

# When the market went viral: COVID-19, stock returns, and firm characteristics\*

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## Abstract

We examine how the market valuation of firms varies on account of characteristics that make them vulnerable to the COVID-19 pandemic across different stages of the crisis. Using plant location data that uniquely identify the vulnerability of firms to operational disruptions, we find that firms with plants located in zones susceptible to higher infections earn substantially lower returns. Firms unaffiliated to any business group earn lower returns compared to affiliated firms, implying their lower access to shared resources. Affirming the role of liquidity in weathering the crisis, the marginal value of financial flexibility is higher for firms with facilities in vulnerable zones and unaffiliated firms. We also find that firms with higher inflexibility in re-scaling operations earn lower returns. We also document that the signaling value of insider buying increases during the pandemic when information on the firm-level impact is scarce. The paper identifies unique channels through which this pandemic impacts the market value of firms.

*Keywords:* COVID-19; Operating leverage; Financial flexibility; Insider trading; Group affiliation; India

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# 1. Introduction

The COVID-19 pandemic is an unprecedented health crisis that has impacted global financial markets. It has exposed firms to several stiff challenges all at the same time. Production and supply chain disruptions are widespread, owing to lockdowns and infections in facilities. The product market uncertainties have intensified due to sudden shifts in consumer preferences. An increase in risk-aversion in credit and financial markets has upset the capital raising plans of firms. Simultaneously, firms are also exposed to sudden legislative changes that are rapidly altering their business environment. Given the surge in the uncertainty within a short time, the expected impact of COVID-19 on firms is best examined through the changes in equity market value.

We investigate the cross-sectional variation in stock returns on account of their financial, operating, and governance characteristics that make them vulnerable or resilient to the crisis during different stages of the pandemic. The study allows a comparison of the impact of the characteristics on the market value of firms with respect to pre-COVID times. It also highlights the likely differences in the significance of these value drivers as the crisis unfolds. We employ a unique identification of the vulnerability to the spread of the infection in the operational locations of firms. We also examine the influence of a set of governance and ownership attributes, specific to emerging markets. Furthermore, we investigate how these characteristics interact with well-documented measures of financial vulnerability, which affect the cross-sectional stock returns during times of crisis. The joint influence of pandemic specific variables, such as government-mandated containment zones and the financial characteristics of firms, allows us to identify unique channels through which this pandemic impacts the market value of firms.

Unlike the developed economies, a developing economy such as India is particularly vulnerable to the adverse impact of the COVID-19 crisis. First, it has a relatively poor public health infrastructure, with only 3.5% of the GDP spent on healthcare compared to the global average of 9.9% at the end of 2017, as per the World Bank data. Second, India implemented the strictest nation-wide lockdown in the world, which strongly impacted the

economic activities.<sup>1</sup> Third, the high population density makes social distancing difficult for a large fraction of its population, and this makes them vulnerable to infections in the post-lockdown period (Jha & Kawoosa, 2020; Pandey, 2020). Fourth, the stimulus announced by the Government of India was largely focused on liquidity support rather than direct fiscal support (Iyer, 2020). The higher vulnerability to the spread of infections and low fiscal support expose the country to the likelihood of more significant economic contraction and greater loss of market value for its firms. Furthermore, India has a stressed banking system and a shallow bond market (Das & Nath, 2020; Lele, 2020). Reflective of such challenges, the Indian equity market (NIFTY) rapidly shed nearly 40% of its market value by March 24, 2020, compared to its value at the beginning of the year (see Figure 1).<sup>2</sup> These factors make it a valuable context to examine how the firm-level characteristics impact the firm value during the pandemic.

Our research attempts to address several interesting questions on how the operational, financial, and governance characteristics affect the market value of firms. First, how does the varying degree of operational disruptions due to infections impact the stock return of firms? Possibly, there is an exacerbated adverse impact on firms located in hotspots designated as ‘red zone’ by the Government of India (MOHFW, 2020).<sup>3</sup> Commercial operations in the red zones remained restricted. For instance, in its mandatory disclosure on the impact of COVID-19, Coal India Ltd., the largest mining firm in India, stated that “Operations in major coal fields like Korba and Ib valley were disrupted due to declaration of Red zone in some of the areas of these coalfields.”

Second, how does the market value of cash holdings differ across firms due to the susceptibility of firms to operational disruptions? A high degree of financial flexibility offers considerable strength to firms in a stormy economic and credit market situation. Third, how does the inflexibility in the cost structure of the firms impact their market value? The unprecedented contraction in demand for many products and services brings

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<sup>1</sup>As per the tracker developed by Hale, Petherick, Phillips, and Webster (2020), the strictness index of the lockdown imposed by India was significantly higher than those of the US and the UK.

<sup>2</sup>While the drawdown of NIFTY is closer to that of S&P 500 (34%), the recovery (a shortfall of 18%) until June 12, 2020, was significantly sub-par relative to that of S&P 500 (a shortfall of 7%).

<sup>3</sup>The classification of the red zones is based on the number of active cases, the time taken for the number of cases to double, and the test rate in the district.

to fore the operating flexibility of a firm as a highly valuable character. Fourth, does business group affiliation of a firm, a distinct feature of emerging markets, make it more resilient to the crisis? Governance and ownership characteristics such as business group affiliation and insider buying could be a strong signal of a firm's underlying strength.

Moreover, a firm's degree of resilience on account of each of these characteristics could vary substantially, depending on the stage of the unfolding crisis. The stage-wise analysis would deepen the understanding of the shifts in the influence of the firm characteristics and the effectiveness of the policy interventions.<sup>4</sup> Hence, we have divided the onset of the COVID-19 pandemic in India into various sub-periods based on the severity of the outbreak and policy interventions similar to [Ramelli and Wagner \(2020\)](#).

The findings of the study and their implications are as follows. We find that firms with production facilities located inside geographic zones identified with a higher number of infections (red zones) suffer a higher market value loss during the pandemic than their peer group having facilities outside a red zone. For instance, a firm with all its plants located in a red zone had a higher value erosion of 318 basis points (bps) during the *Limited Outbreak* period, and 547 bps during the *Outbreak* period compared to its peer group of firms with none of their plants in a red zone. The relatively higher market value loss is most likely on account of the productivity loss in such geographic zones due to restrictions on people's mobility and infection among employees. The finding of the greater vulnerability of firms to operational disruptions is largely robust to alternative measures of the susceptibility of the plant location to the spread of the infections.

However, we do not find any significant influence of the corporate head-office location in red zones on stock returns. This might be due to the amenability to work from home (WFH) for corporate head-office employees. The cross-sectional explanatory power of the geographic location of the firm establishes a physical channel in the impact of the pandemic on the stock returns of firms. The evidence is in line with the literature on the geographic commonality of equity returns ([Barrot, Grassi, & Sauvagnat, 2020](#); [Murfin & Spiegel, 2020](#); [Pirinsky & Wang, 2006](#)). Furthermore, we also document how the

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<sup>4</sup>The stages are described in [Table 1](#).

vulnerability induced by the geographic location interacts with other firm characteristics such as financial flexibility and, consequently, affects the stock returns during the crisis.

Firms with greater liquidity have relatively higher returns in the initial phase of the pandemic. However, the outperformance of firms with higher financial flexibility is reversed in the later stages when the lockdown restrictions are eased. For instance, firms with a one-standard-deviation higher liquidity earn 178 bps higher returns during the initial stage of the pandemic (*Limited Outbreak*), relative to the pre-COVID period. In the *Living with COVID* stage, the corresponding return is -83 bps. The relatively greater return of firms with higher liquidity suggests that the market attaches a higher value to the cash surplus held by the firms. The observed impact may be on account of the likely constriction of cash flows due to a diminished demand for products and disruption in the operations of the firm.

In a related finding, we observe that higher leverage leads to a greater loss of value during the initial stages of the pandemic, relative to the pre-COVID period. The loss is about 212 bps for firms with a one-standard-deviation higher leverage than the average firm. Even in the later stages, no significant reversal occurs in the value of highly indebted firms, suggesting an enduring loss in their value. The lasting adverse impact on the value of firms with higher leverage could be linked to the limited stimulus and ongoing financial sector crisis in India ([RBI, 2019](#)). The findings also corroborate the higher value of financial flexibility reported during earlier crises ([Campello, Graham, & Harvey, 2010](#)).

Interestingly, we find that the value attached to financial flexibility is significantly higher for firms located in red zones, relative to their peers outside red zones. While the value assigned to financial flexibility declines in the later stages for the average firm, it does not show such a pattern for firms in red zones. The observed difference in the value of financial flexibility for firms located in red zones demonstrates a channel through which it can add value to firms during the pandemic. The combined impact of the financial flexibility and geographic location of the firm documented in our paper complements the findings of [Davison \(2020\)](#) who documented an adverse impact on levered firms operating in sectors subjected to social distancing requirements in the US.

Firms with a greater degree of operating leverage and inflexibility have a higher adverse impact due to the pandemic. For such firms, the demand contraction combined with the high fixed cost of operations, magnify the impact of the economic shock. For instance, firms with one-standard-deviation higher inflexibility relative to the average firm, lose about 243 bps market value in the initial stages of the pandemic. Given the evidence that high operating leverage translates into high risk only for firms that carry a higher degree of inflexibility (Gu, Hackbarth, & Johnson, 2017), our findings highlight that such firms multiply the risk associated with the pandemic. Reflecting on the role of flexibility, firms with a one-standard-deviation higher employee expense ratio than the average firm realize about 475 bps higher market returns in the initial phase of the crisis. Noticeably, several states in India have substantially amended the labor laws that allow firms to right-size their labor force (Pradhan, 2020). The relative advantage of firms that have labor as the prominent factor of production is in line with the findings of Alfaro, Chari, Greenland, and Schott (2020). On the other hand, capital-intensive firms show greater vulnerability to the pandemic, possibly due to their difficulty to reverse fixed investments without incurring high costs.

Group-affiliated private-sector firms witness lower erosion of market value compared to their unaffiliated peers in almost every stage of the pandemic. The wedge in the return between the group-affiliated firms and the unaffiliated firms ranges between 1.4% and 4.5% across the various stages. The relative outperformance of the group-affiliated firms could be attributable to their access to the resources of the group, which may provide the critical support required for the survival of the firm. In line with the greater access to resources of the group firms, we further find that the marginal value attached to financial flexibility by the market is lower for group firms during the crisis. For instance, during the *Outbreak* phase, the marginal value of holding one-standard-deviation higher net cash is lower for group firms by 226 bps. The findings on the group-affiliated firms bring out the heterogeneity in the impact of liquidity on the firm value, depending on their group affiliation. The result is consistent with the role of internal capital markets in studies that document a premium for the group-affiliated firms during earlier crisis

episodes (Kuppuswamy & Villalonga, 2016; Santioni, Schiantarelli, & Strahan, 2019). We also find that state-owned firms fare better during most of the pandemic stages, compared to their private-sector counterparts.

Indicative of the signaling value of insider actions during periods of heightened uncertainty, we find that higher insider buying is associated with relatively higher returns. For instance, a one percent increase in net buying by insiders is associated with about 8% increase in the market value of the firm in the *Limited Outbreak* stage of the pandemic. Such a relationship, however, weakens in the later stages of the outbreak. The finding on the impact of insider buying is in agreement with the earlier research findings on the signaling role of insider buying (Cziraki, 2018).

Firms that have a wider network with other firms through their board interlocks outperform their peers in the initial stages. Networked firms also preserve their market value relative to the less networked peer group during the *Stimulus* stage. The finding implies that the market likely factors in the ability of firms to channelize the benefits of the stimulus effectively. The positive association of the market value and board interlock is in line with the findings of Zheng, Liu, and George (2010) and Fisman (2001).

The major contributions of our study are as follows. First, we examine the impact of certain unique dimensions of firm vulnerabilities on the market value when an unprecedented crisis strikes an emerging market. We contribute to the understanding of how disruptions impact the value of firms during the pandemic by linking it to the location of firms in the geographic zones more vulnerable to infections. Second, the study extends the understanding of how financial flexibility impacts the market value of firms during the pandemic by documenting that it is more valued for firms located in red zones. In contrast to the findings of Ramelli and Wagner (2020) for the US market, we do not find a significant reversal in the value erosion of levered firms. The market continues to place a higher value on financial flexibility for firms in red zones, indicating that markets price the relative advantage of cash and low debt based on the firm's susceptibility to continued disruption.

Third, to the best of our knowledge, no study has examined the role of insider ac-

tions during a pandemic such as COVID-19 in providing valuable information to the market participants, at a time when little information is available on the impact of the pandemic on firm-level outcomes. Fourth, we document that business group affiliation, which potentially provides greater access to resources for firms, positively impacts the market value of firms amidst the crisis. In particular, by estimating the difference in the marginal value of financial flexibility in favor of the unaffiliated firms during the crisis, we contribute to the understanding of the role of the group structure to mitigate financial market frictions. Finally, our study complements the findings of other recent studies on COVID-19 on the role of financial flexibility and operating flexibility ([Alfaro et al., 2020](#); [Ding, Levine, Lin, & Xie, 2020](#); [Ramelli & Wagner, 2020](#)).

Our analysis encompasses several areas of rapidly emerging finance literature that explores the impact of COVID-19 on firms and market outcomes. [Ramelli and Wagner \(2020\)](#) showed that the liquidity and solvency of firms emerged as concerns in the US market, suggesting that the market expects the crisis to prolong. [Ding et al. \(2020\)](#) documented that firms with a stronger pre-2020 balance sheet had a lower market value loss during the COVID-19 pandemic. They also found that firms with lower exposure to global supply chains and fewer entrenched employees performed better. Based on the stock market reaction, [Fahlenbrach, Rageth, and Stulz \(2020\)](#) found that financially flexible firms are expected to perform better during the COVID-19 crisis. Lastly, our paper is closely related to research on the susceptibility to the infection in the workplace and its impact on the value of firms. [Alfaro et al. \(2020\)](#) predicted that the stock market reacts to unexpected changes in the aggregate number of infections at a country level. The authors documented that firms with higher capital intensity and firms in industries that are conducive for the spread of infection had more significant loss of market value during the early phases of COVID-19.

In [Section 2](#), we discuss the conceptual background and key research questions of our study. In [Section 3](#), we explain the empirical approach and the data employed. [Section 4](#) discusses the findings and their implications. In [Section 5](#), we discuss several robustness checks. Finally, we conclude with the critical insights related to our findings.



## 2. Conceptual background and key research questions

In order to investigate the impact on the market value of firms, we examine the stock returns across different stages of the pandemic. The stages capture the varying degrees of perceived vulnerability of firms to the crisis. Markets are likely to underestimate the economic impact of the pandemic in the *Incubation* phase, given the rare occurrences of such events in the past. The recognition of the damaging impact of the crisis becomes apparent when the number of infections rises.

A major market correction is expected when the state or advisory bodies, acknowledging the likely disruption in economic activities, make salient announcements, or take actions. The adverse impact on the market value is expected to partly reverse when the liquidity and other fiscal support measures are announced. We explore the likely heterogeneous response of the market to COVID-19 on account of the variation in firm-level vulnerabilities, both within and across the pandemic stages. The different stages of the pandemic employed in the study are described in [section 3](#). Below, we describe the various dimensions of firms representing a specific aspect of resilience or vulnerability focused on in this study.

### 2.1. Operational fragility

Measures adopted to flatten the infection curve primarily range from advice on social distancing to lockdown of the movement of people and even goods. The initial stages of COVID-19 witnessed unprecedented physical and logistic disruptions due to lockdown ([OECD, 2020](#); [Wang & Chou, 2018](#)). The border closures across countries in the initial phase led to disruptions in the global supply chain. While the movement of goods was not hampered substantially, the production in many countries was hit due to the shutdown measures ([Haren & Simchi-Levi, 2020](#)). Using a simulation, [Ivanov \(2020\)](#) and [Inoue and Todo \(2020\)](#) predicted supply chain disruptions due to COVID-19. Greater exposure of firms to global supply chains makes them more vulnerable to current and future disruptions ([Wang & Chou, 2018](#)).

India witnessed one of the strictest lockdowns in the World, which even restricted the intrastate movement of goods and people for a prolonged period (Mehrotra, 2020). While many countries in the World, including India, have largely emerged out of the first wave of lockdowns, one cannot rule out future lockdowns (Express News Service, 2020). For instance, Nestle India Ltd. has communicated to the regulator, "The scaled-down operations at various locations are essentially on account of applicable social distancing norms and the lesser deployment of people. The scaling up, scaling down or suspension of operations at various locations is dependent on the directions of the Central and State Governments . . ." (p. 1).<sup>5</sup> Measures, including containment of the movement of people within a local zone and shutdown of large cities and states to contain the spread of COVID-19, are expected to continue in the near future in different countries. These restrictions have the potential to significantly disrupt the business operations of firms in the near future.

The disruptions are likely to be severe for firms operating in districts with more incidences of the infection. Firms with plant operations in such districts might face intermittent closures because of employees getting infected, the lack of mobility given the enforcement of lockdown, and the time and cost involved in sanitizing the premises in the event of an infection. Firms more susceptible to lockdown induced disruptions would likely face a more significant loss in their production, revenues, and cashflows. Therefore, unlike a financial crisis where firms primarily worry about liquidity and demand contraction, the contagion adds a new dimension of vulnerability for firms through the likely disruptions in the supply chain, even when demand remains buoyant. Hence, we expect investors to attribute a higher value to firms less vulnerable to disruptions as an outcome of the classification of red zones in the country.

Also, we examine whether other channels of operational disruption affect the market value of firms. While we do not have sufficient data to construct a supply chain vulnerability index similar to Wagner and Neshat (2012), we employ measures that contribute to the supply chain fragility. We specifically examine whether firms that are more vulnera-

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<sup>5</sup>The disclosure dated April 21<sup>st</sup> 2020 can be obtained from <https://www.bseindia.com/corporates/ann.html>.

ble to supply chain disruptions through greater reliance on imports and on outsourcing, experience greater price correction in the market. Also, firms that are present across multiple business segments are likely to be less vulnerable to the impact of such disruptions. Hence, firms with lower operational fragility are expected to preserve their market value during the crisis better.

## **2.2. Financial and operating flexibility**

Financial flexibility is argued to be highly valuable for firms as it mitigates financing frictions and reduces the overall cost of capital (Gamba & Triantis, 2008). The precautionary liquidity stock can lend strength to firms to survive the crisis without painful disruptions. For instance, Campello et al. (2010) showed that financially constrained firms had to sell their assets to finance their operations during the global financial crisis, and consequently, had to pass up attractive capital investments. Research has shown that firms are likely to face liquidity crunch due to the pandemic (De Vito & Gomez, 2020). Large cash balance and low-leverage assume greater significance for firms in India due to a credit crisis that predates the virus. The slow-moving crisis has weakened its banks and non-bank financial institutions, including debt mutual funds (Iyengar, 2020). Hence, as firms are likely to face significantly higher financing constraints during episodes such as COVID-19, we expect firms with a lower financial flexibility to suffer a greater loss of market capitalization during the crisis.

It is well-documented that financial leverage and operating leverage together largely determine the equity beta of firms (Mandelker & Rhee, 1984). High fixed costs such as salaries and property rentals could weigh down on the ability of firms to survive the pandemic-induced demand contraction. On the contrary, firms that have a larger fraction of flexible costs can profitably operate with depressed levels of customer demand. It is argued that a high degree of operating leverage magnifies the exposure of firms to underlying economic risks in a way similar to that of interest and debt service outflows (for instance, Novy-Marx, 2011; Reinartz & Schmid, 2016). Kahl, Lunn, and Nilsson (2019) argued that firms with a high degree of operating leverage act in ways similar to

financially constrained firms. Therefore, firms with higher operating leverage are likely to suffer a greater market value loss in the on-going crisis.

We rely on proxies such as the degree of operating leverage (DOL) and inflexibility in scaling the operations of firms proposed by [Gu et al. \(2017\)](#) based on the past volatility of operating income. Inflexibility is claimed to have an independent influence on the degree of operating risk faced by a firm. Moreover, we also capture the flexibility associated with factors of production through the ratio of the employee expense to the overall expense and the ratio of the capital expenditure to the fixed assets. We expect firms with greater reliance on labor as a factor of production to be valued higher by the investors given the flexibility of resizing labor force.

### **2.3. Ownership and governance**

India has a large number of group-affiliated firms. Group firms are known to weather crises by intra-group reallocation of capital and, consequently, outperform non-group firms in investments and post-crisis performance ([Almeida, Kim, & Kim, 2015](#); [Kuppuswamy & Villalonga, 2016](#)). [Khanna and Palepu \(2000\)](#) and [Gopalan, Nanda, and Seru \(2007\)](#) showed that group-affiliated firms in emerging markets outperform the unaffiliated counterparts due to the benefits offered by business groups in bridging institutional voids and capital constraints. We examine whether the extent of market value loss varies between the group-affiliated and unaffiliated firms. Given the benefits that accrue to the group-affiliated firms, we expect such firms to outperform their unaffiliated counterparts.

In markets characterized by extreme uncertainty that arrives in a very short time, price correction takes place without the benefit of large quantities of micro-level information about firm fundamentals. In such situations, it is more likely that the actions of the insiders convey highly price sensitive information ([Kelly, 2018](#)). It is well-documented that insider trading has significant explanatory power on the abnormal returns earned by stocks ([Biggerstaff, Cicero, & Wintoki, 2020](#); [Cziraki, Lyandres, & Michaely, 2019](#)). Therefore, we examine how insider net buying during the progress of COVID-19, impacts the returns of firms.

The governance structure of a firm is known to influence the outcomes of firms and impact the shareholder value. Firms well-connected to other firms through their board of directors can leverage the information and resources to better prepare during the crisis (Pfeffer & Salancik, 2003; Zona, Gomez-Mejia, & Withers, 2018). Board interlocks are also beneficial to firms that rely on research and innovation in their growth strategy (Helmets, Patnam, & Rau, 2017). We expect firms with a higher degree of board connectedness to face relatively lower market value erosion in the crisis. Furthermore, concentrated promoter ownership can be beneficial during the crisis periods (Minichilli, Brogi, & Calabrò, 2016). Therefore, we expect firms with concentrated promoter ownership to preserve value during the pandemic compared to firms with diffused ownership.

### 3. Methodology and data

Given the unprecedented rapidity with which the bad news descended into the market, we rely on the equity market reaction to examine the impact of the pandemic and the response of the government that followed. The equity market reaction provides a leading indication on the real sector outcomes in the post-COVID-19 phase.

While employing the equity market response to assess the impact of the pandemic, we divide the period between December 31, 2019, and June 12, 2020, into various stages based, on the dominant events during the period. We admit that in an evolving scenario such as the pandemic, identification of the stages is primarily driven by characterizing the key events or milestones and not necessarily based on a rigorous approach. The various stages and the corresponding dates are provided in Table 1.

#### 3.1. Timeline of COVID-19 in India

Our tracking of the equity market response starts from December 31, 2019, to March 11, 2020, when the World Health Organisation (WHO) announced that COVID-19 is a pandemic (WHO, 2020). We call this period the ‘Incubation’ stage in India. Several key announcements characterize this stage, and the most prominent ones among them were

the confirmation of human transmission (January 20, 2020) and Italy’s decision to enforce a complete lockdown (February 23, 2020). The ‘Incubation’ stage was followed by the reporting of a limited number of cases in India. These cases were mostly among overseas travelers and their primary contacts. During this stage, denoted as ‘Limited Outbreak’, both the central and most state governments remained optimistic that the viral outbreak would not widely affect India ([Zee Media Bureau, 2020](#)).

The ‘Limited Outbreak’ period ended as things came to head India with the announcement of a ‘Janta Curfew’ (a single day shutdown on March 22, 2020), which hinted that the country would require an immediate lockdown. Janta Curfew was followed up with a strict three-week lockdown across the country. The lockdown announcement was widely appreciated as an effective step to prevent contagion. We call this the ‘Outbreak’ stage. As the number of infections continued to rise during the initial lockdown period, the government announced an extended lockdown by mid-April. By then, it was evident that there could be a widespread outbreak in India. We denote this stage between April 14, 2020, and May 12, 2020, ‘Widespread outbreak.’ By mid-May, both the central bank (Reserve Bank of India) and the Central Government announced various relief measures, including direct cash transfer, liquidity support for the industry, and a limited fiscal stimulus. On account of these developments, we call the period from May 12, 2020, to May 22, 2020, as the ‘Stimulus’ stage.

Along with the relief announcements, the Central Government announced a plan to exit the lockdown from May 23, 2020. We refer to this period as ‘Living with COVID’ (LWC). We limit the LWC period to June 12, 2020, as an unprecedented military standoff between India and China characterized the subsequent weeks. It was followed by several initiatives by the government to reduce trade flows between India and China, which may have impacted the market value of firms. [Table 1](#) provides the calendar and the corresponding trading dates for each period.

### 3.2. Empirical approach

Our analysis employs stock returns rather than abnormal returns because of the following concerns. First, the unprecedented crisis can materially change firms' risk characteristics relative to pre-COVID times. For instance, low-beta firms based on their past data with plant locations in geographic zones with a high incidence of infections could be re-designated as high-beta firms during the pandemic. Similarly, firms not amenable to the work from home (WFH) mode are likely to be regarded as riskier with COVID-19. Such a sudden shift in the risk exposures of firms makes risk parameters, such as CAPM and factor betas estimated from pre-pandemic times unreliable to estimate abnormal returns during our sample period. Second, even if the estimated covariances correctly reflect the future riskiness of firms, they subsume the key characteristics examined in the paper. For instance, the CAPM beta is expected to reflect the degree of financial flexibility of a firm (Doshi, Jacobs, Kumar, & Rabinovitch, 2019). Similarly, the ability to profitably alter the scale of operations is expected to be embedded in the firm's exposure to the value factor (Novy-Marx, 2011). Therefore, employing abnormal returns in the analysis would not allow us to determine the role of the chosen characteristics. Hence, we investigate the impact on raw returns after controlling for pre-COVID estimates of the size, CAPM beta and, book-to-market ratio, similar to the approach employed by Ramelli and Wagner (2020).

We estimate the stock price impact attributable to a specific firm-level characteristic across the six stages of the COVID-19 epidemic in India. The control period, called the pre-incubation period in this study, is the one-month period between December 1, 2019, and December 30, 2019. The choice of the one-month pre-incubation period corresponds to the commonly employed time window to examine the association between firm characteristics and cross-sectional stock returns. We use an event-study framework similar to that of Ramelli and Wagner (2020) to capture the differential impact of the pandemic on the market value of firms with varying characteristics. The dependent variable is the price return realized during a particular stage of the pandemic, including dividends. To examine the impact of the COVID-19 pandemic on the market value of firms, we employ

the following pooled estimation of stock returns.

$$R_{it} = \sum_{t=1}^7 \beta_t \times Firm\_Char_i \times Stage_t + \sum_{t=1}^7 \gamma_t \times X_i \times Stage_t + \delta_i + \mu_{jt} + \epsilon_{it} \quad (1)$$

where  $R_{it}$  is the price return of stock  $i$  for the period  $t$ .  $Firm\_Char$  represents the various firm characteristics described earlier under each hypothesis. We employ dummy variables to distinguish each of the periods.  $Stage_t$  is a dummy variable that takes the value of 1 for the respective period  $t$  and is 0 otherwise. The six stages, excluding the pre-incubation period, of the pandemic adopted in the estimation, are discussed earlier in the paper.  $\beta_t$ , the coefficients of the interaction between the period dummies and a chosen stock characteristic ( $Firm\_Char \times Stage_t$ ) capture the estimated impact. Each interaction term represents the incremental return earned by the stock during that particular stage of the epidemic.

We control for any time-varying preference for large firms by controlling for firm size by period ( $X \times Stage_t$ ). We similarly control for any time-varying preference for risk and growth opportunities by adding  $Beta$  by period and  $bm - ratio$  by period controls, respectively. Although most firm-level characteristics, which are not expected to drastically change during the estimation period, are controlled by the firm fixed effects, the interaction would capture any time-variant preference of investors for firms that are larger, riskier, and have higher growth opportunities.  $\mu_{jt}$  captures the  $Industry_j \times Stage_t$  fixed effects of the industry  $j$  to account for any time-variant industry-specific changes to the return characteristics. For example, any preference over time for Pharma stocks would be captured by these interactive fixed-effect dummies (Gormley & Matsa, 2014). Furthermore, these interactions will capture any industry-wise susceptibility to the supply of one key raw material or the amenability to work from home measures. The  $Industry_j \times Stage_t$  fixed-effects also subsume any common shocks in the market during each period  $t$ . For instance, these dummies would subsume the market reaction to the WHO announcement.  $\delta_i$  captures firm-level fixed effects. These dummies would capture any observable or unobservable effects that do not vary by time. All of our estimations employ robust standard errors clustered at the firm and period level to capture control for heteroscedasticity,



auto-correlation, and cross-sectional dependence (Petersen, 2009).

Given that the COVID-19 pandemic is an exogenous shock to the Indian market, the choice of sub-periods based on the government reaction to the shock provides us with an instrument that facilitates a causal inference of our results. Therefore, in our model, concerns of endogeneity arising out of reverse causality are minimal in our empirical setting. As we saturate our estimations with several dummies to capture time-invariant and time-variant unobserved heterogeneities, endogeneity concerns due to omitted variables are minimized to a considerable extent. We try to mitigate selection issues in our sample by extending the sample to include relatively less-liquid stocks in Section 5.2.

### 3.3. Data

We employ firm-level stock return data of the listed firms in India from December 2, 2019, to June 12, 2020. Our universe of firms is the entire set of listed firms in India, at the National Stock Exchange (NSE) and the Bombay Stock Exchange (BSE) as of January 2020, excluding the financial sector firms.<sup>6</sup> From the 4,000 firms, we exclude firms with negative book value of equity and negative sales. From the remaining firms, we choose the top 500 firms for the main analysis, which contribute to more than 95% of the total market capitalization in the Indian market. The sample of firms also has relatively higher liquidity to ensure reliable analysis based on market responses over short-periods represented by the different stages of the pandemic. In addition, we extend the analysis to a larger sample of top 1,500 firms on market capitalization.

We obtained the stock price data and firm-level financial information from CMIE Prowess database. The firm-level variables employed in our analysis are based on the annual report data of FY 2018-19 reported in CMIE Prowess. We hand-collected the data of plant locations from CMIE Pace database, where the plant location for each firm is provided separately in a document format. Of the sample of 500 firms, we have data of plant locations for 386 firms. We collected the data on infections and zoning categories from the official notifications issued by the Ministry of Health and Family Welfare. We

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<sup>6</sup>Two-digit NIC codes 64, 65 and 66 correspond to financial sector firms.

obtained the data on insider trades from the NSE database.<sup>7</sup> We collected the board membership data from the corporate governance data provided in CMIE Prowess. All financial variables are winsorized at the 1<sup>st</sup> and the 99<sup>th</sup> percentile to avoid outliers in the analysis. The stock returns are adjusted for dividend payments for the sample period.<sup>8</sup> Table 2 gives the definitions of the variables employed in the analysis. Table 3 provides the summary statistics of the returns across each stage of the pandemic. Table 4 presents descriptive statistics of the key variables. The key characteristics of the firms during the pre-COVID period are highlighted below.

The median firm has total assets of INR 32.59 billion and market capitalization of INR 41.05 billion. The median firm has a cash-to-assets ratio of about 5.70%, and when we net out the short-term debt, the net cash ratio is about 0.64%. The liquidity indicators suggest that a large fraction of the Indian firms have liquidity issues due to the on-going corporate slowdown in India. The debt ratio of the median firm is 11.24%. The operating leverage indicates that for a rupee change in revenue, the median firm generates 13 paise change in operating profits.

The employee expenses and the capital expenditures for the median firm are 9.11% and 20.24%, respectively. About 70% of the firms (358) have employee expenses exceeding the capital expenditure. Of the 500 firms in our main sample, we have plant location data for 386 firms. Of 386 firms, 304 of them at least one location falling within the red zone. A total of 76 firms have all their operational locations inside red zones. The median (average) firm has a *Zone Score* of 3 (3.11) and has 50%(47%) of its plants located inside a designated red zone.

Of the 500 firms in our sample, 56 firms have sourced the raw materials from other countries. The average firm relies on 3.85% of its raw material sourcing through imports. Such a firm has outsourced about 2.85% of its operational expenses. Firms focused on single businesses account for 68%, and diversified firms constitute about 32% of the sample. The median firm is interlocked with five firms and has substantial promoter

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<sup>7</sup>Data on insider buying, and selling is available from NSE, based on SEBI regulations 7 (2). The data can be accessed from <https://www.nseindia.com/companies-listing/corporate-filings-insider-trading>.

<sup>8</sup>The data on dividend announcements are available only until March 31, 2020.

ownership of 58.07%. The group-affiliated firms represent a large fraction of the sample. A total of 284 firms (57%) in our sample are affiliated to a business group, 170 firms are unaffiliated, and 46 firms are state-owned. Manufacturing firms dominate the sample, and about 64% of the sample represents manufacturing. IT and other technology services firms account for about 5% of the sample. The sample comprises about 78.2% of firms focused on the domestic market.

## 4. Findings and discussion

In the following section, we present the findings related to the key questions addressed in this research and discuss their implications. In all the estimation results shown in this section, in the odd columns, we control for unobserved heterogeneity with the firm and industry-stage fixed effects. In the even columns, in addition to these fixed effects, we control for the effect of the size, market beta, and book-to-market ratio on the firm value within each stage of the pandemic.

### 4.1. Stock returns across stages and industries

Figure 3 depicts the characteristics of the stage-wise distribution of the firm-level returns, and Table 3 presents the descriptive statistics. For reference, in each figure, the return distribution of the Pre-incubation period is superimposed. As seen in the panels, the major correction in the Indian market happened in the *Limited Outbreak* period ( $-29.6\%$ ), capturing the anticipated business losses due to the impending health crisis. The market correction in India was well-ahead of the actual outbreak of infections. The rapidity of the response in the Indian market could be because of the benefit of hindsight from the experience of other countries. The market partly regained about 19% of the lost ground as the infection started spreading in India during the *Outbreak* phase.<sup>9</sup> Unlike the US market, which took off on the stimulus announcement, the Indian market remained somewhat flat in the *Stimulus* period. The muted response to the stimulus could have been

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<sup>9</sup>The market correction could be partly attributed to the large stimulus announcement in the US.

due to the lower fiscal support, greater impetus on liquidity, and emphasis on the medium and small firms.<sup>10</sup>

We also observe a substantial cross-sectional variation in the returns across industries. [Figure 4](#) shows the impact on the market value of different industries across the pandemic stages (January 1, 2020, to June 12, 2020).<sup>11</sup> The worst affected industries are tourism, real estate, and hospitality, where the market value losses exceed 40%. Admittedly, lockdown and social distancing measures directly impacted them. Their value loss is also reflective of the likely contraction in discretionary spending by households and businesses. Five industries out of twenty-four have lost at least a quarter of their market capitalization in the period. Pharmaceutical and telecommunication industries added substantial market value during the pandemic. The positive impact on the pharmaceutical and telecommunication industry has also been documented in the US ([Ramelli & Wagner, 2020](#)).

## 4.2. Univariate comparison of returns

We examine the univariate trends in the market value changes across different stages of the pandemic. [Figure 5](#) shows the trends that capture the difference between the mean returns of sub-samples classified on the median value of the respective characteristic variable. Firms with manufacturing facilities in the red zones earn lower returns as the crisis deepens in India (*Limited Outbreak* and *Outbreak* phases). The difference we observe in the mean returns for sub-samples of firms that vary on liquidity indicates the higher marginal value of liquidity (figures for both *Netcash* and *Cash*) during periods of financial stress. The marginal value attached to liquidity is lower in the later stage when the restrictions are lifted with the announcement of a stimulus. The wedge in returns between sub-samples based on leverage (*DebtRatio*) more or less mirrors the difference observed for liquidity. Highly levered firms lose greater market value in the initial stages and then rebound as the lockdown is lifted. It is interesting to notice that firms with

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<sup>10</sup>The small and medium sized firms in India are those with a turnover of INR 2.5 billion or lower as per the revised definition adopted in 2020.

<sup>11</sup>The industry market values are estimated as the capitalization-weighted (weights as of January 1, 2020) market value of the constituent firms.

higher employee expenses ( $EmpExp$ ) have benefited in the earlier stages of the crisis. The higher reliance on labor as a factor of production is valuable in a crisis as it could allow faster and cheaper re-scaling of operations. On the contrary, the trends for firms with higher capital expenditure ( $Capex$ ), a less malleable factor of production, indicate that investors are concerned about the adjustment costs associated with fixed assets.

In univariate comparison, we find that the group-affiliated firms earn higher returns than their non-affiliated counterparts in the outbreak period. The value of firms governed by more networked boards rises as the crisis unfolds ( $BoardInterlock$ ). We observe a significant increase in the market value of firms associated with insider buying ( $InsiderTrans$ ) during the pandemic. The trend suggests the value relevance of insider action during periods of heightened uncertainty.

### 4.3. Impact of operational fragility

We examine the impact of operational disruptions on the market value of firms by identifying a set of suitable proxies. The vulnerability of firms to disruption of business operations due to the spread of COVID-19 is primarily captured through the intensity of the infections, in geographies where firms' commercial operations are concentrated. The proxies that we employ capture: (a) the natural log of the total number of COVID-19 infections across all the districts where a firm operates its manufacturing facilities, (b) a weighted score for each firm that captures the intensity of the pandemic across its manufacturing locations, (c) the proportion of plants that are situated in the red zone, and (d) an indicator variable that captures if at least one of its plants is located in a red zone.<sup>12</sup> We believe that each of these proxies captures a particular character of a firm's vulnerability to disruptions. For instance, an FMCG firm that produces more or less the same product mix at various locations would lose out on the market share for its products if a large fraction of its facilities is located in containment zones. However, for an integrated metal manufacturing firm, even disruption in operations of one of the upstream facilities has serious potential to disrupt its downstream operations.

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<sup>12</sup>For computing the *Zone Score*, plants in the red zone are assigned a score of 5, in the orange zone are assigned a score of 2, and in the green zone are assigned a score of 0.

Table 5 gives the results of the analysis of the vulnerability of firms to operational disruption and its impact on market value. We observe a more significant loss of market value for firms with manufacturing facilities in red zones or areas with a higher intensity of infections. For instance, a firm with all its plants located in red zones had a market value erosion of 318 bps during the *Limited Outbreak* period, and 547 bps during the *Outbreak* period (column (3)), relative to its peer group of firms with no facility located in a red zone.

The significantly lower returns earned by the firms with operational locations falling inside the red zones during the early stages of the pandemic (*Limited*, *Outbreak*, and *Widespread*) suggest that the market was pricing the anticipated severity of disruptions. We find that the relative loss in the value is enduring throughout the rest of the stages. The performance during the *Living with COVID* stage suggests that market factors in the difficulty of firms with operations in the red zone to revert to business as usual. The results imply that the market is accounting for the possibility of longer-term disruptions in the operations of the firms located in highly infectious zones. A similar negative impact is observed when an indicator variable for at least one plant in a red zone (see columns (5)-(6)) is employed. We also re-estimate the impact of disruptions using the number of infections in a district (columns (7)-(8)). Again, we observe an adverse impact on the market value of firms operating in highly infected districts during the later stages of the spread of the pandemic in India.

In unreported estimations, we have classified firms based on their headquarter location rather than the plant locations. However, the results indicate no significant adverse impact based on the headquarter classification. Most operations at the headquarters are likely to be amenable to work from home mode of functioning. We also find that the magnitude of the adverse impact is similar even when we classify information technology sector firms with reported operations in the red zones as un-impacted. Such firms are less susceptible to disruptions owing to their flexibility to pivot to work from home mode (Dingel & Neiman, 2020). Overall, the findings suggest that the market is pricing in the adverse impact of operational disruptions.

We also examine the impact of operational fragility with the help of three other proxies: number of business segments covered by the operations of the firm, the dependence of a firm on outsourced work, and its reliance on imported raw materials, in Internet Appendix [Table A1](#). Columns (1)-(2) show the estimations with the number of segments. In the initial phase, we observe that firms with a large number of segments fared poorly compared to the Pre-incubation period. However, in the later stages, we observe a reversal in the impact on such firms. During the *Outbreak* period, firms with diversified business interests fared better compared to focused firms. As shown in columns (3)-(4), we do not find any significant impact on firms with a higher reliance on outsourced work. In columns (5)-(6), we find no adverse impact on firms with higher reliance on imported raw material. While we expected the firms with higher import reliance to have an adverse effect on the market value in the initial stages, we do not find any such impact. However, we find that such firms marginally benefited during the *Widespread Outbreak* period. Likely, the easing of restrictions in China and lower restrictions on goods movement among countries would have played a part in easing imports. Overall, we find weak evidence that firms with greater supply chain fragility have higher erosion of value during the crisis.

The findings deepen the understanding of the influence of a firm's geographic location on its market value. The explanatory power of the geographic location of the business operations of firms identifies a specific channel through which the pandemic impacts their value. The evidence on the common variation in returns of firms located in certain geographic zones is in line with the literature on the geographic commonality of equity returns ([Davison, 2020](#); [Murfin & Spiegel, 2020](#); [Pirinsky & Wang, 2006](#)). Furthermore, our results are related to the findings of [Davison \(2020\)](#) on how industry-wise social distancing requirements affect the operations and thereby impact the firm value. In our analysis, we control for industry-wise stage-specific variations, such as the amenability to work from home, and examine the pricing impact driven purely by their geographic risk.

#### 4.4. Impact of financial flexibility

Table 6 shows the results of the estimation shown in Equation 1 for firm characteristics that proxy for financial flexibility. We find that firms that maintained a higher level of liquidity in the form of cash and cash equivalents (see coefficients of  $Cash \times Stage$  in columns (3)-(4)) faced a lower decline in market value during *Limited Outbreak*, *Outbreak* and *Widespread Outbreak*. A one-standard-deviation increase in the cash-to-assets ratio (14.35%) is associated with 173 bps ( $0.14 \times 12.38$ ) higher return in the *Limited Outbreak* stage. Once the nation-wide lockdown restrictions are lifted, firms with lower flexibility outperform their flexible peers, indicating a reversal and the associated value provided by the liquid resources at a firm's disposal. A one-standard-deviation increase in the cash-to-assets ratio (0.14) during *Living with COVID* is associated with 80 bps ( $0.14 \times 5.718$ ) lower return. We find similar results for the estimations with *Netcash* (columns (1)-(2)), where the short-term liabilities are netted out. In the *Living with COVID* stage, firms with large cash reserves witness some reversal in the value gains made in the initial stages. Why should cash drive the market value more than net cash? The similarity in the findings between estimations with *Cash* and *Netcash* could be attributed to the moratorium provided for formal financial contracts and the flexibility expected in informal short-term liabilities. Hence, unlike normal times, the marginal value attached to cash and net cash for a firm may not significantly diverge.

Interestingly, firms with a higher debt-to-assets ratio, a measure of the balance sheet solvency of a firm, saw a larger erosion in the firm value (columns (5)-(6)). A one-standard-deviation increase in the leverage ratio (0.17) is associated with a 212 bps reduction in the market valuation of a firm during the *Limited Outbreak* period (column (5)). When we control for the firm size, beta, and the book-to-market ratio (column (6)), the effect is stronger with a reduction in the value by 262 bps during the *Limited Outbreak* phase and a further reduction of 104 bps during the *Stimulus* stage. Relatively levered firms were considered riskier during the initial stages of the pandemic, and they continued to underperform firms with lower leverage. The incremental market value enjoyed by firms with financial flexibility documented in our paper is consistent with the findings of



Campello et al. (2010) on the beneficial role of financial slack for firms during the 2008 global financial crisis.

The observed market outcomes show that firms with higher liquidity will undergo a short-term reversal when the nation-wide lockdown is lifted. On the contrary, the impact of solvency, which has long-term implications, does not reverse substantially when the lockdown measures are eased. The findings on financial flexibility have significant implications for firms in emerging markets such as India. On the one hand, the utility of maintaining precautionary liquidity and strategic cash balance rewards investors significantly during the crisis, though, it abates when the uncertainty subsides. On the other hand, maintaining a highly levered capital structure backfires during such events. Despite the market recovery, highly levered firms continue to suffer shareholder value loss.

The value attached to financial flexibility could be conditional on the extent of the operational disruptions likely to be faced by firms. Hence, we examine how the losses inflicted on the market value attributable to lower financial flexibility are magnified through the operational fragility of firms in Table 7. We estimate the impact with interactions involving the proxies of financial flexibility and operational fragility across different stages of the pandemic. The findings indicate that the vulnerability to disruptions has a greater cost for firms with lower financial flexibility or higher indebtedness. For instance, a one-standard-deviation increase in the value of *NetCash* (20.38%) for a firm with all the plants located in the red zone during the *Widespread Outbreak* leads to 436 bps ( $0.204 \times 21.40$ ) higher returns (column (1)). Similarly, a one-standard-deviation increase in *DebtRatio* (17.05%) for a firm having all the plants in the red zone during the *Widespread Outbreak* period leads to 254 bps ( $0.17 \times 14.87$ ) lower returns (column (5)). The results indicate that financial flexibility is more valuable for firms whose operations are likely impacted more adversely by COVID-19.

The enduring impact of leverage on the market value of firms argued earlier is driven by firms with operations inside the red zones (column (5)). However, we observe a reversal of the impact of leverage for firms not operating in the red zones implying that the market regards the potential for operational disruptions through the geographic location of firms

as a channel that would magnify the solvency issues of highly levered firms. The economic significance of the coefficient of triple interactions suggests that investors have heightened concerns about operational disruptions for firms with little liquidity or higher leverage. Our results document a clear channel through which the COVID-19 pandemic multiplies the risk of firms with low liquidity or higher financial commitments. Davison (2020) found that another dimension of operational vulnerability, reflected in the unsuitability of firms to the ‘work from home’ mode of operation, magnified the impact of the leverage on firms.

#### 4.5. Impact of operating flexibility

Firms could attempt to restore the profitability of their operations through a variety of actions such as optimization of the product mix, market re-focus, plant shutdowns, and reduction of overheads. However, firms that exhibit higher past variations in their operating profitability, along with changing the scale of operations, are likely to face a greater adverse impact during the crisis. Table 8 gives the results of the estimation of the impact of operating flexibility on stock returns.

We find that higher operating inflexibility (*Inflex*), measured as the difficulty of a firm to re-scale operations without adversely impacting profitability, has a significantly adverse impact on the market value of a firm. The coefficient of *Inflex* (columns (3)-(4)) for the *Incubation* stage shows that a one-standard-deviation increase in *Inflex* leads to a 243 bps greater decline in the market value ( $0.64 \times 3.8$ ) relative to the pre-incubation stage. The sign of the coefficients in most stages suggests that higher fixed costs and inflexibility make a firm more vulnerable to the crisis. We also employ operating leverage (columns (1)-(2)) as an alternative proxy for operating inflexibility. Relative to the pre-incubation stage, firms with a higher proportion of fixed costs in their cost structure suffer a greater market value loss during the different stages of the pandemic. For instance, during the early stage of the crisis (*Incubation*), a one-standard deviation (1.87) increase in the degree of operating leverage (*DOL*) leads to about 133 basis points (bps) greater decline in the value of the firm ( $1.87 \times 0.71$ ) relative to the pre-incubation period.

In unreported results, we find that the operating leverage has a significant negative impact on returns even after controlling for the degree of operating flexibility.<sup>13</sup> It suggests a greater market value loss for firms with higher operating leverage when their operations are relatively inflexible. The significance of *Inflex* is in line with the findings of Gu et al. (2017) that a higher degree of operating leverage mostly hurts firms that exhibit a high level of inflexibility. The magnifying impact of operating leverage and firm-level inflexibility to profitably re-scale operations reflects the poor economics of operations that could be faced by such firms with demand contraction likely to be triggered by Covid-19.

We also investigate the association between market returns and other dimensions of operating flexibility, such as the ratio of employee expenses to total expenses (*EmpExp*) and the ratio of capital expenditure to total fixed assets (*Capex*). The coefficients of *EmpExp*  $\times$  *Stage* in columns (5)-(6)) suggest that labor-intensive firms are considered less susceptible to the impact of the pandemic. For instance, at the beginning of the crisis, firms with a one-standard-deviation higher employee expense ratio (0.145) had an increase in return of about 475 bps relative to the pre-incubation period (column (6)). We find a similar increase in the value of about 171 bps at the beginning of the outbreak. The estimated impact of *Capex* by and large mirrors the findings for the labor-intensive firms (columns (7)-(8)). Capital-intensive firms have greater vulnerability to the economic shock created by the crisis. The coefficient of *Capex*  $\times$  *Stage* is negative in all the stages of the crisis, reflective of the disadvantage of such firms when faced with unpredictable demand.

The higher market valuation of firms that have greater labor cost intensity suggests that the market expects such firms to optimize operating costs in the future significantly.<sup>14</sup> The findings on the impact of employee cost are in sync with widely reported instances of reduction of employee benefits and large-scale retrenchments (Barrero, Bloom, & Davis, 2020). Furthermore, our findings on the relatively greater market valuation of labor-

<sup>13</sup>The coefficient of the triple interaction between *DOL*  $\times$  *Inflex\_Dum*  $\times$  *Stimulus* (where *Inflex\_Dum* is a dummy variable equal to 1 for a firm with an above-median value of *Inflex* and 0 otherwise) is negative and significant (coefficient value = -0.52).

<sup>14</sup>During the period covered in the study, various state governments in India announced major reforms in labor law to lower the difficulty and the cost for firms to resize their workforce (Sundar & Sapkal, 2020).

intensive firms in comparison to the capital-intensive firms corroborate the evidence in the US documented by [Alfaro et al. \(2020\)](#). It is intriguing to notice that during the stage encompassing the announcement of the stimulus (*Stimulus*), the relative performance of the labor-intensive firms is stronger. This outcome during the ‘*Stimulus*’ stage could be attributed to the greater focus of the stimulus package on protecting labor benefits through government transfer ([Iyer, 2020](#)).

#### 4.6. Impact of business group affiliation

[Table 9](#) provides estimates of the impact of the affiliation of a firm with a business group on its equity market value. The coefficients presented in the table provide estimates of the incremental impact on the market value of group-affiliated and unaffiliated firms during the crisis, relative to the state-owned firms.

Among the private-sector firms, those with affiliation to a business group outperform those unaffiliated to any business group. For instance, during the *Outbreak* phase, the unaffiliated firms suffer nearly 3.1% greater loss of market value compared to the firms affiliated to the business groups.<sup>15</sup> The relative advantage of the group-affiliated firms in mitigating the fallout of the crisis had been supported in earlier crises episodes ([Leung & Horwitz, 2010](#)). It is likely that the effects of institutional voids (see for instance, [Khanna & Palepu, 2000](#)) would be played up during a crisis and that business groups with relatively greater access to capital and resources (for instance, [Gopalan et al., 2007](#)) can help their affiliate firms to wade through the crisis ([Kuppuswamy & Villalonga, 2016](#)).

Furthermore, we estimate the impact of financial flexibility for affiliated firms and non-affiliated firms in [Table 10](#). Interestingly, we observe that the marginal value of *NetCash* is significantly higher for the unaffiliated firms during the *Outbreak* stage and remains so even during the *Stimulus* stage (columns (1)-(2)). This result brings out a heterogeneity in the impact of cash on the firm value, depending on the group affiliation. The utility of a rupee of cash is significantly lower for affiliated firms as they may have access to group-level financial resources.

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<sup>15</sup>The sensitivity of returns to business group affiliation (non-BG) is  $-12.0$  ( $-15.1$ ) during the *Outbreak* stage. The difference in sensitivity for these two cohorts is  $-3.1$ .

An almost analogous wedge in the value attached to financial flexibility is evident in estimations involving *DebtRatio* as a proxy. The results for *DebtRatio* suggest that the negative impact of higher leverage on the firm value is significantly higher for unaffiliated firms compared to the affiliated firms (columns (3)-(4)). Moreover, the enduring nature of the impact of *DebtRatio* on the market value explained in Section 4.4 is primarily driven by the unaffiliated firms. The findings suggest that the market believes that the affiliated firms are better equipped to deal with the fallout of the crisis than the unaffiliated counterparts. The observed wedge in the value attached to financial flexibility for group affiliated firms and the unaffiliated firms is in line with the resourcefulness of group affiliated firms (Gopalan et al., 2007; Kuppuswamy & Villalonga, 2016), as their internal capital markets can meet the financial needs of firms.

The government-owned firms have outperformed their private counterparts during most stages of the ensuing crisis. For instance, the government-owned firms outperformed the firms affiliated to a business group by 7.2, 12.0, 2.5, and 4.1 percentage points during the *Limited Outbreak*, *Outbreak*, *Stimulus*, and *Living with COVID* stages respectively (see Table 9). The relatively low market value loss of the state-owned firms is especially evident during the onset of the crisis (until the *Outbreak* stage). With stimulus measures, the wedge has narrowed between the government-owned firms and the private-sector counterparts. The relative performance of the state-owned firms could be partly linked to the announcement of privatization of all state-owned firms, except in four strategic sectors, made during the period.<sup>16</sup>

#### **4.7. Impact of insider buying, board interlocks and promoter ownership**

We examine the influence of insider actions, interlocked boards, and concentrated ownership on the market value of firms. We estimate the net insider buying for each stage as a proportion of total shares outstanding. Table 11 provides results of the estimation

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<sup>16</sup>An article on the stock market reaction to the announcement of privatization of state-owned firms can be accessed from <https://economictimes.indiatimes.com/markets/stocks/news/railway-linked-stocks-rally-up-to-16-as-privatisation-process-kicks-off/articleshow/76745165.cms>.

of net insider buying. Firms where insiders increase their stake show resilience in their market value during the crisis. For instance, a one-standard-deviation increase in insider ownership in the *Limited Outbreak* stage is associated with a 27.8% ( $3.1 \times 8.98$ ) increase in the market value of the firm relative to the pre-incubation period (columns (1) and (2)). The magnitude of the impact is economically significant and conveys that net insider buying is valued positively by the market.

The positive association between insider net buying and the market value holds in several other stages in the crisis (*Outbreak* and *LWC*).<sup>17</sup> The positive association reflects the signaling value of insider actions in periods characterized by a high degree of ambiguity. Our findings on the significance of the insider actions are broadly in agreement with the earlier research findings on the issue (Cziraki, 2018).

Columns (3) and (4) of Table 11 provide the estimates of the impact of a firm's ability to leverage its network on shareholder value. The measure that we employ is the board connectedness proxied by the number of interlocks of a firm with other listed firms in India. The estimates suggest that interlocked firms can enhance the market value during the pandemic. A one-standard-deviation increase in the board interlock measure (5.17) is associated with an increase in the value of about 187 bps in the *Incubation* stage relative to the pre-incubation stage (column (4)). A similar incremental impact in the *Stimulus* period is 128 bps. The above favorable impact is likely as interlocked firms will have better access to resources. Similarly, in the later phase, when the government offers a stimulus to the industry, firms with more extensive networks are likely to enjoy greater rewards out of it. The findings on the significance of the board connectedness can be related to the role of the network in increasing the firm value (Helmerts et al., 2017; Zona et al., 2018). A network allows firms to cobble together a faster response to any emerging crisis, and our results during this unprecedented twin crises underscore the same.

Columns (5) and (6) of Table 11 provide the estimates of the impact of promoter ownership on the market value of firms. Firms with higher promoter ownership earn relatively

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<sup>17</sup>The finding of the positive association of stock returns and insider buying is unlikely to be driven by the price impact of insider buying volume. We find that the volumes associated with insider trades are relatively small compared to the daily stock volumes.

higher returns during the early phase of the COVID-19 crisis. A one-standard-deviation increase in the promoter ownership (15.7%) in the *Incubation* period is associated with a 1.89% increase in market value relative to the pre-incubation period (column (5)). The outperformance of firms with concentrated promoter ownership during the pandemic is similar to the finding of [Minichilli et al. \(2016\)](#) during the 2008 Global Financial Crisis.

## 5. Robustness

### 5.1. Alternative Pre-incubation periods

While a one-month pre-incubation period, in line with the convention adopted in asset pricing studies, is employed to judge the relative impact of the pandemic on firms, our results are not specific to the pre-incubation window of one month. In alternative estimations, we re-estimate our key results with an alternative pre-incubation period of 45 days and 60 days immediately before the *Incubation* period. Our key results are qualitatively the same for these alternative pre-incubation periods. Internet Appendix [Table A2](#) and [Table A3](#) show the results of the estimation for all variables for 45-day and 60-day windows, respectively.

### 5.2. Impact of the crisis on an extended sample of firms

We re-estimate the impact of the crisis on a larger sample of firms. For the large sample, we start with the top 1500 firms by their market capitalization as of December 31, 2019. After excluding firms in the financial sector, with negative book-value, and with incomplete financial data, the extended sample consists of 1,157 firms. The smallest firm in the sample has a market capitalization of INR 878 million.<sup>18</sup>

Admittedly, stocks in the extended sample have lower liquidity and, therefore, may have delayed response to the rapidly evolving news during the pandemic. However, the issue of asynchronicity in trading may not be a major concern over extended periods covered by the six different stages of the pandemic. [Figure 6](#) gives the results of the

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<sup>18</sup>The minimum market capitalization required to maintain listing at the NSE is INR 250 million.

estimation of the coefficient of the interaction between the chosen firm-characteristic and the period dummies. Each sub-figure provides the value of the estimated coefficient along with its 95% confidence band. Detailed results are shown in the Internet Appendix from [Table A4](#) to [Table A10](#).<sup>19</sup>

On several characteristics, the extended sample corroborates the findings from the sample employed in the main analysis. Most importantly, financial flexibility (*Cash*) is valuable in the initial stages compared to the later stages. On the other hand, leverage has a significant adverse impact on the market value in the initial stages. The market value impact of operating flexibility (*Inflex*) is also consistent with the main findings. Firms with higher employee expenses earn higher returns. On the other hand, firms with higher capital expenditure underperform, as found in the baseline analysis. The impact of promoter ownership is positive and significant during the *Incubation* and *Limited Outbreak* phases. These results are consistent with those observed for the main sample. Affiliation to a business group enhances the market value in the extended sample as well. The findings from the extended sample are largely consistent with the findings from our baseline sample of 500 firms.

## 6. Conclusion

In our study, we exploit the short-term variation in the market value of a wide cross-section of Indian firms, over markedly different stages to assess the likely impact of the COVID-19 pandemic. We examine the variation in the impact on the firm value due to the differences in the operational fragility, financial and operating flexibility, and governance characteristics of firms. The analysis attempts to identify characteristics that amplify the impact of the crisis on firms. The study brings out a set of unique channels through which the health crisis translates into a firm-level shock.

We find that firms with operations in locations designated as high-risk zones based on the spread of infections suffer a greater market value loss than their peers. Firms with

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<sup>19</sup>Internet Appendix [Figure A1](#) to [Figure A3](#) illustrate the industry-wise market value changes during the pandemic, distribution of returns in different stages of COVID-19 pandemic, and the comparison of the returns of sub-groups based on firm characteristics for the extended sample, respectively.



lower financial flexibility and higher leverage have a more significant adverse impact. Furthermore, we find that the marginal value attributed by the market to the financial flexibility of a firm is greater for firms susceptible to operational disruptions. Firms with greater operating flexibility, lower operating leverage, and scalable operations earn higher returns. It suggests that markets value firms' ability to profitably adjust their operations to match the demand levels.

Our findings suggest that the governance and ownership characteristics of firms matter when besieged by a crisis. Interestingly, firms with affiliation to a business group are expected by the market to better navigate through the pandemic. The deeper access of the group firms to financial and other resources is likely to make such firms less vulnerable to the severity of the crisis. Complementing the finding on the resilience of the group firms, we find that the marginal value of liquidity is higher for the unaffiliated firms. In line with the argument that insider actions carry significant signaling value during crisis periods, we find that insider buying favorably affects the shareholder value. Finally, we document that firms with greater interlocks through board memberships face a lower impact of the COVID-19 crisis compared to their less-connected peers.

The results identify the firm-level operational and financial attributes valued by the market as mitigants that help weather the economic shock. The results also highlight the explanatory power of a range of risk-related stock characteristics, some of which become prominent only during a crisis. Another way of interpreting our results is that they indicate investors' willingness to accept relatively lower returns for firms that are likely to emerge with a lower degree of damage.

The findings of our study highlight the benefits that accrue to firms that maintain excess financial resources and have a relatively low operating risk in facing an unprecedented shock. While the slack in firm resources does not often reward shareholders in normal times, it is valued during testing times. Our findings suggest that the market values prudent risk management. While efficiency is a crucial tenet for corporate managers, the evidence from the market reaction during the crisis reveals the importance of maintaining strategic redundancy. The findings of our paper offer useful guidance to

firms to prioritize actions that would mitigate the impact of the crisis as we learn to live with the virus.

The market reaction to the disruptions brought about by the pandemic is a leading indicator of the expected change in the firm value. Our findings based on the market reaction over six months may not fully judge the vulnerabilities or resilience of firms and the associated characteristics in the context of an unprecedented and fast-evolving crisis. Future research, with information on firm-level fundamentals, can examine whether the market response adequately reflected the true impact of the crisis and accordingly priced the firm-level risk.

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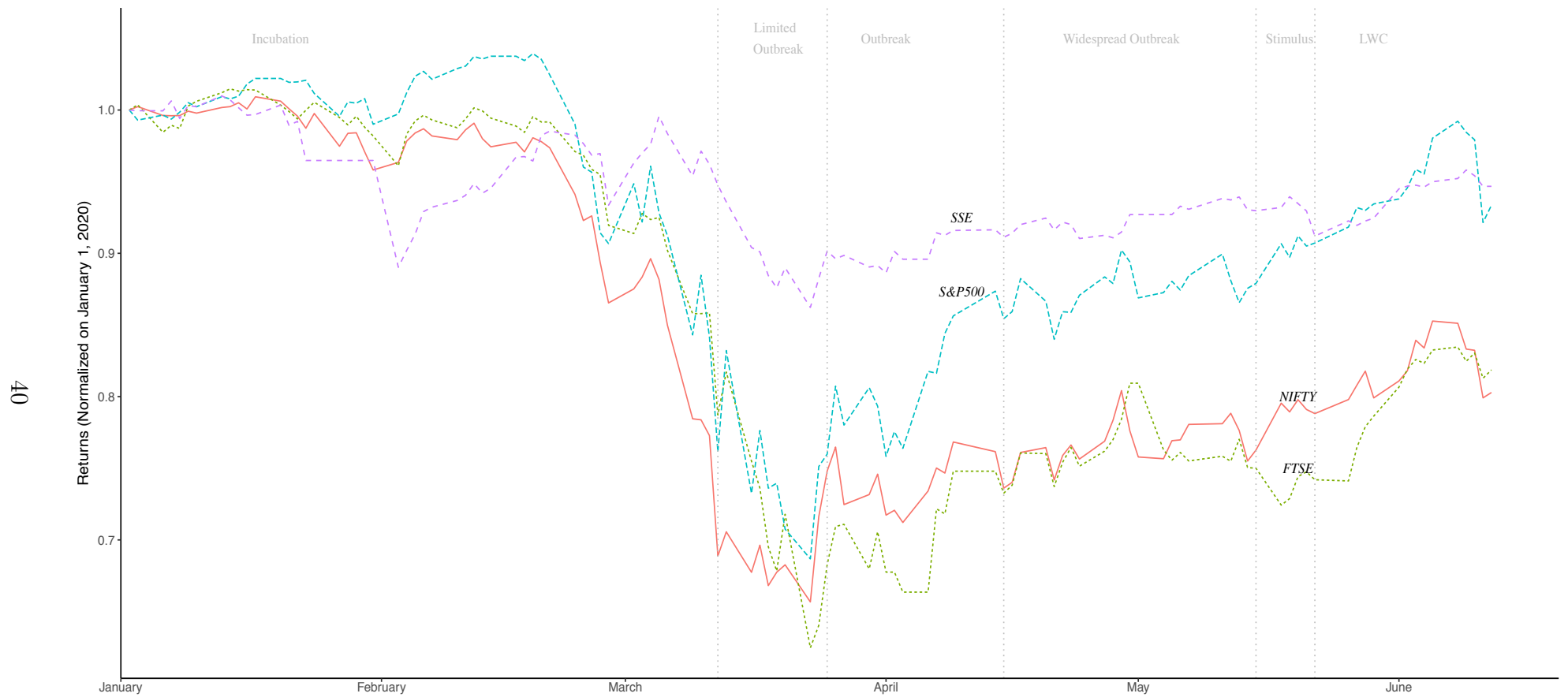
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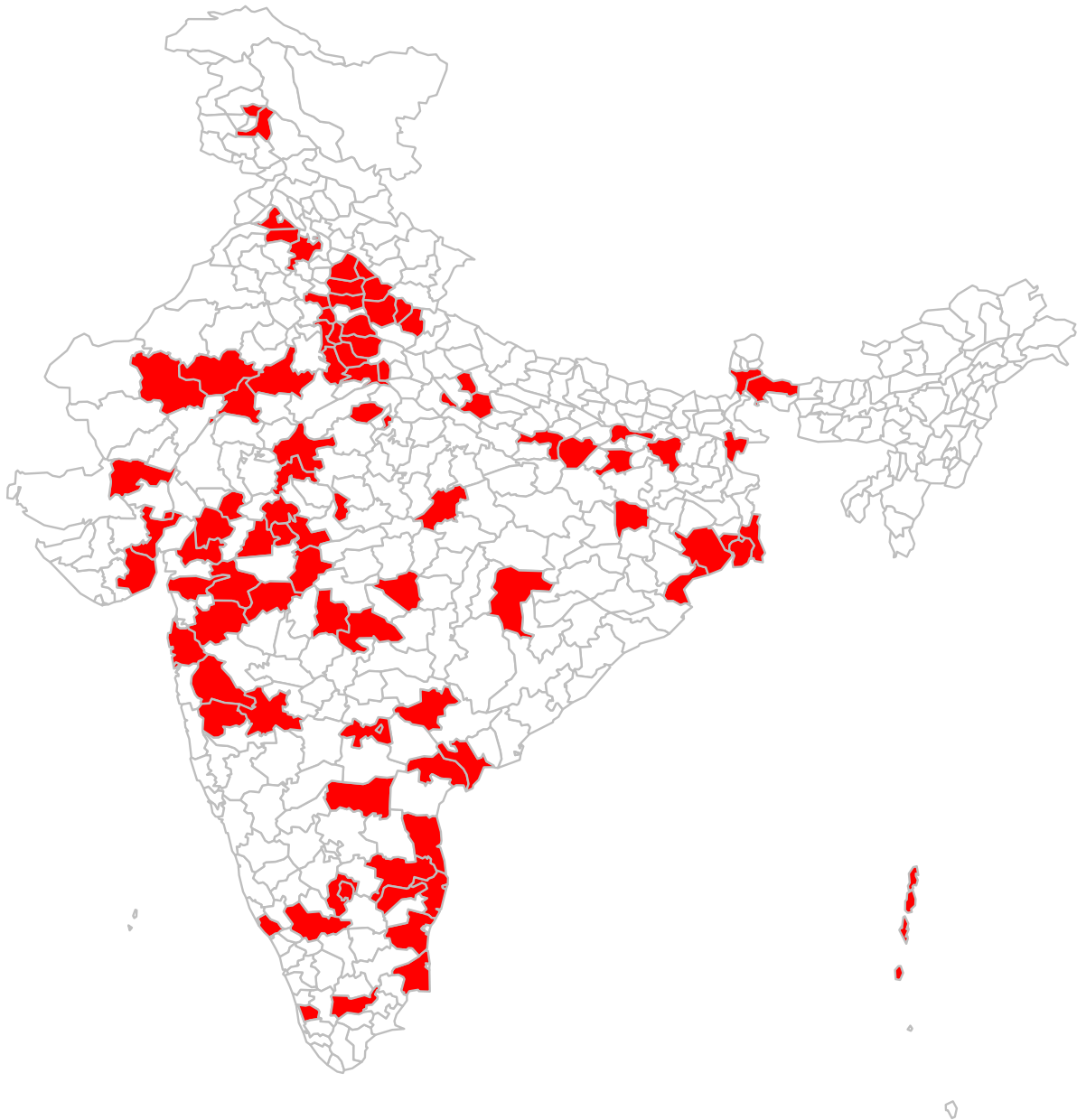


Figure 1: Comparison of index returns during different stages of COVID-19 pandemic



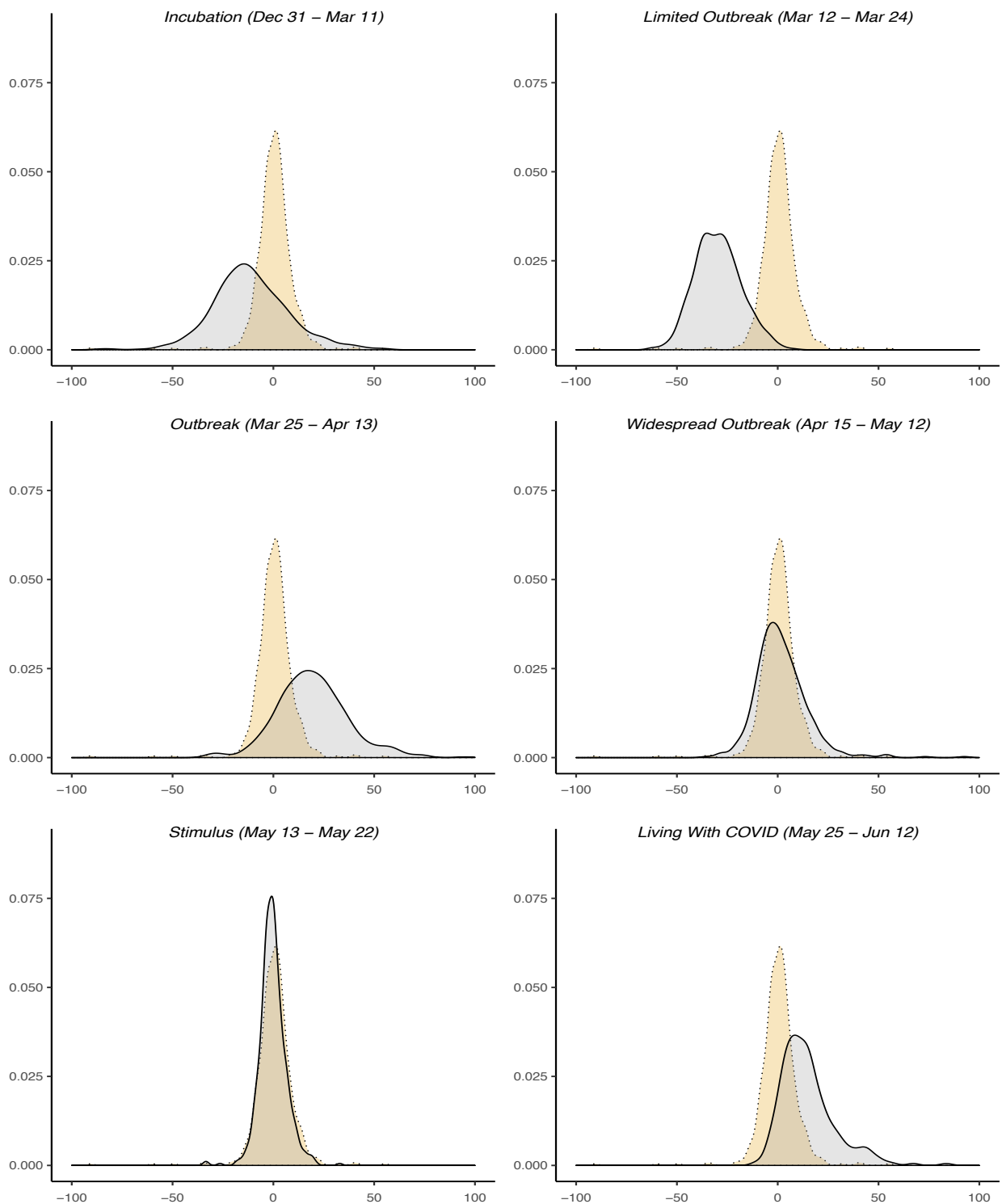
The figure shows the normalized (normalized on the first trading date of the FY 2020) index values of NIFTY, S&P 500, SSE Composite and FTSE. The different stages of the pandemic are as defined in [Table 1](#). (Source: [Yahoo Finance](#))

Figure 2: Geographic map of the red zones in India



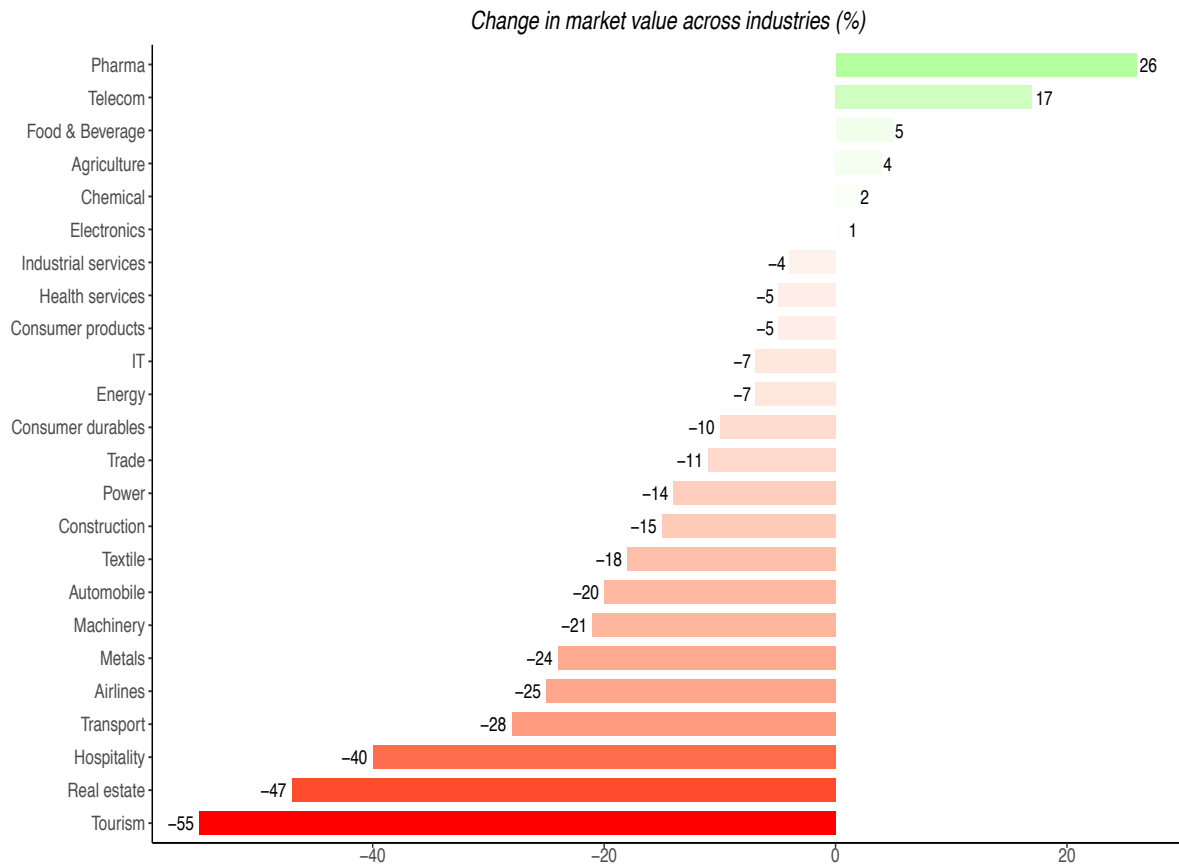
The figure provides the geographic location of the ‘red zones’ in India. The categorization of the ‘red zones’ is done by the Ministry of Health and Family Welfare on April 30, 2020 (Source: [MOHFW \(2020\)](#)).

**Figure 3: Distribution of returns in different stages of COVID-19 pandemic**



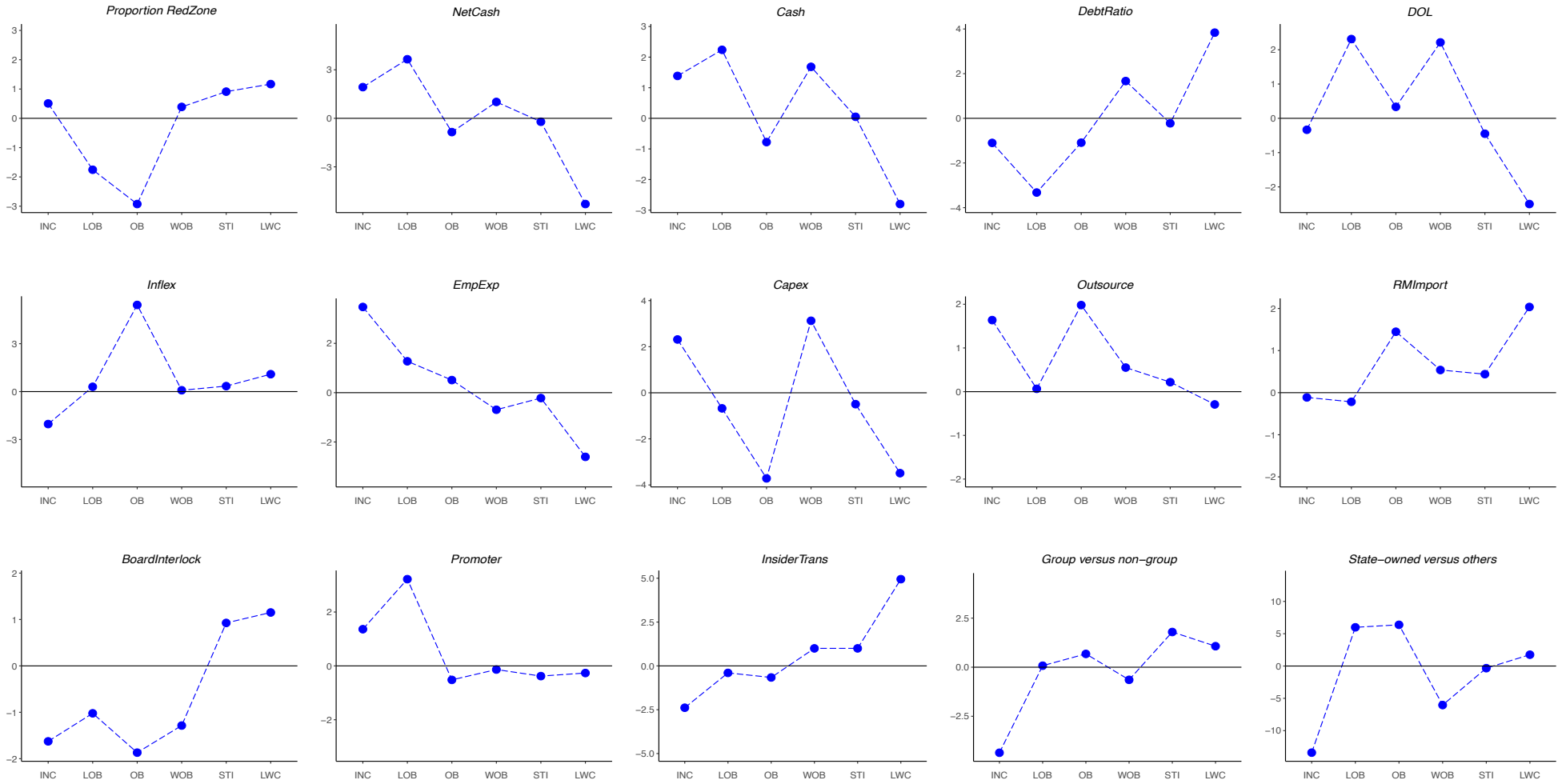
The figure shows the return (in %) distribution in each of the stages for the top 500 firms. The return distribution in the “Pre-Incubation” period is overlapped in each panel for reference.

**Figure 4: Industry-wise market value changes during the pandemic**



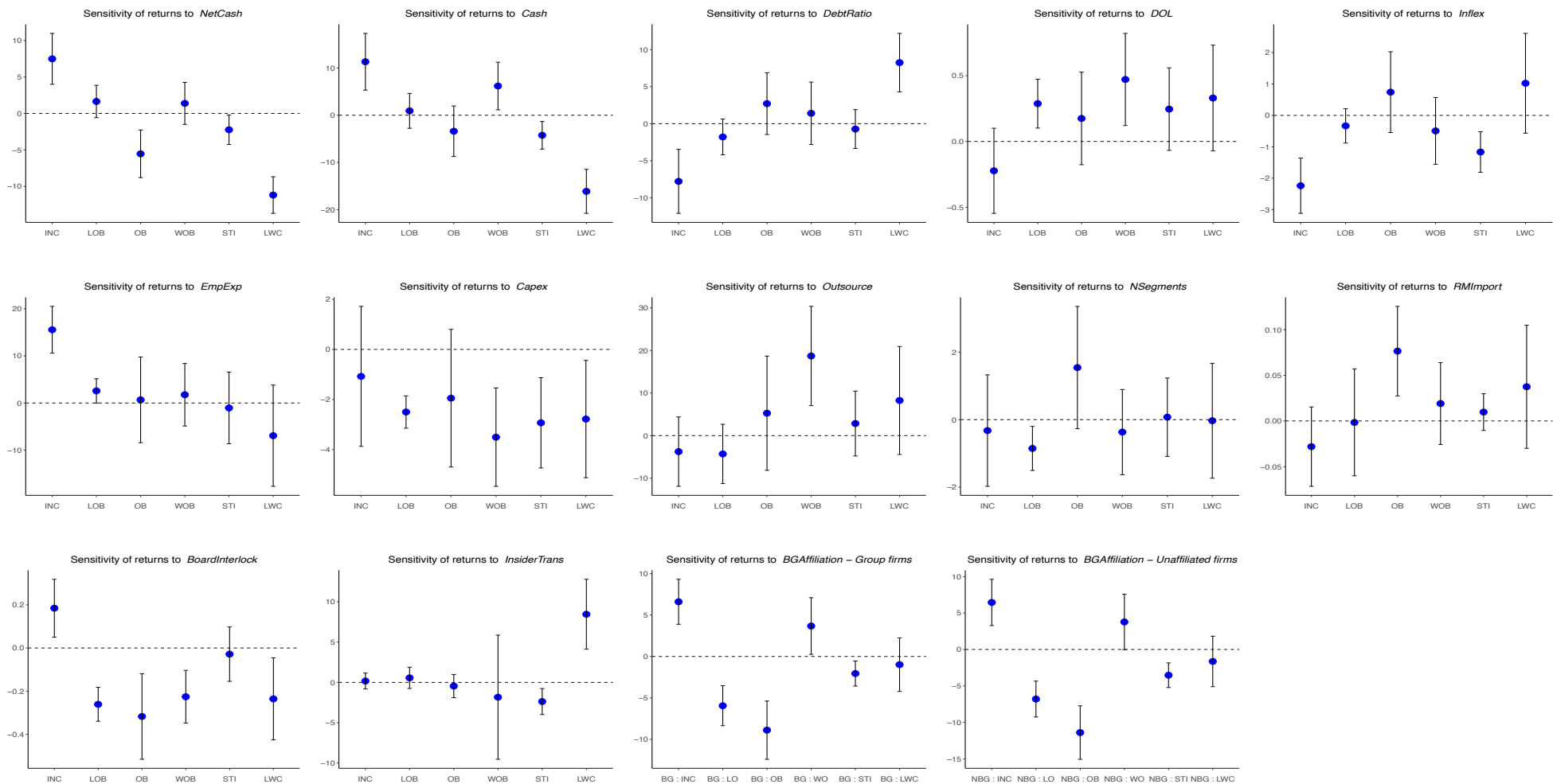
The figure shows the change in the weighted market value of industries (weights are the market value of the constituent firms as of December 31, 2019) during the pandemic period (January 1 to June 12, 2020). Firms are grouped into 25 broad industry sectors as per the authors' classification guided by the CMIE prowess industry names.

Figure 5: Comparison of the returns of sub-groups based on firm characteristics



The figures plot the difference of mean returns (in percentage) in each stage for sub-samples of firms, which are grouped based on the median of each characteristic. INC, LOB, OB, WOB, STI and LWC represent the *Incubation*, *Limited outbreak*, *Outbreak*, *Widespread outbreak*, *Stimulus* and *Living with COVID* stages as described in Table 1. The characteristic variable in each panel title is as defined in Table 2.

Figure 6: Sensitivity of returns to firm characteristics for the extended sample



The figure plots the estimated coefficients from the regression (see Equation 1) conducted with an extended sample of 1,157 firms. The confidence band shown in the figure is for a 95% confidence interval. INC, LOB, OB, WOB, STI and LWC represent the *Incubation*, *Limited outbreak*, *Outbreak*, *Widespread outbreak*, *Stimulus* and *Living with COVID* stages as described in Table 1. BG refers to private firms affiliated to a business group and NBG refers to unaffiliated private firms. The characteristic variable in each panel title is as defined in Table 2.

**Table 1:** Description of the timeline of COVID-19 pandemic in India

Period	Calendar dates (Trading dates)	Description
<i>Pre-Incubation</i>	Dec 1 - Dec 30 (Dec 2 - Dec 30)	Market period without any major influence of COVID-19 employed as the base period for comparison.
<i>Incubation</i>	Dec 31 - Mar 11 (Dec 31 - Mar 11)	Period characterized by the confirmation of human transmission on January 20 and decision by Italy to enforce a complete lockdown on February 23. The period ends with the declaration of COVID-19 as pandemic by WHO.
<i>Limited Outbreak</i>	Mar 12 - Mar 24 (Mar 12 - Mar 24)	Only a limited number of COVID-19 cases in India, mostly due to overseas travellers and their primary contacts. Both the central and state governments remained optimistic that India would not be widely impacted by an outbreak.
<i>Outbreak</i>	Mar 25 - Apr 14 (Mar 25 - Apr 13)	Announcement of a strict three weeks lockdown. At the time of the announcement of the lockdown, India had only 536 infections and it was widely appreciated as an effective way to prevent the contagion.
<i>Widespread Outbreak</i>	Apr 15 - May 12 (Apr 15 - May 12)	As infections continued to rise in the initial lockdown, the government extended the lockdown. The period ends on the day of the announcement of a stimulus package that was made by the Prime Minister. The number of COVID-19 patients increased from 12,370 to 85,784 during this period.
<i>Stimulus</i>	May 13 - May 22 (May 13 - May 22)	During this period, a stimulus package was announced five days from May 13 to May 17. The central bank (Reserve Bank of India) announced various monetary measures on May 22.
<i>Living with COVID</i>	May 23 - June 14 (May 25 - June 12)	The decision to ease the restrictions, allow domestic rail and flight operations and permit inter-state travel.

The number of infections is obtained from [Worldometer India](#).

**Table 2: Variable definitions and data sources**

Variable	Definition and construction	Data source
<hr/> Operational Fragility: <hr/>		
<i>Zone Score</i>	Weighted average of score of a firm based on the zone in which the plants are located. <i>Red</i> = 5, <i>Orange</i> = 2, <i>Green</i> = 0	CMIE Pace
<i>Proportion RedZone</i>	Variable capturing the proportion of a firm's plants located in designated red zones.	CMIE Pace
<i>I(RedZone)</i>	Indicator variable taking a value of 1 if a firm has at least one plant located in designated red zone.	CMIE Pace
<i>Cases</i>	Natural log of total number of reported cases across all the districts in which a firms has its plants as on May 31, 2020	CMIE Pace
<i>RMImport</i>	Raw material imported as a proportion of total raw material expenses for FY 2019	CMIE Prowess
<i>Outsource</i>	Outsourced expenses incurred for industrial and manufacturing jobs scaled by the total expenses for FY 2019	CMIE Prowess
<i>NSegments</i>	An indicator variable that takes a value of 1 when the firm reports revenue from more than one segment	CMIE Prowess
<hr/> Financial Flexibility: <hr/>		
<i>NetCash</i>	Sum of cash and short-term investments net of short-term borrowings and the current portion of long-term borrowings as of FY 2019 scaled by the total assets as of FY 2018	CMIE Prowess
<i>Cash</i>	Sum of cash and short-term investments as of FY 2019 scaled by the total assets as of FY 2018	CMIE Prowess
<i>DebtRatio</i>	Sum of long-term debt and short-term debt as of FY 2019 scaled by the total assets for FY 2018	CMIE Prowess
<hr/> Operating Flexibility: <hr/>		
<i>DOL</i>	Change in EBIT scaled by the change in sales between FY 2018 and 2019	CMIE Prowess
<i>Inflex</i>	5-year range of a firm's operating costs to sales ratio, scaled by the past 5-year volatility of the firm's sales growth (see <a href="#">Gu et al. (2017)</a> for details)	CMIE Prowess
<i>EmpExp</i>	Employee compensation for FY 2019 scaled by Sales for FY 2018	CMIE Prowess
<i>Capex</i>	Cash outflow on capital expenditure for FY 2019 scaled by the net PPE as of FY 2018	CMIE Prowess

*Continued on next page*



Table 2 – Continued from previous page

Variables	Definition and Construction	Data Source
<i>Business Group:</i>		
<i>BGAffiliation</i>	Category variable that takes value 1 if a private firm is affiliated to a business group and 2 if a private firm is unaffiliated to a business group, and 3 if a firm is state owned	CMIE Prowess
<i>Governance:</i>		
<i>InsiderTrans</i>	Net buying of shares by insiders as a proportion of total shares outstanding (as on December 1, 2019), estimated for each stage as defined in <a href="#">Table 1</a>	NSE
<i>Promoter</i>	Promoter ownership of shares out of total shares as of December 31, 2019	CMIE Prowess
<i>BoardInterlock</i>	Number of firms interlocked with a firm, through common board memberships as of FY 2019	CMIE Prowess
<i>Other Variables:</i>		
<i>Return</i>	Buy and hold return of the firm, including dividends	CMIE Prowess
<i>Size</i>	Natural log of the total assets as of FY 2019 in million INR	CMIE Prowess
<i>Beta</i>	Sensitivity of a firm's monthly return to the market (Nifty 50 Index) monthly return calculated over a 60 month period from January 2015 to December 2019	CMIE Prowess
<i>bm-ratio</i>	The ratio of the book value of equity to the market capitalization, as of December 31, 2019	CMIE Prowess
<i>M.Cap</i>	Market capitalization of the firm as of December 31, 2019 in billion INR	CMIE Prowess

**Table 3:** Return characteristics across the stages of the COVID-19 pandemic

Stage	Mean	SD	Skewness	Kurtosis	Min	P10	P25	Median	P75	P90	Max.
Pre-Incubation	0.53	9.75	-176.24	2457.39	-90.60	-8.13	-3.60	0.57	4.79	9.56	55.28
Incubation	-11.12	18.98	23.54	415.55	-85.93	-32.55	-23.26	-12.27	-0.15	12.04	54.65
Limited Outbreak	-29.60	11.47	24.46	296.62	-61.97	-44.07	-37.82	-30.19	-22.26	-14.01	7.88
Outbreak	19.36	17.74	37.04	409.72	-31.21	-1.04	8.06	18.46	29.43	40.89	95.33
Widespread Outbreak	2.21	14.95	276.37	1971.31	-35.45	-11.38	-6.14	0.30	7.95	16.79	126.05
Stimulus	-0.31	6.68	0.20	679.19	-33.48	-7.43	-4.00	-0.48	3.16	7.65	32.95
Living with COVID	15.21	14.87	258.70	1870.05	-10.88	1.26	5.60	12.56	20.75	32.57	152.31

Notes: The definitions of the variables are provided in [Table 2](#). *SD* denotes the standard deviation and *P* stands for percentile. All values are multiplied by 100.

**Table 4:** Summary statistics of the key explanatory variables

Variable	Mean	SD	Skewness	Kurtosis	Min.	P10	P25	Median	P75	P90	Max.	N.Obs.
<b>Operational Fragility</b>												
<i>RMImport(%)</i>	3.85	13.55	4.04	19.73	0.00	0.00	0.00	0.00	0.00	3.85	89.35	495
<i>Outsource(%)</i>	2.85	7.96	415.98	2078.46	0.00	0.00	0.00	0.00	1.72	6.56	47.02	500
<i>NSegments</i>	0.32	0.47	0.78	1.61	0.00	0.00	0.00	0.00	1.00	1.00	1.00	500
<i>Zone Score</i>	3.11	1.32	-0.19	2.39	0.00	1.41	2.00	3.00	4.00	5.00	5.00	386
<i>Proportion RedZone Cases</i>	0.47	0.35	0.19	1.91	0.00	0.00	0.20	0.50	0.69	1.00	1.00	386
	7.49	2.15	-0.25	2.07	1.61	4.63	5.80	7.41	9.28	10.20	11.21	386
<b>Financial Flexibility</b>												
<i>NetCash(%)</i>	2.92	20.38	50.10	349.98	-61.62	-20.06	-10.34	0.64	13.31	32.13	58.74	500
<i>Cash(%)</i>	11.69	14.35	176.67	577.29	0.05	0.43	1.48	5.70	16.76	32.26	63.51	500
<i>DebtRatio(%)</i>	16.25	17.05	104.96	356.18	0.00	0.00	0.72	11.24	27.25	40.06	74.93	500
<b>Operating Flexibility</b>												
<i>DOL</i>	0.11	1.87	-1.05	25.47	-10.99	-0.38	0.01	0.13	0.38	0.80	11.99	499
<i>Inflex</i>	0.64	0.64	2.93	15.58	0.04	0.14	0.25	0.45	0.84	1.38	4.88	492
<i>EmpExp(%)</i>	13.58	14.48	284.63	1189.62	0.02	3.45	6.04	9.11	14.91	25.46	81.60	500
<i>Capex(%)</i>	32.39	48.27	506.96	3479.64	0.00	4.25	10.71	20.24	35.06	59.87	402.73	498
<b>Business Group Affiliation</b>												
<i>BGAffiliation</i>	0.57	0.50	-0.28	1.08	0.00	0.00	0.00	1.00	1.00	1.00	1.00	500
<b>Ownership and governance</b>												
<i>InsiderTrans(%)</i>	0.12	3.09	7.68	183.83	-31.93	-0.08	0.00	0.00	0.02	0.35	51.86	500
<i>Promoter(%)</i>	57.26	15.67	-0.55	3.50	0.00	35.90	47.57	58.07	70.50	74.99	99.06	497
<i>BoardInterlock</i>	6.53	5.17	0.97	3.56	0.00	1.00	2.00	5.00	10.00	14.00	25.00	492
<b>Other Variables</b>												
<i>Size (log)</i>	10.53	1.33	0.62	3.09	7.54	9.00	9.55	10.41	11.29	12.30	13.95	500
<i>bm-ratio</i>	0.50	0.55	3.57	23.39	0.05	0.10	0.18	0.34	0.61	1.08	5.62	500
<i>Beta</i>	1.06	0.50	0.39	3.83	-0.76	0.44	0.73	1.03	1.38	1.67	2.93	500
<i>M.Cap (INR billion)</i>	203.78	669.70	9.81	121.13	10.28	13.24	18.90	41.05	152.85	436.08	9598.19	500

Notes: The definitions of the variables are provided in [Table 2](#). *N.Obs* denotes the number of firms. *SD* denotes the standard deviation and *P* stands for percentile.

**Table 5:** Impact of plant location

	<i>Zone Score</i>		<i>Proportion RedZone</i>		<i>I(RedZone)</i>		<i>Cases</i>	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Var</i> × <i>Incubation</i>	1.036** (0.325)	0.848* (0.410)	2.507 (1.400)	1.650 (1.621)	−0.004 (1.139)	−0.308 (1.285)	−0.290 (0.215)	−0.366 (0.229)
<i>Var</i> × <i>Limited Outbreak</i>	−0.902*** (0.151)	−0.709** (0.211)	−3.183*** (0.501)	−2.252** (0.765)	−1.396** (0.439)	−2.304** (0.650)	−0.213 (0.148)	−0.455** (0.178)
<i>Var</i> × <i>Outbreak</i>	−1.586*** (0.415)	−1.365** (0.425)	−5.469** (1.579)	−4.572** (1.339)	−5.110*** (1.258)	−4.709*** (1.153)	−1.038*** (0.220)	−0.933*** (0.212)
<i>Var</i> × <i>Widespread Outbreak</i>	−0.384 (0.211)	−0.275 (0.291)	−2.696** (0.774)	−2.339** (0.930)	−3.224*** (0.703)	−3.556*** (0.917)	−0.736*** (0.139)	−0.812** (0.234)
<i>Var</i> × <i>Stimulus</i>	−0.578*** (0.133)	−0.341* (0.152)	−1.733*** (0.432)	−0.762 (0.420)	−1.735** (0.476)	−2.178*** (0.496)	−0.500** (0.139)	−0.611*** (0.133)
<i>Var</i> × <i>Living with COVID</i>	−1.101** (0.445)	−1.005* (0.473)	−3.819* (1.798)	−3.327 (1.734)	−6.665*** (1.313)	−6.122*** (1.310)	−0.901** (0.292)	−0.770* (0.317)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Stage fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size × Stage	No	Yes	No	Yes	No	Yes	No	Yes
Beta × Stage	No	Yes	No	Yes	No	Yes	No	Yes
bm-ratio × Stage	No	Yes	No	Yes	No	Yes	No	Yes
Observations	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695
Adjusted R <sup>2</sup>	0.573	0.601	0.572	0.600	0.573	0.601	0.572	0.600

The dependent variable employed in all the estimations is the returns (%) earned by each firm  $i$  in each stage  $t$ . The description of the stages is provided in [Table 1](#). The key explanatory variables denoted by *Var* in the estimations are *Zone Score* (columns (1)-(2)), *Proportion RedZone* (columns (3)-(4)), *I(RedZone)* (columns (5)-(6)), and *Cases* (columns (7)-(8)) as defined in [Table 2](#). Robust standard errors, clustered at the firm and stage level, are reported in parenthesis. \*\*\*, \*\* and \* indicate statistical significance at the 1%, 5% and 10% levels, respectively.

**Table 6:** Impact of financial flexibility

	<i>NetCash</i>		<i>Cash</i>		<i>DebtRatio</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Var</i> × <i>Incubation</i>	7.330** (2.773)	2.156 (3.137)	7.501 (4.236)	0.446 (4.455)	-4.816** (1.813)	0.409 (2.309)
<i>Var</i> × <i>Limited Outbreak</i>	12.588*** (1.915)	14.018*** (1.956)	10.993** (2.995)	12.381*** (2.900)	-12.461*** (1.717)	-15.357*** (1.657)
<i>Var</i> × <i>Outbreak</i>	-1.329 (1.744)	6.169** (1.819)	0.468 (2.596)	10.040*** (2.483)	-1.824 (2.447)	-8.601*** (2.275)
<i>Var</i> × <i>Widespread Outbreak</i>	4.098* (1.992)	5.195** (2.102)	11.088*** (2.925)	12.943*** (2.914)	5.139** (2.009)	4.913* (2.322)
<i>Var</i> × <i>Stimulus</i>	-1.324 (1.425)	1.515 (1.305)	-4.796* (2.147)	-1.299 (1.982)	-2.290 (1.255)	-6.147*** (1.111)
<i>Var</i> × <i>Living with COVID</i>	-9.449*** (0.878)	-4.059*** (1.038)	-12.919*** (1.428)	-5.718*** (1.158)	6.847* (2.899)	1.961 (2.329)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Stage fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Size × Stage	No	Yes	No	Yes	No	Yes
Beta × Stage	No	Yes	No	Yes	No	Yes
bm-ratio × Stage	No	Yes	No	Yes	No	Yes
Observations	3,498	3,498	3,498	3,498	3,498	3,498
Adjusted R <sup>2</sup>	0.552	0.575	0.552	0.574	0.551	0.575

The dependent variable employed in all the estimations is the returns (%) earned by each firm  $i$  in each stage  $t$ . The description of the stages are provided in [Table 1](#). The key explanatory variables denoted by  $Var$  in the estimations are *NetCash* (columns (1)-(2)), *Cash* (columns (3)-(4)), and *DebtRatio* (columns (5)-(6)) as defined in [Table 2](#). Robust standard errors, clustered at the firm and stage level, are reported in parenthesis. \*\*\*, \*\* and \* indicate statistical significance at the 1%, 5% and 10% levels, respectively.

**Table 7:** Impact of financial flexibility and plant location

	<i>NetCash</i>		<i>Cash</i>		<i>DebtRatio</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Var</i> × <i>Incubation</i>	-0.317 (4.705)	-8.319 (5.318)	-8.009 (7.334)	-18.952* (7.836)	-4.175 (4.001)	6.453 (4.473)
<i>Var</i> × <i>Limited Outbreak</i>	9.651** (2.616)	10.696*** (2.807)	3.918 (4.198)	6.618 (4.582)	-13.471*** (2.481)	-13.351*** (2.623)
<i>Var</i> × <i>Outbreak</i>	-11.068** (3.903)	-0.902 (3.212)	-7.944 (5.661)	5.003 (4.496)	14.827** (5.402)	1.768 (5.513)
<i>Var</i> × <i>Widespread Outbreak</i>	-3.066 (3.040)	-1.164 (3.187)	-1.672 (3.876)	1.248 (3.590)	1.235 (2.507)	-0.217 (2.840)
<i>Var</i> × <i>Stimulus</i>	-8.701*** (1.954)	-4.986** (1.727)	-19.092*** (2.335)	-13.456*** (2.370)	4.241** (1.435)	-0.296 (0.898)
<i>Var</i> × <i>Living with COVID</i>	-16.119*** (3.195)	-10.159** (2.755)	-18.960*** (4.098)	-11.776** (3.666)	21.348*** (5.206)	12.556* (5.228)
<i>Var</i> × <i>Prop RedZone</i> × <i>Incubation</i>	13.150 (7.033)	17.532* (7.456)	29.989** (9.089)	34.875*** (9.321)	1.947 (7.647)	-8.169 (7.976)
<i>Var</i> × <i>Prop RedZone</i> × <i>Limited Outbreak</i>	10.714** (4.161)	8.570* (3.841)	18.103*** (4.564)	12.722** (4.061)	-4.264 (6.283)	-7.525 (5.829)
<i>Var</i> × <i>Prop RedZone</i> × <i>Outbreak</i>	16.698** (6.218)	11.222* (5.654)	10.733 (10.159)	5.534 (9.611)	-23.917** (7.054)	-11.032 (7.138)
<i>Var</i> × <i>Prop RedZone</i> × <i>Widespread Outbreak</i>	21.402*** (5.602)	19.593*** (5.270)	24.472*** (6.407)	21.278** (5.905)	-14.869** (4.907)	-14.432** (4.509)
<i>Var</i> × <i>Prop RedZone</i> × <i>Stimulus</i>	14.255*** (2.590)	11.165*** (2.459)	27.008*** (2.916)	21.885*** (3.191)	-8.294** (2.253)	-5.731** (1.601)
<i>Var</i> × <i>Prop RedZone</i> × <i>Living with COVID</i>	16.707** (5.586)	14.384** (4.746)	10.933 (8.794)	10.312 (7.559)	-35.055*** (7.875)	-25.685** (7.635)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Stage fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Size × Stage	No	Yes	No	Yes	No	Yes
Beta × Stage	No	Yes	No	Yes	No	Yes
bm-ratio × Stage	No	Yes	No	Yes	No	Yes
Observations	2,695	2,695	2,695	2,695	2,695	2,695
Adjusted R <sup>2</sup>	0.575	0.601	0.574	0.601	0.575	0.601

The dependent variable employed in all the estimations is the returns (%) earned by each firm  $i$  in each stage  $t$ . The description of the stages are provided in Table 1. The key explanatory variables denoted by *Var* in the estimations are *NetCash* (columns (1)-(2)), *Cash* (columns (3)-(4)), and *DebtRatio* (columns (5)-(6)) as defined in Table 2. Robust standard errors, clustered at the firm and stage level, are reported in parenthesis. \*\*\*, \*\* and \* indicate statistical significance at the 1%, 5% and 10% levels, respectively.

**Table 8:** Impact of operating flexibility

	<i>DOL</i>		<i>Inflex</i>		<i>EmpExp</i>		<i>Capex</i>	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Var</i> × <i>Incubation</i>	−0.680* (0.302)	−0.705* (0.343)	−3.918*** (0.810)	−3.804*** (0.797)	34.804*** (2.975)	32.837*** (2.990)	0.290 (1.000)	−0.492 (1.255)
<i>Var</i> × <i>Limited Outbreak</i>	−0.004 (0.170)	0.090 (0.190)	−1.137 (0.599)	−1.302* (0.626)	7.621** (2.550)	11.800*** (1.872)	−0.996 (0.822)	−1.170 (0.728)
<i>Var</i> × <i>Outbreak</i>	−0.155 (0.291)	−0.148 (0.335)	2.126** (0.736)	1.926** (0.735)	10.465 (5.953)	12.362* (5.487)	−2.359 (1.842)	−1.374 (1.658)
<i>Var</i> × <i>Widespread Outbreak</i>	0.083 (0.323)	0.093 (0.366)	−0.122 (0.494)	−0.171 (0.545)	−3.332 (3.201)	−2.779 (2.910)	−2.877*** (0.390)	−2.849*** (0.532)
<i>Var</i> × <i>Stimulus</i>	−0.152 (0.101)	−0.084 (0.165)	−1.018** (0.320)	−1.259** (0.397)	7.013** (2.610)	10.154** (2.846)	−0.394 (1.044)	−0.102 (1.056)
<i>Var</i> × <i>Living with COVID</i>	−0.317 (0.271)	−0.351 (0.316)	0.129 (0.680)	0.056 (0.822)	−0.547 (5.306)	0.758 (5.262)	−2.643** (1.037)	−1.753* (0.864)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Stage fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size × Stage	No	Yes	No	Yes	No	Yes	No	Yes
Beta × Stage	No	Yes	No	Yes	No	Yes	No	Yes
bm-ratio × Stage	No	Yes	No	Yes	No	Yes	No	Yes
Observations	3,498	3,498	3,442	3,442	3,498	3,498	3,491	3,491
Adjusted R <sup>2</sup>	0.549	0.573	0.552	0.573	0.551	0.575	0.550	0.574

The dependent variable employed in all the estimations is the returns (%) earned by each firm  $i$  in each stage  $t$ . The description of the stages are provided in [Table 1](#). The key explanatory variables denoted by  $Var$  in the estimations are  $DOL$  (columns (1)-(2)),  $Inflex$  (columns (3)-(4)),  $EmpExp$  (columns (5)-(6)), and  $Capex$  (columns (7)-(8)) as defined in [Table 2](#). Robust standard errors, clustered at firm and stage level, are reported in parenthesis. \*\*\*, \*\* and \* indicate statistical significance at the 1%, 5% and 10% levels, respectively.

**Table 9:** Impact of business group affiliation

	<i>BGAffiliation</i>	
	(1)	(2)
$I(\text{Private} : \text{BG}) \times \text{Incubation}$	8.130*** (1.371)	4.370** (1.322)
$I(\text{Private} : \text{non BG}) \times \text{Incubation}$	7.476*** (1.494)	2.952* (1.487)
$I(\text{Private} : \text{BG}) \times \text{Limited Outbreak}$	-7.243*** (0.997)	-6.551*** (1.064)
$I(\text{Private} : \text{non BG}) \times \text{Limited Outbreak}$	-10.578*** (1.092)	-8.280*** (1.196)
$I(\text{Private} : \text{BG}) \times \text{Outbreak}$	-12.006*** (1.376)	-8.845*** (1.645)
$I(\text{Private} : \text{non BG}) \times \text{Outbreak}$	-15.115*** (1.495)	-12.032*** (1.767)
$I(\text{Private} : \text{BG}) \times \text{Widespread Outbreak}$	1.837 (1.149)	2.521* (1.108)
$I(\text{Private} : \text{non BG}) \times \text{Widespread Outbreak}$	0.677 (1.170)	1.608 (1.207)
$I(\text{Private} : \text{BG}) \times \text{Stimulus}$	-2.527*** (0.484)	-0.810 (0.774)
$I(\text{Private} : \text{non BG}) \times \text{Stimulus}$	-7.271*** (0.590)	-4.534*** (0.914)
$I(\text{Private} : \text{BG}) \times \text{Living with COVID}$	-4.058** (1.305)	0.528 (2.073)
$I(\text{Private} : \text{non BG}) \times \text{Living with COVID}$	-5.839*** (1.274)	-1.199 (2.283)
Firm fixed effects	Yes	Yes
Industry-Stage fixed effects	Yes	Yes
Size $\times$ Stage	No	Yes
Beta $\times$ Stage	No	Yes
bm-ratio $\times$ Stage	No	Yes
Observations	3,498	3,498
Adjusted R <sup>2</sup>	0.556	0.575

The dependent variable employed in all the estimations is the returns (%) earned by each firm  $i$  in each stage  $t$ . The description of the stages are provided in [Table 1](#). The key explanatory variable denoted by  $Var$  in the estimations is *BGAffiliation* (columns (1)-(2)) as defined in [Table 2](#). *BGAffiliation* is a factor variable with three levels. The base group in all the stages comprises the state-owned firms and the magnitude of the coefficients for all stages is with respect to the base group.  $I(\text{Private} : \text{BG})$  is an indicator for private firms affiliated with a business group.  $I(\text{Private} : \text{non BG})$  is an indicator for private firms not affiliated with any business group. Robust standard errors, clustered at the firm and stage level, are reported in parenthesis. \*\*\*, \*\* and \* indicate statistical significance at the 1%, 5% and 10% levels, respectively.



**Table 10:** Impact of financial flexibility for group affiliated firms

	<i>NetCash</i>		<i>DebtRatio</i>	
	(1)	(2)	(3)	(4)
<i>Var</i> × <i>Incubation</i>	6.820 (4.908)	3.199 (5.314)	-13.668** (4.869)	-8.918 (5.554)
<i>Var</i> × <i>Limited Outbreak</i>	17.965*** (3.480)	16.382*** (3.638)	-25.777*** (5.451)	-24.393*** (5.421)
<i>Var</i> × <i>Outbreak</i>	5.493 (3.315)	10.295** (3.271)	-14.171** (4.815)	-20.960*** (4.785)
<i>Var</i> × <i>Widespread Outbreak</i>	-2.087 (4.370)	-1.401 (4.411)	3.871 (8.391)	3.602 (8.370)
<i>Var</i> × <i>Stimulus</i>	3.605 (2.554)	4.185 (2.669)	-17.065*** (2.191)	-18.926*** (2.457)
<i>Var</i> × <i>Living with COVID</i>	-9.952*** (2.132)	-6.497*** (1.668)	7.997* (3.947)	3.008 (3.611)
<i>Var</i> × <i>Incubation</i> × <i>I(Private : BG)</i>	-2.242 (5.749)	-3.911 (6.001)	11.133* (5.440)	11.496 (5.930)
<i>Var</i> × <i>Limited Outbreak</i> × <i>I(Private : BG)</i>	-7.899 (4.386)	-6.297 (4.339)	19.768** (5.587)	15.187** (5.611)
<i>Var</i> × <i>Outbreak</i> × <i>I(Private : BG)</i>	-13.486** (3.967)	-11.104** (3.738)	17.918** (5.348)	17.333** (5.082)
<i>Var</i> × <i>Widespread Outbreak</i> × <i>I(Private : BG)</i>	7.751 (5.206)	8.514 (5.333)	1.564 (8.445)	0.631 (8.481)
<i>Var</i> × <i>Stimulus</i> × <i>I(Private : BG)</i>	-8.358** (2.852)	-6.895* (2.937)	20.255*** (2.245)	18.090*** (2.408)
<i>Var</i> × <i>Living with COVID</i> × <i>I(Private : BG)</i>	-2.669 (2.756)	-0.180 (2.444)	-0.781 (5.506)	-2.331 (4.628)
Firm fixed effects	Yes	Yes	Yes	Yes
Industry-Stage fixed effects	Yes	Yes	Yes	Yes
Size × Stage	No	Yes	No	Yes
Beta × Stage	No	Yes	No	Yes
bm-ratio × Stage	No	Yes	No	Yes
Observations	3,176	3,176	3,176	3,176
Adjusted R <sup>2</sup>	0.545	0.563	0.543	0.563

The dependent variable employed in all the estimations is the returns (%) earned by each firm  $i$  in stage  $t$ . The description of the stages is provided in [Table 1](#). The explanatory variables denoted by *Var* in the estimations are *NetCash* (columns (1)-(2)), and *DebtRatio* (columns (3)-(4)) as defined in [Table 2](#).  $I(\text{Private} : \text{BG})$  is an indicator variable taking a value of 1 if a firm is a private firm affiliated to any business group and 0 if it is a private firm unaffiliated to any business group. We have excluded government owned firms from this sample. Robust standard errors, clustered at the firm and stage level, are reported in parenthesis. \*\*\*, \*\* and \* indicate statistical significance at 1%, 5% and 10% levels, respectively.

**Table 11:** Insider buying, board interlocks and promoter ownership

	<i>Insider Trading</i>		<i>BoardInterlock</i>		<i>Promoter</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Var</i> × <i>Incubation</i>	1.343* (0.663)	1.214* (0.572)	0.295*** (0.063)	0.362** (0.110)	0.121*** (0.024)	0.094** (0.031)
<i>Var</i> × <i>Limited Outbreak</i>	8.987*** (1.957)	7.993*** (1.808)	0.163*** (0.035)	−0.063 (0.053)	0.110*** (0.014)	0.155*** (0.023)
<i>Var</i> × <i>Outbreak</i>	9.478*** (2.406)	8.191*** (1.970)	−0.149 (0.078)	−0.138 (0.084)	−0.014 (0.025)	0.016 (0.031)
<i>Var</i> × <i>Widespread Outbreak</i>	−6.445 (7.561)	−5.725 (5.837)	−0.006 (0.050)	−0.019 (0.061)	0.050** (0.015)	0.060* (0.027)
<i>Var</i> × <i>Stimulus</i>	−1.168 (1.894)	−1.878 (1.745)	0.345*** (0.044)	0.248*** (0.064)	−0.025 (0.013)	0.008 (0.017)
<i>Var</i> × <i>Living with COVID</i>	14.463*** (2.074)	13.098*** (2.199)	0.002 (0.079)	0.075 (0.074)	−0.041 (0.027)	−0.016 (0.045)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Stage fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Size × Stage	No	Yes	No	Yes	No	Yes
Beta × Stage	No	Yes	No	Yes	No	Yes
bm-ratio × Stage	No	Yes	No	Yes	No	Yes
Observations	3,498	3,498	3,442	3,442	3,477	3,477
Adjusted R <sup>2</sup>	0.555	0.578	0.552	0.575	0.550	0.573

The dependent variable employed in all the estimations is the returns (%) earned by each firm  $i$  in each stage  $t$ . The description of the stages is provided in Table 1. The key explanatory variables denoted by *Var* in the estimations are *Insider Trading* (columns (1)-(2)), *BoardInterlock* (columns (3)-(4)), and *Promoter* (columns (5)-(6)) as defined in Table 2. Robust standard errors, clustered at the firm and stage level, are reported in parenthesis. \*\*\*, \*\* and \* indicate statistical significance at the 1%, 5% and 10% levels, respectively.

The internet appendix can be downloaded from the following [link](#)