (11) BS      | −0.003 | 0.009 | 0.567 | 0.238 | −0.223 | 0.173 | 0.277 | 0.237 |
| (12) IDOB    | 0.000 | 0.112 | 0.118 | 0.115 | 0.021 | −0.083 | −0.024 | −0.124 |
| (13) Duality | −0.003 | −0.025 | −0.065 | −0.056 | −0.012 | 0.067 | 0.000 | 0.042 |
| (14) GDPgrowth | 0.004 | −0.136 | 0.213 | −0.087 | −0.107 | 0.079 | −0.007 | −0.013 |
| (15) Over65pop | −0.013 | 0.043 | −0.192 | 0.012 | 0.170 | 0.046 | 0.075 | 0.179 |
| (16) PDI     | −0.001 | −0.241 | −0.039 | −0.134 | −0.196 | 0.299 | 0.066 | 0.113 |
| (17) IDV     | 0.000 | 0.224 | 0.179 | 0.111 | 0.236 | −0.324 | −0.092 | −0.140 |
| (18) MAS     | −0.014 | 0.003 | 0.017 | −0.032 | 0.215 | 0.027 | 0.077 | 0.233 |
| (19) UAI     | −0.004 | −0.029 | −0.329 | 0.004 | −0.054 | 0.153 | 0.102 | 0.158 |
| (20) LTD     | −0.002 | −0.211 | −0.233 | −0.104 | −0.265 | 0.333 | 0.108 | 0.174 |
| (21) IVR     | 0.000 | 0.233 | 0.107 | 0.119 | 0.228 | −0.329 | −0.087 | −0.139 |

Table 4 reports the correlation coefficient matrix of the variables. All coefficients significant at the 5% level are in bold.

A possible explanation for this difference is that startups are usually smaller than mature firms and their size does not vary much (their standard deviation in the sample is less than 30% of the average size). Before the COVID-19 pandemic, 38.5% of the sample had already experienced negative earnings with an average ROA of −36.8%, much higher than the average ROA of 6.37% among profitable firms. Negative profitability coupled with credit constraints could be the motivation for cash accumulation among startups to assure their flexibility in handling operating costs and financing future investment opportunities (Gamba & Triantis, 2008; Hokavimian & Titman, 2003). Given the financial instability of startups and the severity of the pandemic, high cash retention may not actually help. This rationale, to some extent, can justify the insignificant impact of firm size, cash holdings, and profitability in building up corporate immunity against the COVID-19 pandemic. We conclude that startups with lower debt ratios before the pandemic help stock perform better during the COVID-19 time. Although the government’s campaign to encounter the COVID-19, and therefore there is no impact of the COVID-19 on the sector. The stock returns of other three industries, on the other hand, are significantly and negatively affected by COVID-19 since those industries are non-essential and face disruption during the pandemic. Besides, the estimated coefficients of Size × Covid19 are significantly positive in Industrial, Technology and Materials sectors, while the coefficients of Leverage × Covid19 are significantly negative in the two former sectors. These results are consistent with the previous findings on the full sample, indicating that among sectors affected by the COVID-19 pandemic, firms with larger size and lower debt suffer milder impact.

4.3.2. CSR commitment

Next, we examine whether a commitment to CSR helps startups better withstand the impact of COVID-19. For each variable, we estimate its coefficient towards Returns twice: first with only the variable Covid19 and then with the addition of firm financial capacity variables, country-specific variables and country fixed effects. Table 7 Columns (1) and (2) show the estimates of ESG × Covid19; both coefficients are insignificant at the 10% level. This shows that the disclosure level of ESG did not improve stock returns during the COVID-19 period. Breaking down the ESG disclosure score, we test the impact of Environmental and Social disclosure scores (Table 7, Columns (3)–(6)). We find that, like the ESG disclosure score, two of its components are statistically insignificant, hence consolidating the negligible moderating effect of CSR disclosure on the stock returns – COVID-19 relationship. Although CSR disclosure may drive firms’ valuation in economic calms (Dhaliwal et al., 2014; Fatemi et al., 2018; Gao et al., 2016), investors tend to be more prudent when evaluating startups’ disclosure of non-profitable activities during economic adversity (Al-Dah et al., 2018). The next section deals exclusively with corporate governance practices.

We investigate the moderating effect of ESG-linked CEO bonus policy on the stock returns – COVID-19 relationship (Table 7, Columns (7), (8)) and get an insignificant result. The results of all interaction terms are habit from direct to online shopping (Sheth, 2020). Moreover, the emergence of home-nesting leads to increasing spendings on household items for gardening, home gyms, home entertainment, etc. (Remes et al., 2020). The next section deals exclusively with corporate governance practices.
robust when pooled in Column (9). It is possible that startups’ investors do not fixate on CSR engagement because its benefits are long term (De Villiers, Naiker, & Van Staden, 2011); instead, they pay attention to fundamental business figures that could better signify startups’ survivability during a pandemic. We conclude that both the disclosure of ESG and ESG-linked bonus policy for the CEO do not safeguard stock performance against a COVID-19 negative impact.

4.3.3. Corporate governance

We now turn to corporate governance practices among startups, proxied by the size of the board (BS), independent directors (IDOB) and CEO duality (Duality). We are interested in the coefficients of the interaction terms between these three variables and Covid19. Each variable is estimated with and without interactions controlling for firm financial capacity, country traits, and country fixed effects.

Table 8 presents the results of the estimates of three interactions related to corporate governance and Covid19. The coefficient of BS × Covid19 is significant at 10% significance level in columns (1) and (7), meaning that larger board size dilutes the negative relationship between stock returns and COVID-19. Since larger board tends to have more coordination issue due to their variation in expertise and risk preferences, decision-making is reached on the basis of compromises, which ends up with less risk-taking flavor (Cheng, 2008). As the market rewards low risk-profile firms during the heightened uncertainty period (Baek, Kang, & Park, 2004), stock value of startups with larger board pre-COVID-19 should experience less extreme reduction. The coefficient of IDOB × Covid19 is significant only for the estimate in Column (3), indicating that the proportion of independent directors on board does not change the stock returns-COVID-19 relationship. The ambiguous impact of board independence on stock returns during past crises has been documented in Ferrero-Ferrero, Fernandez-Izquierdo, and Munoz-Torres (2012) and Francis, Hasan, and Wu (2012).

Similar but more pronounced than board size, CEO duality also reduces the negative impact of COVID-19 on stock returns, given the robustly positive, significant coefficients of Duality × Covid19 across the different tests. A positive coefficient implies that, during the COVID-19 pandemic, startups with the CEO concurrently holding the board chair position have higher stock returns than non-duality ones. Although corporate governance principles, including the non-duality of CEO and chair, are strongly promoted because of their roles in enhancing corporate performance and transparency (Balachandran & Paff, 2015), no set of principles fits all firms. Since startups are usually young and sensitive to economic adversity, having focused leadership can help them respond faster to external shocks and raise their survival chances if the agency problem is mitigated (Pfeffer & Salancik, 2003).

These results thus promote the notion that some encouraged corporate governance practices are not suitable for startups in turbulent economic times (Ferrero-Ferrero et al., 2012). Since the COVID-19 pandemic happened suddenly and unpreparedly, startups need to respond unriskily and decisively, thus emphasizing the necessity of having a larger size of board and leadership power concentration in the course of a pandemic (Van Essen et al., 2013).

Overall, the examination of corporate immunity yields some noticeable results. We identify that the reliance of startups on leverage during a pandemic is inversely associated with their stock performance. At the same time, firm size, cash holdings and profitability do not have a significant contribution to startups’ immunity. Concentrated power at the top level (i.e., CEO duality) helped startups perform better during the COVID-19 crisis. Conversely, we find no evidence supporting the role of CSR in boosting startups’ endurance to the crisis.

4.4. Moderating effect of national cultures on the return-COVID pandemic relationship

This section further looks for drivers of stock returns during the COVID-19 pandemic from the national culture perspective. Hofstede et al. (2010) believe that human patterns of thoughts and behaviors are hugely influenced by the culture and norms of the society in which they live, and recommend six indices quantifying different dimensions of national culture. Those indices include: Power Distance Index (PDI), Individualism (IDV), Masculinity (MAS), Uncertainty Avoidance (UAI), Long-term Orientation (LTO) and Indulgence (IVR). The coefficients of
Table 5
Stock returns and COVID-19.

|                  | (1)          | (2)          | (3)          | (4)          | (5)          | (6)          |
|------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Covid19          | -3.270***    | -1.365***    | -3.322***    | -3.488***    | -1.428***    | -1.526***    |
|                  | (-48.931)    | (-26.286)    | (-70.124)    | (-71.917)    | (-27.341)    | (-27.605)    |
| Time fixed effect| N            | Y            | N            | Y            | Y            | Y            |
| Industry fixed   | N            | N            | Y            | N            | Y            | Y            |
| Country fixed    | N            | N            | N            | Y            | N            | Y            |
| Observations     | 79,656       | 79,656       | 79,620       | 79,656       | 79,620       | 79,620       |
| R-squared        | 0.041        | 0.332        | 0.043        | 0.044        | 0.333        | 0.333        |

Panel B of Table 6 reports the coefficient estimates of variable Covid19 in relation to the dependent variable Returns. Robust standard errors are clustered at the firm level. Robust t-statistics are in parentheses; the 1%, 5% and 10% level of significance is denoted as ***, ** and *, respectively. All continuous variables are winsorized at 1% and 99%.

Table 6
The moderating effect of firm capacities on the returns-COVID-19 relationship.

|                  | (1)          | (2)          | (3)          | (4)          | (5)          | (6)          |
|------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Covid19          | -2.011***    | -1.048***    | -1.392***    | -1.468***    | -1.633***    | -3.322***    |
|                  | (-11.205)    | (-14.720)    | (-20.000)    | (-26.309)    | (-7.534)     | (-8.486)     |
| Size × Covid19   | 0.106***     | (3.431)      | 0.140***     | 0.052        | (4.019)      | (1.492)      |
| Leverage × Covid19| -0.019***    | (-6.925)     | -0.022***    | -0.017***    | (-7.566)     | (-5.848)     |
| Cash × Covid19   | -1.234       | (-3.820)     | -0.275       | -0.279       | -0.273       | (1.043)      |
| ROA × Covid19    | 0.569***     | (3.580)      | 0.195        | 0.209        | (1.998)      | (1.986)      |
| GDPgrowth × Covid19| 0.659***     | (18.965)     | 0.012        | (0.714)      | (0.714)      | (0.714)      |
| Over65 × Covid19 | Y            | Y            | Y            | Y            | Y            | Y            |
| Main effects     | Y            | Y            | Y            | Y            | Y            | Y            |
| Time fixed effect| Y            | Y            | Y            | Y            | Y            | Y            |
| Industry fixed   | Y            | Y            | Y            | Y            | Y            | Y            |
| Country fixed    | N            | N            | N            | N            | N            | Y            |
| Observations     | 78,429       | 78,375       | 78,429       | 78,339       | 78,285       | 78,285       |
| R-squared        | 0.334        | 0.335        | 0.334        | 0.335        | 0.335        | 0.338        |

Interaction variable

|                  | Communications | Consumer | Health care | Industrials | Materials | Technology |
|------------------|----------------|----------|-------------|-------------|-----------|------------|
| Covid19          | -1.954         | -1.422   | -0.406      | -4.519***   | -5.055*** | -4.523***  |
|                  | (-0.990)       | (-1.630) | (-0.214)    | (-5.583)    | (-2.972)  | (-6.413)   |
| Size × Covid19   | -0.052         | -0.101   | -0.091      | 0.166*      | 0.340*    | 0.253***   |
|                  | (-0.376)       | (-1.098) | (-1.168)    | (1.795)     | (1.906)   | (4.916)    |
| Leverage × Covid19| -0.014        | -0.027***| -0.004      | -0.022***   | -0.008    | -0.019***  |
|                  | (-1.234)       | (-3.820) | (-0.761)    | (-3.020)    | (-0.439)  | (-3.841)   |
| Cash × Covid19   | -1.652         | -0.709   | -0.875**    | 0.073       | 1.932     | -0.049     |
|                  | (-0.916)       | (-0.892) | (-2.297)    | (0.081)     | (1.170)   | (-0.089)   |
| ROA × Covid19    | 2.312          | 0.777    | 1.020***    | -0.691      | -0.434    | -0.865*    |
|                  | (1.453)        | (1.150)  | (3.860)     | (-0.895)    | (-0.479)  | (-1.688)   |
| GDPgrowth × Covid19| 0.710***      | 0.347*** | 0.507***    | 0.664***    | 0.520***  | 0.827***   |
|                  | (3.529)        | (4.249)  | (4.365)     | (9.243)     | (8.852)   | (13.342)   |
| Over65 × Covid19 | -0.030         | -0.007   | -0.101      | 0.004       | -0.024    | 0.020      |
|                  | (-0.362)       | (-0.241) | (-0.947)    | (0.111)     | (-0.319)  | (0.060)    |
| Main effects     | Y              | Y         | Y           | Y           | Y         | Y          |
| Time fixed effect| Y              | Y         | Y           | Y           | Y         | Y          |
| Industry fixed   | Y              | Y         | Y           | Y           | Y         | Y          |
| Country fixed    | Y              | Y         | Y           | Y           | Y         | Y          |
| Observations     | 4670           | 16,827    | 17,596      | 13,607      | 5109      | 20,458     |
| R-squared        | 0.345          | 0.373     | 0.302       | 0.323       | 0.327     | 0.395      |

Panel A: Panel A of Table 6 reports the coefficient estimates of variable Covid19 and its interactions with Size, Leverage, Cash, ROA, GDPgrowth, Over65pop, in relation to the dependent variable Returns. Robust standard errors are clustered at the firm level. Robust t-statistics are in parentheses; the 1%, 5% and 10% level of significance is denoted as ***, ** and *, respectively. All continuous variables are winsorized at 1% and 99%.

Panel B: Panel B of Table 6 reports the coefficient estimates of variable Covid19 and its interactions with Size, Leverage, Cash, ROA, GDPgrowth, Over65pop, in relation to the dependent variable Returns in multiple industries. Robust standard errors are clustered at the firm level. Robust t-statistics are in parentheses; the 1%, 5% and 10% level of significance is denoted as ***, ** and *, respectively. All continuous variables are winsorized at 1% and 99%.
the interactions between these six indices and Covid19 are under investigation in order to see whether culture played a moderating role on stock returns during the COVID-19 time.

The results from the regressions of stock returns on each interaction are shown in Table 9. Accordingly, they provide solid evidence supporting the effect of national culture on the relationship between Returns and Covid19. All interaction coefficients are significant at the 1% level; the coefficients of PDI × Covid19, UAI × Covid19, LTO × Covid19 are positive and coefficients of IDV × Covid19, MAS × Covid19, IVR × Covid19 are negative.

The coefficient of PDI × Covid19 is significantly positive, meaning that, under the effect of the COVID-19 pandemic, stock returns are higher in a country where residents lean towards accepting unequal distribution of power among members of the society compared with a country where people strive for equal power distribution. Residents' acceptance of a hierarchical order assists the government to enforce proper, timely, effective measures, such as social distancing and contact tracing, to restrain virus proliferation (Anderson et al., 2020).

Second, the interaction IDV × Covid19 is inversely correlated with Returns, suggesting that the negative effect of COVID-19 on stock returns is amplified in a country where individualism prevails compared with a country where residents value the collectivist mindset.

Third, the inverse relationship between MAS × Covid19 and Returns indicates that, under the negative influence of COVID-19 information, stock returns in a country where competitiveness is promoted are more underwhelming than stock prices in a consensus-oriented country. These findings substantiate the view of An et al. (2018) and accentuate the importance of collaboration and care among individuals to alleviate the severity of the pandemic.

Fourth, the positive coefficient of UAI × Covid19 means that, during the COVID-19 time, a country with lower tolerance towards uncertainty has higher stock returns than a country that has a more relaxed attitude towards uncertainty. As stock returns highly deteriorate during times of economic uncertainty (Bali, Brown, & Tang, 2017), uncertainty-intolerant countries would be more likely to actively suppress COVID-19-related uncertainties by strict policies, which, in turn, accelerate the recovery of their financial market.

Fifth, the positive coefficient of LTO × Covid19 reveals that a country that encourages future-oriented efforts suffers less from stock price decreases in the COVID-19 time than a country that avoids changing its long-term behaviors or thoughts. We interpret this effect as the long-term orientation culture enabling a country to rapidly learn from other countries' experiences and adopt appropriate measures to contain the virus while still managing to harmonize those measures with social norms.

Lastly, the coefficient of IVR × Covid19 is negatively associated with Returns, signifying that stock performance is worse in a society having more free gratification of needs than a society where the gratification of needs is highly controlled. The significant moderating effect of IVR supplements the finding relating to IDV and MAS dimensions, in that it emphasizes the relevance of community-driven attitudes to coronavirus confinement and stock market resilience.

From the above results, we can conclude that culture plays an important part in constraining the negative impact of COVID-19 on stock returns of sample startups, validating our Hypothesis 5. Overall, the effects of the COVID-19 pandemic are better contained in a society where power is less equally distributed, a collectivistic and cooperative attitude prevails, uncertainties are avoided, and long-term vision is promoted. These cultural traits well-feature the tight and interdependent culture discussed in Gelfand et al. (2011) and Van Bavel et al. (2020). Our findings thus accentuate the potency of culture tightness in coping with the abrupt COVID-19 infectious pandemic.

### 4.5. Robustness

To check the robustness of the COVID-19 proxy, we use two other measures. The first is the growth rate of COVID-19 confirmed cases using a different formula:

\[
\text{Covid19}_{gr,t} = \left( \frac{(\text{Covid19 confirmed cases}_{t} - \text{Covid19 confirmed cases}_{t-1}) \times 100}{\text{Covid19 confirmed cases}_{t-1}} \right)
\]

To have a more comprehensive view of COVID-19's impact, we follow Al-Awadhi et al. (2020) and Ashraf (2020a, 2020b) to derive a second measure from the accumulated number of deaths caused by the virus:

\[
\text{Covid19death}_{t} = \ln(1 + \text{Covid19 deaths}_{t}) - \ln(1 + \text{Covid19 deaths}_{t-1})
\]

We carry out all of the above tests with the inclusion of interactions between the two alternative measures of Covid19 and firm financial

### Table 7 COVID-19 and CSR.

| Interaction variable | Dependent variable: Returns |
|----------------------|-----------------------------|
| Covid19              | (1) -1.253*** (2) -0.797*** (3) -1.584*** (4) -0.826*** (5) -1.405*** (6) -0.929*** (7) -1.177*** (8) -0.927*** (9) -0.810*** |
| ESG × Covid19        | (0.212) -0.010 (0.585) |
| EnvDis × Covid19     | (2.357) 0.031** (0.644) |
| SocialDis × Covid19  | (1.073) 0.011 (0.226) |
| Coebonus × Covid19   | (0.250) 0.120 (0.253) |
| FirmFC × Covid19     | Y N Y N Y N Y N Y |
| CF × Covid19         | Y Y Y Y Y Y Y Y |
| Main effects         | Y Y Y Y Y Y Y Y Y |
| Time fixed effect    | Y Y Y Y Y Y Y Y Y |
| Industry fixed effect| Y Y Y Y Y Y Y Y Y |
| Country fixed effect  | N Y N Y N Y N Y N |
| Observations         | 16,613 16,595 7901 7901 |
| R-squared            | 0.393 0.307 0.432 0.440 |

Table 7 reports the coefficient estimates of variable Covid19 and its interactions with the CSR-related variables (ESG, EnvDis, SocialDis, Coebonus) in relation to the dependent variable Returns. Firm financial capacities include four variables: Size, Leverage, Cash and ROA. Country-specific traits include GDP growth and Over65. Robust standard errors are clustered at the firm level. Robust t-statistics are in parentheses; the 1%, 5% and 10% level of significance is denoted as ***, ** and *, respectively. All continuous variables are winsorized at 1% and 99%. 
capacity as well as country traits and fixed effects.

The results of both alternative measures of Covid19, shown in Tables 10 and 11, are identical to the results obtained from the main analysis. That is, both measures are negatively correlated with stock returns, their interactions with Leverage (Duality) yields a negative (positive) sign, and all six cultural dimensions have similar impacts on stock returns – COVID19 relationship presented in the main discussion.

On the other hand, some interaction variables are sensitive to COVID-19 measures as BS × Covid19 is unrelated to stock returns when we use the accumulated number of death as the dependent variable, and the coefficients of Over65 × Covid19 are significantly positive in both alternative measures of COVID-19. As a result, the other results resemble the findings presented in the main analysis.

Overall, the robustness tests confirm the findings of corporate immunity and national culture in relation to the impact of the COVID-19 crisis on startups’ stock returns.

5. Conclusion

The COVID-19 pandemic behaves as a once-in-a-century event (Gates, 2020) that results in a high level of economic uncertainty and dipping stock markets. Startups, commonly considered as the future accelerator of the global economy, are taking a fatal blow because of their financial fragilities and high sensitivity to external changes. Within
In this context, we investigated the corporate built-up immunity of startups listed on NASDAQ, CHINEX, JSDAQ and KOSDAQ towards the COVID-19 pandemic using pre-COVID-19 reported accounting data and stock returns during the early period of the COVID-19 pandemic. We hypothesize that the COVID-19 pandemic adversely affects stock market returns, and that corporate built-up capacity and national culture can alter that negative impact.

The conducted tests deliver some interesting findings. The COVID-19 health crisis exerts a significant and negative impact on the stock returns of startups. This impact is weaker among startups with lower leverage ratios, CEO duality regime, and larger board (to some extent), as well as in countries having higher GDP growth. The negative effect on startups’ stock performance is significant in the Industrial, Materials and Technology sectors, while no effect is found in the Communications, Consumer, and Health care sectors. Incorporating national cultural dimensions into our analysis, we find that the effect of the COVID-19 pandemic is better contained in a society where people accept unequal power distribution, value collectivistic and cooperative attitudes, avoid ambiguities, and promote long-term vision. Our findings give support to Gelfand et al. (2011) and Van Bavel et al. (2020) who elaborate on the role of culture in curbing the spread of interpersonally transmissible viruses. Interestingly, our results suggest that firm size does not significantly moderate the effect of COVID-19 pandemic if viewing corporate immunity via the financial capacity alone (Table 6). However, when we broaden the investigation to other corporate aspects and national culture using firm size as control variables, firm size matters. Larger startup size thus nullifies the negative impact of COVID-19 pandemic.

Overall, our study not only broadens the limited literature relating to the impact of COVID-19 pandemic on stock returns and how corporate immunity helps firms survive against this crisis, but also pioneeers scrutiny of the impact of COVID-19 on corporate market performance from a cultural perspective. Its findings deliver some important implications for startup community. First and foremost, although leverage is important for startups to spur future investments, it is a double-edged sword that hurts them badly in the face of a crisis.

### Table 10

An alternative measure of Covid-19 – the alternative growth rate of Covid-19.

| Interaction variable | Dependent variable: returns | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|----------------------|-----------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Covid19gr            | −1.616***                   | −2.411*** | −2.437*** | −2.575*** | −2.105*** | −1.625*** | −2.742*** | −2.456*** | −1.984*** | −1.444*** |
| ESG × Covid19gr      | (−14.663)                   | (−6.676) | (−4.914) | (−5.262) | (−16.414) | (−16.743) | (−15.258) | (−16.353) | (−16.488) | (−12.567) |
| EnDis × Covid19gr    | 0.004                       | (0.812) |
| SocialDis × Covid19gr| 0.000                       | (0.205) |
| Ceobonus × Covid19gr | 0.067                       | (0.441) |
| BS × Covid19gr       | 0.210**                     | (2.093) |
| IDOB × Covid19gr     | 0.000                       | (−0.084) |
| Duality × Covid19gr  | 0.142**                     | (3.377) |
| PDI × Covid19gr      | 0.011***                    | (6.695) |
| IDV × Covid19gr      | 0.000                       | (−0.004) |
| MAS × Covid19gr      | 0.000                       | (−0.006) |
| UAI × Covid19gr      | 0.000                       | (6.695) |
| LTO × Covid19gr      | 0.003***                    | (6.695) |
| IVR × Covid19gr      | −0.006***                   | (−6.695) |
| Size × Covid19gr     | −0.000                      | (−0.025) |
| (2.369)               | (2.475) |
| Leverage × Covid19gr | −0.004**                    | −0.007*** | −0.013*** | −0.007*** | −0.004*** | −0.004*** | −0.004*** | −0.004*** | −0.004*** | −0.004*** |
| Cash × Covid19gr     | −0.081                      | 0.153    | 0.128   | 0.201*  | −0.017 | −0.017 | −0.017 | −0.017 | −0.017 | −0.017 |
| ROA × Covid19gr      | 0.044                       | −0.077   | −0.383* | 0.101   | −0.035 | −0.035 | −0.035 | −0.035 | −0.035 | −0.035 |
| GDPgrowth × Covid19gr| 0.248***                    | 0.312*** | 0.309*** | 0.287*** | 0.171*** | 0.236*** | 0.432*** | 0.329*** | 0.242*** | 0.225*** |
| Over65 × Covid19gr   | 0.046***                    | 0.061*** | 0.061*** | 0.049*** | 0.045*** | 0.054*** | 0.144*** | 0.052*** | 0.050*** | 0.052*** |
| Main effects          | Y                           | Y       | Y       | Y       | Y       | Y       | Y       | Y       | Y       | Y       |
| Time and Industry fixed effect | Y     | Y       | Y       | Y       | Y       | Y       | Y       | Y       | Y       | Y       |
| Country fixed effect  | Y                           | Y       | Y       | Y       | Y       | Y       | Y       | Y       | Y       | Y       |
| Observations          | 78,285                      | 16,595  | 7901    | 20,159  | 78,285  | 78,285  | 78,285  | 78,285  | 78,285  | 78,285  |
| R-squared             | 0.338                       | 0.398   | 0.442   | 0.403   | 0.339   | 0.339   | 0.339   | 0.339   | 0.339   | 0.339   |

Table 10 reports robustness tests with an alternative measure of growth rate of confirmed cases - Covid19gr. Time, industry and country fixed effects are included. Robust standard errors are clustered at the firm level. Robust t-statistics are in parentheses. The 1%, 5% and 10% level of significance is denoted as ***, ** and *, respectively. All continuous variables are winsorized at 1% and 99%.
Therefore, startups should, based on their own projections of financial needs, establish a proper financial plan that does not heavily rely on external capital. An equal importance must be placed on the maintenance and development of their innovative capacity, talented workforce, and agile problem solving in order to quickly adapt to the new situations. Examples include some startups that have helped many countries to particularly cope with the need of remote working, production, and digital health services during the coronavirus pandemic. Second, startups should consider which corporate governance practices are critical for startup survival given their high leverage and risky short-term liquidity challenges during the pandemic. These supports are much influenced by market participants’ behavior, which is, to some extent, determined by the culture embedded in each society. To the extent that the national culture is unchangeable, startups need to act to amplify (curtail) the positive (negative) impact of culture on stock reactions are much influenced by market participants’ behavior, which is, to some extent, determined by the culture embedded in each society. To the extent that the national culture is unchangeable, startups need to act to amplify (curtail) the positive (negative) impact of culture on stock
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