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Outbreak risk, managerial distraction, and corporate information disclosure: Evidence from the COVID-19 pandemic

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ABSTRACT

To fill the gaps between managerial distraction and disclosure quality of management earnings forecasts (MEFs), we examine the effects of managerial selective attention resulting from the COVID-19 pandemic. Using this pandemic in 2020 as an adverse shock potentially causing managerial distraction, results based on a difference-in-differences estimation suggest that managerial distraction had a negative effect on MEFs and affected forecast quality by increasing work burden and perceptual narrowing among managers, while cash reserves demonstrated a preventive function and alleviated such adverse effects. Our findings are robust, as supported by tests that address potential measurement errors.

1. Introduction

This study investigates the impact of managerial distraction on management earnings forecasts (MEFs). MEFs are potentially one of the most important and influential disclosure mechanisms, as they serve to establish or change the expectations of the capital market, avoid litigation risks, and build managerial reputations through transparent and accurate disclosures (Clement et al., 2003; Hirst et al., 2008; Hutton et al., 2003; Pownall et al., 1993). From the perspective of managerial disclosure motivation in relation to MEFs, the literature has typically noted that managers select optimal disclosure strategies rationally and calmly, with the aim of maximizing shareholders’ wealth or personal benefit (Dutta and Trueman, 2002; Healy and Palepu, 2001; Wagenhofer, 1990). However, a growing body of literature has focused on external attributions of managerial disclosure behaviors, such as individual background (Bochkay et al., 2019; Libby and Rennekamp, 2012) and information feedback mechanisms (Ajinkya et al., 2005; Baik et al., 2011; Jayaraman and Wu, 2019). We complement the current literature on MEFs by verifying the impact of managers’ bounded rationality, which is defined as a mental shortcut or distraction that leads managers to fail to make accurate forecasts (Conlisk, 1996; Simon, 1972).

Nevertheless, managerial distraction is difficult to observe and measure. Thus, there is limited empirical evidence on whether managerial attention is a necessary resource in MEF disclosures. In this study, we use the COVID-19 and large-scale infection as an exogenous shock that can potentially elucidate the concept of managerial distraction by providing an opportunity to conduct a quasi-natural experiment. An advantage of using the COVID-19 outbreak is that it is unpredictable and amplifies the process of executives’ selective attention allocation because of its considerable impact on the capital market and daily operation of enterprises. It has been observed that when people perform multiple tasks simultaneously, attention is reallocated and performance suffers (Riley and Roitblat,
Moreover, some studies demonstrate that executives can control disclosure transparency and accuracy for their own incentives and to manipulate market responses (Cheng et al., 2013; Hirst et al., 2007). However, managers who have the most control over MEFs, face a decrement in attention when they encounter unanticipated events, such as the COVID-19 pandemic. Such managerial distraction is likely to play a substantial role in disclosure decisions, because these decisions often involve significant estimation, experiential judgment, and appropriate engagement.

This study uses a unique dataset from the unexpected exogenous shock of the COVID-19 outbreak to examine the impact of managerial distraction on MEFs. We identify managers who are most likely to have been influenced by COVID-19 by determining the industries with a relatively higher degree of pandemic-related disruption based on government reports and global studies (Del Rio-Chanona et al., 2020; Devpura and Narayan, 2020). We compare affected managers with managers in the control group using a generalized difference-in-differences (DID) approach to estimate the effect of managerial distraction on firm disclosure behavior and quality. Furthermore, we exclude the alternative explanation-managers might intentionally choose a more inaccurate disclosure strategy to communicate the expectation of pandemic uncertainty with market (Chen et al., 2021). Arguably, we could alleviate this concern to some extent by confirming whether MEF quality is largely affected by two psychological mechanisms: managers’ increasing work burden and narrowing perceptions. Specifically, we examine whether MEFs are of lower quality when there is an increase in managerial distraction caused by problems with resuming work and production which could change in managerial cognition. Empirically, we use the proportion of employees from Hubei to total non-local employees to measure the managerial burden on resuming work and production. Moreover, we determine whether an executive’s birthplace is a high-risk area to represent the extent of executives’ narrowing perception, because managers might first pay more attention to the circumstances of their families or friends, which they know will conflict with their duty to maintain rational judgment. This means that an atmosphere of infection could increase managerial inefficiency and influence performance by changing first-order recognition and narrowing managerial attention (Baddeley, 1972; Driver, 2001; Hirshleifer et al., 2009).

Taking annual MEFs released by A-share listed companies from 2018 to 2020 in China as the research objects, this study empirically tests the impact of managerial distraction on disclosure behavior in relation to MEFs and contributes to the literature in several ways. To the best of our knowledge, this study is the first to relate managerial attention to MEFs during the COVID-19 pandemic. The findings could have important implications for studies conducted in emerging markets, because a common characteristic of developing countries is the information asymmetry between investors and managers. The adverse impact of limited managerial attention might exacerbate the information gap between immature market participants and managers, thus creating a vicious cycle in relation to resource allocation across the capital market (Bennedsen et al., 2020; Dong and Heo, 2014; Vigna and Pollet, 2009). Using a Chinese data sample, we support this conjecture by showing whether managers disclose lower-quality MEFs under the conditions of selective attention. This study also addresses the main obstacle in existing research, which is the endogenous relationship between information production and human capital characteristics (Gow et al., 2016).

Using the COVID-19 outbreak as an exogenous variable, this study aims to establish a dynamic causal relationship between human capital and enterprise information production, and reveal whether the exogenous shock of managerial distraction weakens the quality of information disclosure in the information production process. Furthermore, we aim to supplement the current literature regarding the information production costs of enterprises, such as managerial distraction. The literature has mainly focused on the impact of costs related to external factors on information quality, for instance, litigation risk and board structure, and their impact on information quality (Beyer et al., 2010; Karamanou and Vafeas, 2005). Our study seeks to provide relevant empirical evidence about whether managerial distraction caused by the COVID-19 pandemic may reduce the quality of MEFs, which can complement previous studies on the determinants of earnings forecast quality.

The rest of this paper is organized as follows. Section 2 briefly reviews prior studies linking managerial distraction and the three examined hypotheses. Section 3 discusses the data and methodology. Section 4 presents and discusses the empirical results and includes robustness tests. Section 5 concludes.

2. Institutional background and hypothesis development

2.1. Characteristics of the COVID-19 outbreak

In 2020, the COVID-19 spread from Wuhan to all of China rapidly. The World Health Organization announced that the COVID-19 outbreak was a Public Health Emergency of International Concern (PHEIC) on January 30th, 2020. Compared with SARS and MERS, COVID-19 is slightly pathogenic and has a lower-case fatality rate. But, it has a longer incubation period (Huang et al., 2020; Wu et al., 2020) and is prone to family aggregation and private gatherings. That is to say, it has a higher rate of transmission between individuals (Chan et al., 2020). Therefore, the COVID-19 has not only endangered the life and health of personnel and their family members, but...
also caused significant economic losses and market return volatility (Bannigidadmath et al., 2021; Narayan et al., 2020; Phan and Narayan, 2020).

2.2. COVID-19 and quality of MEF

Managerial distraction typically occurs for two reasons. First, increasing work burden negatively impacts managers’ concentration. First of all, the pandemic’s clearest and most immediate repercussions have been on the labor market (Narayan, 2021; Padhan and Prabheesh, 2021) and employees infected with the COVID-19 generally need a considerable amount of time and money to recover, which will lead to a high rate of work absenteeism (Keech and Beardsworth, 2008). However, issuing MEFs requires intensive cooperation, analysis, and processing (Call et al., 2017; Cheng et al., 2013). It’s a complex process that focuses on both the past and future, relies on the coordination of employees from each department and entire management teams, and includes accounting estimations by accountants and judgments by senior managers according to daily operations. In addition, owing to pandemic prevention policy in China, most listed companies’ manufacturing departments were shut down on January 22nd, 2020. When employees stop working or work remotely, managers could face more burdens in taking advantage of information from production activities (Baek and Oh, 2004). Therefore, as executives face the prospect of working with fractured teams, they experience increasing disclosure and operation burdens, which will reduce the time they have to generate information and lead to failures in assuring disclosure quality⁴ (Palmer et al., 2010; Van Wormer and Besthorn, 2017).

Second, the atmosphere created by the COVID-19 pandemic, including the potential for friends or relatives to become infected, could change first-order recognition and increase managerial distraction, which could influence the quality of MEFs by narrowing perception (Baddiley, 1972). In particular, the media’s continuous reporting and tracking of the pandemic, and the continuous increase in the number of confirmed cases in areas where executives’ relatives or friends are located, will cause concentration difficulties leading to managerial distraction. Moreover, as the initial COVID-19 outbreak (January 1, 2020) coincided with the window for listed companies to disclose⁵ their annual MEFs, it likely to have significantly affected managerial attention to these disclosures. Owing to the relatively harsh monitoring mechanisms for MEFs in China, it could be difficult for managers to cancel their disclosure or strategically give an inaccurate forecast.⁶ That is to say, even if some industries are severely impacted by the pandemic, enterprises will continue to produce MEFs, thereby increasing the impact of perceptual narrowing on MEFs.

Arguably, distractions caused by the pandemic will reduce managerial work efficiency and thus disclosure quality. Furthermore, this influence will be more obvious for enterprises that have been seriously affected by the COVID-19. This study investigates the impact of managerial distraction on corporate information disclosure, using width and revision times of MEFs to measure the quality and quantity of information disclosure. Accordingly, the following hypothesis is proposed:

**Hypothesis 1.** All other things being equal, MEFs issued by corporations influenced by the pandemic will be less accurate and have fewer revisions compared to those issued by the control group after the COVID-19 outbreak.

The basic idea of the above analysis is that the COVID-19 pandemic distracts managers, which significantly affects the quality of information generation and disclosure. One of psychological mechanisms underlying this effect is that the pandemic damages labor efficiency in the workplace, thereby causing managers to expend more attention and energy to complete their work related to disclosure (Akazawa et al., 2003). In addition, such increasing working burden on managers hinders their disclosure effectiveness especially when managers cannot depend on their past experiences to make accurate forecasts. In particular, the more non-local workers there are from Hubei province, the more productivity will be impeded, and thus, the larger the burden managers will experience. Therefore, the second hypothesis is as follows:

**Hypothesis 2.** All other things being equal, the negative impact of the COVID-19 on the accuracy of MEFs will be more pronounced for firms with more non-local employees from Hubei province.

The second psychological mechanisms could be managerial perceptual narrowing. To be a bit more specific, the impact of the pandemic on corporate information disclosure will be affected by managerial distraction on the condition that managers’ relatives or friends are in a high-risk infection area. It may not only lessen managers’ efforts to collect and analyze information but also diminish their perceptual ability to obtain and interpret internal information, resulting in decreased forecast quality (Li et al., 2007). Furthermore, the distraction caused by the pandemic also change managers’ first-order recognition and hinders their effective mutual learning, which will weaken their ability to correct past errors and lead to the absorption of incorrect information into performance

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⁴ For example, judging whether assets should be impaired, the point of time of revenue recognition, etc.

⁵ Notably, management has the motivation to disclose high-quality information, because low-quality disclosures will attract negative attention or punishment from regulators, and can also cause investor dissatisfaction.

⁶ The disclosure period of MEFs is generally between the balance sheet date (December 31st) and the formal disclosure of the annual report (April 30th of the next year).

⁷ MEFs in China are under relatively more strict monitoring. For example, managers might receive the warning letter from China Securities Regulatory Commission (CSRC) because of the poor quality of MEFs; there are some conditions for compulsory disclosure on time for some MEFs (see Appendix 1.2 for more details). Therefore, in such background, we can observe the effect of managerial distraction more conveniently because managers might have less incentives to disclose a broader width of forecast strategically to meet market expectation. PS. During the COVID-19 pandemic, the CSRC allowed firms for which disclosure is compulsory to postpone the time at which they would disclose MEFs.
predictions, eventually resulting in decreased efficiency (Gong et al., 2011). Therefore, it can be reasonably expected that if executives’ birthplaces are high-risk areas, the adverse impact of the pandemic on the disclosure quality of MEFs will be clearer. Accordingly, the third hypothesis is as follows:

**Hypothesis 3.** All other things being equal, the negative impact of the COVID-19 on the accuracy of MEFs will be more pronounced for executives whose birthplaces have a higher infection risk.

The foregoing discussion analyzes whether the negative impact of managerial distraction on information disclosure could be alleviated from the perspective of preventive measures from enterprises. To go a step further, if enterprises enact more preventive measures and can take precautions in time, the negative impact of managerial distraction might be reduced. Therefore, this study examines the mitigating effect of preventive measures on the above relationship from the perspective of cash reserves. The classic literature on cash reserves argues that firms hold cash mainly due to transaction and prevention motivations (Dittmar and Mahrt-Smith, 2007; Faulkender and Rong, 2006; Han and Qiu, 2007; Opler et al., 1999). The COVID-19 outbreak has led to national shutdowns, which have a substantial impact on enterprises’ daily operations. The prevention motivation for maintaining cash reserves can alleviate this negative impact, such as through supporting daily corporate operation and coping with the need to directly confront emergencies. Accordingly, executives may experience less work burden and anxiety in ensuring business survival. Thus, the following hypothesis is proposed:

**Hypothesis 4.** All other things being equal, the negative impact of the COVID-19 on the accuracy of MEFs will be alleviated for firms with larger cash reserves.

3. Data, sample, and research design

3.1. Data and sample selection

The initial sample included all A-share listed firms’ annual MEFs from 2018 to 2020 obtained from the WIND database. The accounting and firm characteristic data is downloaded from the CSMAR database. First, we removed the observations of financial and insurance companies. Next, duplicate observations were deleted for listed companies belonging to Shanghai-Hong Kong Stock Connect because they would disclose two MEFs with the same content both in Shanghai Stock Exchange and Hong Kong Exchanges and Clearing Limited respectively. Finally, we omitted observations with missing values. The total sample comprised 5366 observations.

Furthermore, for data of the COVID-19 pandemic, we manually collected the proportion of employees from Hubei province out of all non-local employees in the province where the firm was located, and the proportion of the total number of infected individuals to the total population in the birthplace of executives. All continuous variables were winsorized at 1% to avoid the influence of extreme values.

3.2. Methodology and variable definitions

To examine the effects of the COVID-19 on the quality of MEFs, we adopted a generalized DID approach and specified the following panel regression models:

\[
\text{Width}_{it} \text{ or } \text{Revision}_{it} = \alpha + \beta_1 \text{COVID}_{it} + \beta_2 \text{COVID}_{it} \times \text{Post}_{it} + \sum_j \text{Control}_{ijt} + \text{Year FE} + \text{Industry FE} + \epsilon_{it}
\]  

(1)

where the dependent variables are Width_{it} and Revision_{it}. Width_{it} denotes the accuracy of MEFs, which equals the absolute value of the difference between the maximum and minimum forecasted profit of listed company i for year t, divided by the closing stock price at the end of year t-1 (Cheng et al., 2013). The larger the forecast width is, the lower the forecast accuracy becomes. For point estimation, the forecast width is 0, which represents the highest forecast accuracy. Revision_{it} represents the number of times MEFs were revised, calculated by the total number of revisions by company i in year t.

The independent variables are Post_{it} and COVID_{it}. Post_{it} is a dummy variable, which represents whether the enterprise is affected by the COVID-19. MEFs disclosed after December 31st, 2019 are taken as 1, and 0 otherwise. COVID_{it} is a dummy variable, which represents the differing impact of the pandemic on various industries, taking 1 for the greater impact and 0 for the less. We controlled variables which affect the quality of MEFs been shown in prior studies (Cheng et al., 2013; Li and Zhang, 2015).

Next, to test H2–H4, we used the following model:

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8 Our sample includes all annually disclosed MEFs (both voluntary and mandatory disclosure) during the sample period.

9 There are a total of 5274 observations in the sample of the revision times for MEFs because the dependent variable Revision_{it} is based on firm-year level rather than management earnings forecast-year level.

10 Referring to the special government report and literature, the following industries were considered as seriously affected in the present research: transportation and postal; accommodation and catering; culture, sports, and entertainment; manufacturing (including food manufacturing, chemical raw materials and chemical products manufacturing, chemical fiber manufacturing, and pharmaceutical manufacturing); construction; real estate; wholesale and retail; and mining.
\[
\text{Width}_{it} = \alpha + \beta_1 \text{COVID}_i + \beta_2 \text{COVID}_i \times \text{Post}_t + \beta_3 \text{COVID}_i \times \text{Post}_t \times \text{Condition}_{it} + \beta_4 \text{Post} \times \text{Condition}_{it} + \beta_5 \text{COVID}_i \times \text{Condition}_{it} + \sum_j \gamma_j \text{Control}_{it} + \text{Year FE} + \text{Industry FE} + \epsilon_{it} \\
(2)
\]

\text{Condition}_{it} in model (2) includes variables that specifically affect managerial work burden, their perception ability and corporate preventive measures. First, the proportion of non-local employees from Hubei province (\text{Employee}_{it}) is used to measure the increasing managerial work burden. Provincial administrative regions are classified according to the proportion of Hubei employees who returned to work and migrated to their workplaces. A firm in a region with a high proportion of employees from Hubei province is taken as 1, otherwise as 0. Perceptual narrowing is measured by a proxy variable of whether a senior executive’s birthplace is a high-risk area (\text{Birthplace}_{it}). To measure the degree of the perceptual narrowing, provincial regions were divided into two groups based on the cumulative number of confirmed cases from January 1st to June 30th, 2020. If the birthplace of executive is in a province with a high number of confirmed cases, it is taken as 1, otherwise it is 0. According to H2 and H3, the regression coefficient of concern in model (2) is expected to be positive. \text{CashHolding}_{it} is used to assess the effects of preventive measures on enterprises. According to the proportion of cash and cash equivalent in total assets, this variable can be divided into two groups. The group with the lower proportion of cash holding is taken as 1, otherwise as 0. When \text{CashHolding}_{it} equals 1, the enterprise’s ability to alleviate the pandemic’s adverse effects is insufficient. Then, the sign of the variable coefficient \beta_2 is expected to be positive. For definitions of all control variables, see Appendix 1.1.

4. Empirical results

4.1. Summary statistics

Table 1 shows the frequency, form, and revision times distributions of annual MEFs separately. Specifically, the entire sample is separated into two sub-samples based on the COVID-19 pandemic lockdown, which began on January 23rd, 2020. By analyzing the distributions summarized in Panels A, B, and C, we can observe that the frequency and revision times of MEFs, and the proportion of point estimates, dropped significantly as the pandemic worsened. In addition, by comparing the distributions before and after the Wuhan lockdown, the results shows that the quality of MEFs is significantly lower after.\(^{11}\)

Table 2 reports the summary statistics of the main variables. The mean and median of \text{Width}_{it} were 0.0154 and 0.0043, respectively. \text{Revision}_{it} had a mean value of 0.0178 and a median value of 0, which indicates that most companies did not revise their MEFs. The mean for \text{COVID}_i was 0.6463, indicating that 64.63% of companies have been severely affected by the pandemic.

4.2. Univariate test

Table 3 presents the results of a univariate analysis on the accuracy and revision times of the MEFs issued by listed companies before and after the COVID-19 outbreak. Panel A shows that the width of the full sample (\text{Width}_{it}) increased from 0.0142 to 0.0174 after the COVID-19 outbreak, and the difference was significant, while revision times tended to decrease, from 0.0126 to 0.0115. Furthermore, the impact of the COVID-19 on forecast width increased significantly (0.0053) in Group COVID.

Second, we also separated the situations into two time windows based on the occurrence of the Wuhan lockdown, because the negative effect of the COVID-19 pandemic might be further amplified after the lockdown, and the results are shown in Panel B (before the Wuhan lockdown) and Panel C (after the Wuhan lockdown) of Table 3. Post-outbreak, the change in forecast width is more obvious after the Wuhan lockdown. The width of MEFs after the Wuhan lockdown increased by 0.0101 (Panel C), while the width of the MEFs before the lockdown increased by only 0.0051 (Panel B). The changes in MEF revision times mainly occurred after the Wuhan lockdown. Specifically, the revision times dropped by 0.003 in Group COVID after the outbreak, while those in Group Others increased by 0.0008. However, the difference between the two groups was not significant. This shows that the accuracy and revision times of MEFs have decreased more significantly when managers are more severely affected by the pandemic, especially after the Wuhan lockdown, which is consistent with previous expectations. Therefore, the above results further support H1.

4.3. Multivariate regression analysis

To examine the impact of the pandemic on management forecast quality, this study used Eq. (1) to conduct a multivariate regression analysis of the DID estimation, based on the full sample and two subsamples (before and after the Wuhan lockdown). The results are shown in Table 4. Panels A and B in Table 4 show the impact on the accuracy and revision times of MEFs, respectively.

In Panel A, for \text{COVID}_i \times \text{Post}_t, the coefficients are 0.0046* and 0.0048** in Columns (1) and (2), respectively, which indicates that the accuracy of MEFs decreased significantly after the COVID-19 outbreak. By comparing the results of the sub-samples from before and after the Wuhan lockdown, we obtained the same results after the lockdown, as the coefficient of \text{COVID}_i \times \text{Post}_t is 0.0031 and not significant in Column (3), while it is 0.0080 and significant at the 10% level in Column (4).

\(^{11}\) However, it is worth noting that the proportion of there being at least one revision is very low, and the maximum is only 2.01%, in Panel C of Table 1. This makes the later multivariate analysis unrealistic, which means that the deviation of the explained variable is very small. Therefore, the later analysis focused on the change in management earnings forecast accuracy.

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In Panel B, the coefficient estimates for the interaction term ($\beta_2$) are $0.0002$ and $0.0045$ in Columns (1) and (2), respectively, which are not significant. The results of the sub-sample after the Wuhan lockdown shows that the coefficient of $\text{COVID}_i \times \text{Post}_t$ is $0.0170^{**}$ and significant at the 5% level in Column (3). These indicates that the COVID-19 outbreak significantly reduced the frequency of MEF revision for companies that were more strongly impacted by the COVID-19, especially after the Wuhan lockdown.

Overall, the regression results shown in Table 4 support H1, in that if the company is more influenced by the COVID-19, MEFs

| Year | Full sample (Jan 1st-Apr 30th) | Before lockdown of Wuhan (Jan 1st-Jan 22nd) | After lockdown of Wuhan (Jan 23rd -Apr 30th) |
|------|--------------------------------|---------------------------------------------|---------------------------------------------|
|      | Obs | %    | Obs | %   | Obs | %    |
| 2018 | 1657| 30.88%| 330 | 19.92%| 1327| 80.08%|
| 2019 | 1754| 32.69%| 292 | 16.65%| 1462| 83.35%|
| 2020 | 1955| 36.43%| 1217| 62.25%| 738 | 37.75%|
| Total| 5366| 100.00%| 1839| 100.00%| 3527| 100.00%|

**Table 1**

**Distributions of the MEFs.**

### Panel A: Frequency of annual MEFs per year

#### Table 1

**Distributions of the MEFs.**

#### Panel A: Frequency of annual MEFs per year

| Year            | Full sample (Jan 1st-Apr 30th) | Before lockdown of Wuhan (Jan 1st-Jan 22nd) | After lockdown of Wuhan (Jan 23rd -Apr 30th) |
|-----------------|--------------------------------|---------------------------------------------|---------------------------------------------|
|                 | Obs | %   | Obs | %   | Obs | %   |
| 2018            | 1657| 30.88%| 330 | 19.92%| 1327| 80.08%|
| 2019            | 1754| 32.69%| 292 | 16.65%| 1462| 83.35%|
| 2020            | 1955| 36.43%| 1217| 62.25%| 738 | 37.75%|
| Total           | 5366| 100.00%| 1839| 100.00%| 3527| 100.00%|

**Panel B: Forms of annual MEFs.**

### Panel B: Forms of annual MEFs

#### Table 2

**Descriptive statistics.**

| VARIABLES                        | Obs | Mean | 5%  | 50%  | 95%  | Std. Dev. | Min  | Max  |
|----------------------------------|-----|------|-----|------|------|-----------|------|------|
| $\text{Width}_{it}$              | 5366| 0.0154| 0.0000| 0.0043| 0.0585| 0.0441| 0.0000| 0.3385|
| $\text{Revision}_{it}$           | 5274| 0.0178| 0.0000| 0.0000| 0.0000| 0.1337| 0.0000| 2.0000|
| $\text{COVID}_i$                 | 5366| 0.6463| 0.0000| 1.0000| 1.0000| 0.4782| 0.0000| 1.0000|
| $\text{Post}_t$                  | 5366| 0.3643| 0.0000| 0.0000| 1.0000| 0.4812| 0.0000| 1.0000|
| $\text{ROE}_{it}$                | 5366| 0.0479| 0.0000| 0.0362| 0.1599| 0.0534| 0.0000| 0.2923|
| $\text{Forecast Horizon}_{it}$   | 5366| 26.2769| 12.0000| 26.0000| 32.0000| 12.5230| 7.0000| 107.0000|
| $\text{Return Volatility}_{it}$  | 5366| 0.0286| 0.0171| 0.0271| 0.0455| 0.0100| 0.0131| 0.0782|
| $\text{R&D}_{it}$                | 5366| 0.0479| 0.0000| 0.0362| 0.1599| 0.0534| 0.0000| 0.2923|
| $\text{INST}_{it}$               | 5366| 0.3306| 0.0079| 0.3261| 0.6939| 0.2170| 0.0000| 0.8151|
| $\text{B/M}_{it}$                | 5366| 0.4520| 0.0871| 0.3741| 1.0908| 0.3127| 0.0139| 1.5434|
| $\text{Analysis Coverage}_{it}$  | 5366| 11.4676| 0.0000| 3.0000| 51.0000| 17.7308| 0.0000| 86.0000|
| $\text{Size}_{it}$               | 5366| 2929| 521| 2939| 37,559| 20,905| 253| 150,881|
| $\text{Hitech}_{it}$             | 5366| 0.4536| 0.0000| 0.0000| 0.0000| 0.4979| 0.0000| 1.0000|
| $\text{SOE}_{it}$                | 5366| 0.2529| 0.0000| 0.0000| 1.0000| 0.4347| 0.0000| 1.0000|
| $\text{Equity Issuance}_{it}$    | 5366| 0.0084| 0.0000| 0.0000| 0.0000| 0.0912| 0.0000| 1.0000|
| $\text{CashHolding}_{it}$        | 5366| 0.6668| 0.0000| 1.0000| 1.0000| 0.4714| 0.0000| 1.0000|
| $\text{Employee}_{it}$           | 5366| 0.5106| 0.0000| 1.0000| 1.0000| 0.4999| 0.0000| 1.0000|
| $\text{Birthplace}_{it}$         | 5366| 0.2902| 0.0000| 0.0000| 1.0000| 0.4539| 0.0000| 1.0000|
| $\text{Serious}_{it}$            | 5366| 0.4987| 0.0000| 0.0000| 1.0000| 0.5000| 0.0000| 1.0000|

**Note:** This table reports distributions of frequency, form, and revision times of annual MEFs separately. Panel A is frequency distributions of annual MEFs from January 1st to April 30th in 2018, 2019, and 2020. Panel B is form distributions of annual MEFs from January 1st to April 30th in 2018, 2019, and 2020. Panel C is revision times distributions of annual MEFs from January 1st to April 30th in 2018, 2019, and 2020. Specifically, for all the panels, the entire sample is separated into two sub-samples based on the COVID-19 pandemic lockdown, which began on January 23rd, 2020.

In Panel B, the coefficient estimates for the interaction term ($\beta_2$) are $-0.0002$ and $0.0045$ in Columns (1) and (2), respectively, which are not significant. The results of the sub-sample after the Wuhan lockdown shows that the coefficient of $\text{COVID}_i \times \text{Post}_t$ is $-0.0170^{**}$ and significant at the 5% level in Column (3). These indicates that the COVID-19 outbreak significantly reduced the frequency of MEF revision for companies that were more strongly impacted by the COVID-19, especially after the Wuhan lockdown.

Overall, the regression results shown in Table 4 support H1, in that if the company is more influenced by the COVID-19, MEFs...
The previous theoretical analysis shows that the pandemic affects management attention in information production, and thereby reduces the quality of information generation and disclosure. Thus, we can expect that factors that affect the managerial attention invested will exacerbate the impact of the COVID-19 on the accuracy of MEFs ($Width_{it}$).

### 4.4. The mechanisms

The previous theoretical analysis shows that the pandemic affects management attention in information production, and thereby reduces the quality of information generation and disclosure. Thus, we can expect that factors that affect the managerial attention invested will exacerbate the impact of the COVID-19 on the accuracy of MEFs ($Width_{it}$).

#### 4.4.1. Impact of increasing work burden

Table 5 shows the results from estimating Eq. (2) to examine the increasing work burden. For the entire management forecast disclosure period, Columns (1) and (2) present the regression results of Eq. (1), divided by the median of $Employee_{it}$. As shown in Column (3), the coefficient of $COVID_{i} \times Post_{t} \times Employee_{it}$ is 0.0103 ($t = 2.18$), which is significant at the 5% level. Columns (4)–(6) and Columns (7)–(9) are the results before and after the Wuhan lockdown, respectively. For the full sample, the coefficient of $COVID_{i} \times Post_{t} \times Employee_{it}$ in Column (6) is not significant (0.0048, $t = 1.11$), while it is significantly positive (0.0143, $t = 1.65$) in Column (9). By comparing Columns (1) with (2), (4) with (5), (7) with (8), the coefficients of $COVID_{i} \times Post_{t}$ show that if the proportion of employees from Hubei province is relatively higher, managers are more likely to experience a heavier work burden and thus disclose a broader forecast width. Therefore, the decline in accuracy of MEFs is more apparent after the COVID-19 outbreak, and especially after the Wuhan lockdown, which supports H2.

#### 4.4.2. Impact of perceptual narrowing

Based on whether an executive’s birthplace is a high-risk area, we divided the full sample into two groups. Columns (3), (6), and

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**Table 3**

Univariate test results.

| Panel | Full sample (Jan 1st-Apr 30th) | Non-pandemic period (Pre) | Pandemic period (Post) | Difference |
|-------|-------------------------------|---------------------------|------------------------|------------|
|       | Obs  | Mean | Median | Obs  | Mean | Median | Obs  | Mean | Median | Difference |
| **Accuracy of MEFs (Width)** | All | 3411 | 0.0142 | 0.0044 | 1955 | 0.0174 | 0.0041 | 0.0032** | -0.0003 |
|      | COVID | 2239 | 0.0151 | 0.0048 | 1229 | 0.0203 | 0.0048 | 0.0052*** | -0.0001 |
|      | Others | 1172 | 0.0125 | 0.0037 | 726 | 0.0124 | 0.0032 | -0.0001 | -0.0005* |
| COVID VS. Others | 0.0026* | 0.0011*** | 0.0079*** | 0.0016*** | 0.0053*** | 0.0005 |
| **Revision times of MEFs** | All | 3351 | 0.0126 | 0.0000 | 1923 | 0.0115 | 0.0000 | -0.0011 | -0.0000 |
|      | COVID | 2193 | 0.0149 | 0.0000 | 1204 | 0.0138 | 0.0000 | -0.0010 | -0.0000 |
|      | Others | 1158 | 0.0084 | 0.0000 | 719 | 0.0077 | 0.0000 | -0.0007 | -0.0000 |
| COVID VS. Others | 0.0065** | 0.0000* | 0.0061 | 0.0000 | -0.0004 | -0.0000 |

Panel B: Before lockdown of Wuhan (Jan 1st-Jan 22nd)

| Panel | All | 622 | 0.0072 | 0.0037 | 1217 | 0.0122 | 0.0037 | 0.0051*** | 0.0001 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Accuracy of MEFs | COVID | 410 | 0.0080 | 0.0041 | 763 | 0.0146 | 0.0043 | 0.0066*** | 0.0003 |
|      | Others | 212 | 0.0055 | 0.0033 | 454 | 0.0082 | 0.0030 | 0.0027 | -0.0003 |
| COVID VS. Others | 0.0025* | 0.0008* | 0.0064*** | 0.0013*** | 0.0039*** | 0.0005** |

Panel C: After lockdown of Wuhan (Jan 23rd-Apr 30th)

| Panel | All | 2789 | 0.0158 | 0.0046 | 738 | 0.0259 | 0.0047 | 0.0101*** | 0.0000 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Accuracy of MEFs | COVID | 1829 | 0.0167 | 0.0051 | 466 | 0.0296 | 0.0051 | 0.0130*** | 0.0000* |
|      | Others | 960 | 0.0141 | 0.0039 | 272 | 0.0194 | 0.0037 | 0.0053* | 0.0000 |
| COVID VS. Others | 0.0026 | 0.0012*** | 0.0102** | 0.0014*** | 0.0077*** | 0.0002 |
| **Revision times of MEFs** | All | 2734 | 0.0142 | 0.0000 | 723 | 0.0125 | 0.0000 | -0.0017 | -0.0000 |
|      | COVID | 1787 | 0.0167 | 0.0000 | 455 | 0.0137 | 0.0000 | -0.0030 | -0.0000 |
|      | Others | 947 | 0.0095 | 0.0000 | 268 | 0.0103 | 0.0000 | 0.0008 | 0.0000 |
| COVID VS. Others | 0.0072* | 0.0000* | 0.0034 | 0.0000 | -0.0038 | -0.0000 |

Notes: This table shows the univariate tests on width and revision times of MEFs for the difference in quality before and after the COVID-19 outbreak. According to the impact of the pandemic on companies in different industries, we divided the samples into the more affected group (COVID, COVID = 1) and less affected group (Others, COVID = 0) to compare the situations before and after the outbreak. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

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12 In this study, the division of regional risk level is based on the cumulative number of confirmed cases in each province (except the Special Administrative Region) from January 1st to June 30th, 2020.
### Table 4
Impact of distractions on MEFs.

#### Panel A: On the accuracy of MEFs

| VARIABLES | Full sample (Jan 1st-Apr 30th) | Before lockdown of Wuhan (Jan 1st-Jan 22nd) | After lockdown of Wuhan (Jan 23rd-Apr 30th) |
|-----------|---------------------------------|---------------------------------------------|-------------------------------------------|
|           | (1)                             | (2)                                         | (3)                                       | (4)                                      |
| COVID<sub>i</sub> | 0.0066** (2.36) | 0.0019 (0.56) | 0.0002 (0.03) | 0.0038 (0.82) |
| COVID<sub>i</sub> × Post<sub>t</sub> | 0.0046* (1.83) | 0.0048** (1.98) | 0.0031 (1.41) | 0.0080* (1.80) |
| ROE<sub>it</sub> | -0.0363*** (-7.49) | -0.0196*** (-3.01) | -0.0392*** (-6.98) | |
| Forecast Horizon<sub>t</sub> | -0.0007 (-0.60) | -0.0018 (-1.07) | -0.0081** (-2.42) | |
| Return Volatility<sub>t</sub> | 0.1553*** (3.41) | 0.1111* (1.70) | 0.1755*** (2.79) | |
| R&D<sub>it</sub> | -0.0197 (-1.34) | -0.0316* (-1.79) | -0.0147 (-0.79) | |
| INST<sub>it</sub> | 0.0074** (2.32) | 0.0051 (1.40) | 0.0092** (2.04) | |
| B/M<sub>it</sub> | 0.0285*** (7.28) | 0.0210*** (4.21) | 0.0319*** (6.28) | |
| Equity Issuance<sub>t</sub> | -0.0025*** (-4.75) | -0.0014*** (-2.16) | -0.0035*** (-4.94) | |
| Analyst Coverage<sub>t</sub> | -0.0001 (-0.52) | -0.0001 (0.29) | -0.0001 (0.37) | |
| Year Fixed Effects | Yes | Yes | Yes | |
| Industry Fixed Effects | Yes | Yes | Yes | |
| Obs. | 5366 | 5366 | 1839 | 3527 |
| Adj. R<sup>2</sup> | 0.19 | 0.124 | 0.074 | 0.139 |

#### Panel B: On the revision times of MEFs

| VARIABLES | Full sample (Jan 1st-Apr 30th) | After lockdown of Wuhan (Jan 23rd-Apr 30th) |
|-----------|---------------------------------|-------------------------------------------|
|           | (1)                             | (2)                                        | (3)                                      |
| COVID<sub>i</sub> | 0.0298 (1.46) | 0.0196 (1.16) | 0.0118 (0.77) |
| COVID<sub>i</sub> × Post<sub>t</sub> | -0.0002 (-0.04) | -0.0045 (-1.00) | -0.0170** (-2.46) |
| ROE<sub>it</sub> | -0.0053 (-0.73) | -0.0040 (0.29) | -0.0040 (0.37) |
| Forecast Horizon<sub>t</sub> | 0.1058*** (10.22) | 0.2513*** (12.00) | |
| Return Volatility<sub>t</sub> | 0.0088 (0.08) | 0.2245* (1.86) | |
| R&D<sub>it</sub> | -0.0050 (-0.16) | -0.0034 (-0.12) | |
| INST<sub>it</sub> | 0.0102 (1.53) | 0.0095 (1.37) | |
| B/M<sub>it</sub> | -0.0036 (-0.59) | 0.0079 (1.34) | |
| Analyst Coverage<sub>t</sub> | -0.0022* (-1.54) | 0.0023* (-1.81) | |
| Size<sub>it</sub> | 0.0014 (0.83) | 0.0005 (-0.35) | |
| Hitech<sub>t</sub> | -0.0000 (-0.00) | 0.0079 (0.29) | |
| SOE<sub>it</sub> | -0.0067** (-2.07) | -0.0038 (-1.08) | |
| Equity Issuance<sub>t</sub> | -0.0008 (-0.06) | 0.0053 (0.31) | |
| Year Fixed Effects | Yes | Yes | Yes | |

(continued on next page)
Table 4 (continued)

Panel B: On the revision times of MEFs

| VARIABLES                  | Full sample (Jan 1st-Apr 30th) | After lockdown of Wuhan (Jan 23rd - Apr 30th) |
|----------------------------|--------------------------------|---------------------------------------------|
|                            | (1)                            | (2)                                         |
| Industry Fixed Effects     | Yes                            | Yes                                         |
| Obs.                       | 5274                           | 5274                                        |
| Adj. R²                    | 0.008                          | 0.197                                       |

Note: This table presents the panel regression results of DID estimation (Eq. (1)). The sample is divided into two groups: before and after the lockdown of Wuhan. Post, is a dummy variable, which represents whether the enterprise was affected by COVID-19. To be more specific, MEFs disclosed after January 1st, 2020 are taken as 1, otherwise they are taken as 0. COVID, is a virtual variable, which represents the differences in the pandemic’s impact on different industries, taking 1 for those with greater impact and 0 for those with less impact. In each panel, Columns (1) and (2) list the regression results of the full sample without and with control variables, respectively; Columns (3) and (4) are the results for the sub-samples before and after the Wuhan lockdown, respectively. The t-values in parentheses are adjusted by the company cluster. ***, **, * indicate significance at the statistical level of 1%, 5%, and 10%, respectively.

(9) in Table 6 present the regression results of Eq. (2) using Birthplace as a proxy for the narrowing perception of executives. For the entire MEFs disclosure period in Columns (1)–(3), the coefficient of COVID × Post, for more affected executives is 0.0121 (t = 2.62) in Column (1), which is significantly positive at the 1% level. For the full sample, the coefficient of COVID × Post × Birthplace in Column (3) is 0.0109 (t = 1.99), which is significantly positive at the 5% level. By comparing the results before and after the Wuhan lockdown, the coefficient of COVID × Post × Birthplace in Column (6) is negative and not significant (−0.0031, t = −0.59), whereas it is significantly positive (0.0252, t = 2.49) in Column (9). These results show that the negative impact of the pandemic on the accuracy of MEFs is more apparent if executives come from high-risk areas, especially after the Wuhan lockdown, which supports H3.

4.4.4. Combined impact of increasing work burden and perceptual narrowing

To highlight that the impact of the pandemic on information disclosure quality is the co-produced effect of reduced working hours and distractions, we generated a new indicator to test the combined effect of these two mechanisms. Specifically, if the company’s office is in a high-risk area, such as Wuhan City or Hubei Province, the increasing burden will be more serious, and managers will pay much more attention to the pandemic and ignore other things, which will cause perceptual narrowing manifested in Table 7 by regressing Eq. (2). The coefficient of COVID × Post in Column (1) is 0.0102 (t = 3.31), which is significantly positive at the 1% level and significantly negative in Column (2). For the full sample in Column (3), the coefficient of COVID × Post × Serious in Column (6) is significant (0.0103, t = 2.19) significantly at the 5% level; the coefficient of it in Column (6) is significant (0.0104, t = 2.37); however, it’s positive but not significant (0.0093, t = 1.07) in Column (9). These results suggest that, the office of a company is in an area with higher infection risk, the width of MEFs will become broader and less accurate after the COVID-19 outbreak because of managerial distraction, further supporting H2 and H3.

4.4.4. Preventive effect of cash reserves

Table 8 shows regression results, to examine the preventive effect of cash reserves. If a company has sufficient resources for good precautions, the negative impact of the pandemic might be alleviated. Therefore, we used a companies’ cash reserves to measure the preventive effect. Columns (1) and (2) show the regression results of Eq. (1) for the groups with lower and higher levels of cash reserves separately. The coefficient of COVID × Post in Column (1) is 0.0076 (t = 2.32), which is significantly positive at the 5% level, whereas the coefficient of COVID × Post in Column (2) is not significant (−0.0005, t = −0.16). Furthermore, the coefficient of COVID × Post × CashHolding in Column (6) from estimating Eq. (2) is 0.0082 (t = 1.81), which is significant at the 10% level. The coefficient of COVID × Post × CashHolding in Column (9) is significantly positive (0.0147, t = 1.83), while it is positive (0.0070, t = 1.48) but not significant in Column (6). These results show that cash reserves have a preventive effect. Hence, when an enterprise’s cash reserves were lower, the COVID-19 outbreak imposed a greater negative impact on accuracy of MEFs, which supports H4.

4.5. Robustness tests

This section reports the results of several tests conducted to evaluate the robustness of our results. Because the key test variable was Width, it’s calculation method was replaced by Widthlow or Widthhigh to ensure the reliability of our conclusions, respectively. Widthhigh was divided by the net profit of the previous year, and Widthlow was divided by the average of the predicted maximum and minimum values. The regression results were mostly consistent with the results shown in Table 4.

In addition, other tests were conducted on the preventive effect of cash reserves. According to their cash reserve amount, companies were divided into two groups by the median; the lower group was defined as the low-cash-reserve group (CashHolding = 1), and the

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13 To save space, the results of robustness test are not tabulated, unless otherwise noted.
### Table 5

Impact of increasing work burden.

| VARIABLES                  | Full sample | Before lockdown of Wuhan | After lockdown of Wuhan |
|----------------------------|-------------|--------------------------|-------------------------|
|                            | Higher      | Lower                    | All                     |
| (1)                        | (2)         | (3)                      | (4)                     | (5)        | (6)        | (7)        | (8)        | (9)        |
| COVID<sub>i</sub>          | -0.0033     | 0.0003                   | 0.002                   | -0.0096    | 0.0087     | -0.0017    | -0.0003    | 0.0003     | 0.005      |
| COVID<sub>i</sub> × Post<sub>i</sub> | (0.63)      | (0.06)                   | (0.54)                  | (1.36)     | (1.52)     | (0.33)     | (0.04)     | (0.06)     | (1.06)     |
| Post<sub>i</sub> × Employee<sub>it</sub> | (3.27)      | (0.00)                   | (0.12)                  | (1.93)     | (1.80)     | (0.20)     | (2.83)     | (0.21)     | (0.13)     |
| COVID<sub>i</sub> × Post<sub>i</sub> × Employee<sub>it</sub> | 0.0103**    | 0.0048                   | (2.18)                  | (1.11)     | **(1.65)   | -0.0012    | -0.0012    | -0.0012    | -0.0012    |
| Post<sub>i</sub> × Employee<sub>it</sub> | -0.0068**   | (2.12)                   | (0.37)                  | (0.47)     | (0.87)     | -0.047     | (2.38)     | -0.068     | -0.068     |
| COVID<sub>i</sub> × Employee<sub>it</sub> | -0.0005     | 0.0032                   | (1.24)                  | 0.0023     | 0.0009     | 0.0009     | 0.0009     | 0.0009     | 0.0009     |
| Employee<sub>it</sub>      | 0.0011      | 0.0007                   | (0.53)                  | (0.56)     | (0.90)     | (0.53)     | (0.56)     | (0.90)     | (0.90)     |
| ROE<sub>it</sub>           | -0.0365***  | -0.0371***               | -0.0363***              | -0.0418*** | -0.0009    | -0.0200*** | -0.0335*** | -0.0460*** | -0.0392*** |
| Forecast Horizon<sub>it</sub> | -0.0016     | -0.0004                  | -0.0007                 | -0.002     | -0.0008    | -0.002     | -0.0082    | -0.0067    | -0.0081**  |
| Return Volatility<sub>it</sub> | 0.1379**    | 0.1904**                 | 0.1526***               | 0.1617*    | 0.0221     | 0.1160**   | 0.115      | 0.2801***  | 0.1718***  |
| R&D<sub>it</sub>           | 0.002       | -0.0428**                | -0.0188                 | -0.0241    | -0.0246    | -0.0294*   | 0.0117     | -0.0485*   | -0.0143    |
| INST<sub>it</sub>          | 0.0100**    | 0.0041                   | 0.0075**                | 0.0088     | 0.0009     | 0.0055     | 0.0101*    | 0.0074     | 0.0091**   |
| B/M<sub>it</sub>           | 0.0294***   | 0.0295***                | 0.0286***               | 0.0314***  | 0.0114***  | 0.0218***  | 0.0289***  | 0.0371***  | 0.0318***  |
| Analyst Coverage<sub>it</sub> | -0.0026***  | -0.0025***               | -0.0024***              | -0.0001    | -0.0029*** | -0.0044*   | -0.0041*** | -0.0032*** | -0.0035**  |
| Size<sub>it</sub>          | -0.0017     | 0.0009                   | 0.0025***               | -0.0005    | (0.05)     | -0.037     | (0.21)     | -0.046     | -0.040     |
| Hitech<sub>it</sub>        | 0.0024      | 0.0022                   | 0.0007                  | -0.0004    | -0.001     | 0.0004     | 0.0039     | -0.0064    | 0.0002     |
| SOE<sub>it</sub>           | -0.0024     | -0.0056**                | -0.0045***              | -0.0047    | -0.0045    | -0.0022**  | -0.0008    | -0.0066**  | -0.0045*  |
| Equity Issuance<sub>it</sub> | -0.0004     | 0.0043                   | 0.0014                  | 0.0001     | 0.0014     | 0.0013     | -0.0014    | -0.0009    | -0.0025    |
| Year Fixed Effects         | Yes         | Yes                      | Yes                     | Yes        | Yes        | Yes        | Yes        | Yes        | Yes        |
| Industry Fixed Effects     | Yes         | Yes                      | Yes                     | Yes        | Yes        | Yes        | Yes        | Yes        | Yes        |
| Obs.                        | 2740        | 2626                     | 5366                    | 980        | 859        | 1839       | 1760       | 1767       | 3527       |
| Adj. R²                     | 0.139       | 0.117                    | 0.125                   | 0.169      | 0.02       | 0.076      | 0.131      | 0.152      | 0.139      |

Note: This table presents the panel regression of the DID estimation to examine the mechanism of increasing work burden. Employee<sub>it</sub> is an indicator variable measuring the level of reducing working hours, which shows the increasing managerial work burden, and it equals 1 if the proportion of non-local employees from Hubei province to all non-local employees is higher. According to the pandemic statistics from the WIND database, we identified the province with a high reliance on labor from Hubei by the median of the proportion of non-local employees from Hubei province to all non-local employees from Mainland China. This is because most employees from Hubei had already returned to their home in Hubei. After the Wuhan lockdown, the lockdown policy was extended to all cities in Hubei province. Therefore, employees could not go back to their workplaces, causing executives to experience a higher work burden. Please see Appendix 1.1 for variable measurements in detail. The t-values in parentheses are adjusted by the company cluster; ***, **, * indicate significance at the statistical level of 1%, 5%, and 10%, respectively.
Table 6
Impact of executives’ perceptual narrowing.

| VARIABLES | Full sample | Before lockdown of Wuhan | After lockdown of Wuhan |
|-----------|-------------|--------------------------|-------------------------|
|           | High-risk   | Low-risk                 | All                     | High-risk   | Low-risk                 | All                     |
|           | (1)         | (2)                      | (3)                     | (4)         | (5)                      | (6)                     |
| COVID_t  | −0.0063     | 0.0047                   | 0.0018                  | −0.0085     | 0.0043                   | −0.0006                 | 0.0003                  | 0.0048                   | 0.004 |
|          | (−1.09)     | (1.15)                   | (0.50)                  | (−0.82)     | (0.81)                   | (−0.12)                 | (0.03)                  | (0.98)                   | (0.86) |
| COVID_t × Post_t | 0.0121*** | 0.0018                   | 0.0018                  | 0.0031      | 0.0035                   | 0.0041*                 | 0.0262***               | 0.002       | 0.0013              |
|          | (2.62)      | (0.64)                   | (0.64)                  | (0.61)      | (1.41)                   | (1.67)                  | (3.07)                  | (0.40)                   | (2.63) |
| COVID_t × Post_t × Birthplace_a | 0.0109** | (1.99) | (−0.0031) | (−0.59) | (2.49) | 0.0252** | 0.0075** | (0.26) | (1.68) |
| Post_t × Birthplace_a | −0.0075** | (−2.15) | 0.0049 | (−0.26) | (−2.12) | −0.0123** | 0.0022 | (−0.80) | (−22) |
| COVID_t × Birthplace_a | −0.0002 | (−0.59) | 0.0044* | (1.35) | 0.0031 | 0.0052* | (−0.15) | (1.65) | (−7.04) |
| Birthplace_a | 0.0044* | (1.57) | 0.0075** | (0.70) | (−1.08) | (−2.57) | 0.0075** | (0.59) | (−1.08) |
| ROE_a | −0.0480*** | −0.0314*** | −0.0362*** | −0.0398** | −0.0107** | −0.0197*** | −0.0486*** | −0.0353*** | −0.0391*** |
|          | (−4.64)     | (−5.91)                  | (−7.52)                 | (−2.38)     | (−2.13)                  | (−3.03)                 | (−4.12)                 | (−5.73)                 | (−7.04) |
| Forecast Horizon_a | −0.003 | 0.0055      | −0.0099   | −0.0062 | 0.0006 | −0.0019 | −0.0099 | −0.0068* | −0.0085* |
|          | (−1.11)     | (0.38)                   | (−0.70)                 | (−1.22)     | (0.35)                   | (−1.80)                 | (−1.51)                 | (−1.67)                 | (−2.57) |
| Return Volatility_a | 0.3867*** | 0.0806* | 0.1603*** | 0.3172 | 0.041 | 0.1142* | 0.3567*** | 0.0998 | 0.1799*** |
|          | (3.03)      | (1.78)                   | (3.49)                  | (1.51)      | (0.75)                   | (1.73)                  | (2.14)                  | (1.54)                  | (2.85) |
| R&D_a | 0.0238 | 0.0323** | 0.0191 | 0.0511 | 0.0173 | 0.0321* | 0.0513 | 0.0345* | 0.0137 |
|          | (0.76)      | (2.07)                   | (1.30)                  | (1.54)      | (0.91)                   | (1.80)                  | (1.20)                  | (1.77)                  | (0.73) |
| INST_a | 0.0072 | 0.0069** | 0.0073** | 0.005 | 0.0062* | 0.005 | 0.009 | 0.0085* | 0.0091** |
|          | (0.87)      | (2.26)                   | (2.30)                  | (0.55)      | (1.66)                   | (1.38)                  | (0.79)                  | (1.95)                  | (2.03) |
| B/M_a | 0.0385*** | 0.0231*** | 0.0285*** | 0.0317*** | 0.0173*** | 0.0212*** | 0.0386*** | 0.0266*** | 0.0316*** |
|          | (5.10)      | (5.33)                   | (7.30)                  | (2.59)      | (3.75)                   | (4.23)                  | (4.06)                  | (4.65)                  | (6.27) |
| Analyst Coverage_a | −0.0015 | −0.0028*** | −0.0024*** | 0 | −0.0021*** | −0.0014** | −0.0030** | −0.0038*** | −0.0036*** |
|          | (−1.37)     | (−4.94)                  | (−4.75)                 | 0.00        | (−3.10)                  | (−2.10)                 | (−2.05)                 | (−4.77)                 | (−4.99) |
| Size_a | −0.0040*** | −0.0019** | −0.0027*** | −0.0034* | −0.0019** | −0.0024** | −0.0038* | −0.0018 | −0.0026*** |
|          | (−2.84)     | (−3.68)                  | (−3.68)                 | (−2.24)     | (−2.44)                  | (−3.56)                 | (−1.92)                 | (−1.59)                 | (−2.59) |
| Hitech_a | 0.0078 | 0.0001      | 0.0001    | 0.0103 | 0.0008 | 0.0008 | 0.0081 | 0.0044 | 0.0001 |
|          | (1.33)      | (−0.99)                  | (0.34)                  | (0.79)      | (−0.34)                  | (0.24)                  | (0.31)                  | (−0.96)                 | (−2.92) |
| SOE_a | −0.0018 | −0.0055*** | −0.0045*** | −0.0061 | −0.0043* | −0.0045** | 0.0004 | 0.0061** | −0.0045* |
|          | (−0.57)     | (−2.69)                  | (−2.69)                 | (−1.62)     | (−1.69)                  | (0.08)                  | (−2.26)                 | (−1.89)                 |
| Equity Issue_a | 0.0034 | 0.0007      | 0.0015    | −0.0007 | 0.0095 | 0.0065 | 0.0095 | 0.0067 | 0.0021 |
|          | (0.79)      | (0.15)                   | (0.44)                  | (−0.11)     | (0.97)                   | (0.94)                  | (1.64)                  | (1.44)                  | (0.61) |
| Year Fixed Effects | Yes | Yes      | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry Fixed Effects | Yes | Yes      | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Obs. | 1557 | 3809 | 5366 | 518 | 1321 | 1839 | 1039 | 2488 | 3527 |
| Adj. R^2 | 0.165 | 0.112 | 0.125 | 0.155 | 0.052 | 0.073 | 0.195 | 0.13 | 0.141 |

Note: This table presents the panel regression of the DID estimation to examine the mechanism of perceptual narrowing. Birthplace_a is an indicator variable for the level of distractions, and it equals 1 if an executive’s birthplace is in a province with a higher proportion of confirmed diagnoses. According to the pandemic statistics from the WHD database, we identified high-risk provinces by the median of the cumulated number of confirmed diagnoses from provinces in Mainland China. Please see Appendix 1.1 for variable measurements in detail. Due to the inadequate sample and the structure of the data, Analyst Coverage_a is omitted in Row (4). The t-values in parentheses are adjusted by the company cluster; ***, **, * indicate significance at the statistical level of 1%, 5%, and 10%, respectively.
Table 7
Location of the headquarters of the company.

| VARIABLES                  | Full sample | Before lockdown of Wuhan | After lockdown of Wuhan |
|----------------------------|-------------|--------------------------|------------------------|
|                            | High-risk   | Low-risk                 | All                    | High-risk   | Low-risk | All    |
|                            | (1)         | (2)                      | (3)                    | (4)         | (5)      | (6)    |
| COVID                      | 0.0063      | 0.0069                   | 0.002                  | 0.0105*     | 0.0075   | -0.0012 |
|                            | (-1.02)     | (1.36)                   | (0.54)                 | (-1.86)     | (1.18)   | (-0.23) |
|                            | 0.00102***  | -0.0005                  | -0.0004                | 0.0082**    | -0.0018  | -0.0025 |
|                            | (3.31)      | (-0.13)                  | (-0.10)                | (2.53)      | (-0.60)  | (-0.84) |
| COVID × Post              | 0.0102***   | -0.0005                  | -0.0004                | 0.0082**    | -0.0025  | 0.0012  |
|                            | (3.31)      | (-0.13)                  | (-0.10)                | (2.53)      | (-0.60)  | (-0.84) |
| COVID × Post × Serious    | 0.0103**    | -0.0005                  | -0.0004                | 0.0082**    | -0.0025  | 0.0012  |
|                            | (2.19)      | (-0.13)                  | (-0.10)                | (2.53)      | (-0.60)  | (-0.84) |
| Post × Serious            | 0.0005      | 0.0004                   | 0.0004                 | 0.0005      | 0.0004   | 0.0004 |
|                            | (0.25)      | (0.27)                   | (0.27)                 | (0.25)      | (0.27)   | (0.27) |
| Return Volatility         | 0.1332**    | 0.1735**                 | 0.1550***               | 0.2187**    | 0.0477   | 0.1215* |
|                            | (2.23)      | (2.46)                   | (3.04)                 | (2.07)      | (0.77)   | (1.87)  |
| R&D            | -0.0155     | -0.0182                  | -0.019                 | -0.0196     | -0.0241  | -0.0296* |
|                            | (-0.86)     | (-1.03)                  | (-1.06)                | (-0.93)     | (-1.18)  | (-1.31) |
| INST           | 0.0085**    | 0.0059                   | 0.0075**               | 0.0085      | 0.0011   | 0.0054  |
|                            | (2.02)      | (1.24)                   | (2.33)                 | (1.43)      | (0.31)   | (1.50)  |
| B/Ma           | 0.0252***** | 0.0324*****               | 0.0286**               | 0.0319**    | 0.0122** | 0.0214*** |
|                            | (4.48)      | (5.81)                   | (7.28)                 | (3.62)      | (2.50)   | (4.26)  |
| Analyst Coverage   | -0.0026***  | -0.0020***               | -0.0025***              | -0.0010     | -0.0014* | -0.0014* |
|                            | (-3.72)     | (-2.74)                  | (-4.76)                | (-0.98)     | (-2.00)  | (-2.24) |
| Size            | -0.0020**   | -0.0029**                | -0.0066**               | -0.0033***  | -0.001   | -0.0066** |
|                            | (-2.26)     | (-2.77)                  | (-3.49)                | (-3.32)     | (-1.40)  | (-3.56) |
| Hitech         | 0.004       | 0.0032                   | 0.0032                 | 0.0038      | -0.0052  | 0.0015  |
|                            | (0.93)      | (-0.90)                  | (0.37)                 | (0.53)      | (-1.27)  | (0.44)  |
| SOE            | -0.0026     | -0.0051***               | -0.0045***              | -0.0073**   | -0.0005  | -0.0042** |
|                            | (-1.09)     | (-2.11)                  | (-2.62)                | (-2.50)     | (-0.24)  | (-2.31) |
| Equity Issuance   | 0.0031      | 0.0017                   | 0.0017                 | 0.0038      | 0.0052   | 0.0052  |
|                            | (0.66)      | (0.32)                   | (0.47)                 | (0.53)      | (-1.27)  | (0.44)  |
| Year Fixed Effects  | Yes         | Yes                      | Yes                    | Yes         | Yes      | Yes    |
| Industry Fixed Effects | Yes        | Yes                      | Yes                    | Yes         | Yes      | Yes    |
| Obs.             | 2676        | 2690                     | 5366                   | 980         | 859      | 1839   |
| Adj. R²          | 0.145       | 0.113                    | 0.125                  | 0.146       | 0.015    | 0.082  |

Note: This table presents the panel regression of the DID estimation to examine two mechanisms: increasing work burden and perceptual narrowing. Serious is an indicator variable for the combined level of work-time reduction and distraction, which equals 1 if the headquarters of the enterprise is in a province with a higher cumulated number of confirmed diagnoses; otherwise, it equals 0. According to the pandemic statistics from the WIND database, we identified high-risk provinces by the median of cumulated number of confirmed diagnoses from provinces in Mainland China. Please see Appendix 1.1 for variable measurements in detail. Due to the inadequate sample and the structure of data, Equity Issuance is omitted in Row (4). The t-values in parentheses are adjusted by the company cluster; ***, **, * indicate significance at the statistical level of 1%, 5%, and 10%, respectively.
Table 8
Preventive effects of cash reserves.

| VARIABLES            | Full sample | Before lockdown of Wuhan | After lockdown of Wuhan |
|----------------------|-------------|--------------------------|-------------------------|
|                      | Low (1)     | High (2)                 | All (3)                 |
|                      | Low (4)     | High (5)                 | All (6)                 |
|                      | Low (7)     | High (8)                 | All (9)                 |
| \( \text{COVID}_t \) |             |                          |                         |
| –0.0004              | 0.0049      | 0.0003                   | 0.0045                  |
| (–0.09)              | (1.26)      | (0.07)                   | (0.89)                  |
| \( \text{COVID}_t \times \text{Post}_{it} \) | 0.0076**   | –0.0005                  | 0.0056*                 |
| (2.32)               | (–0.16)     | (–0.17)                  | (1.81)                  |
| \( \text{COVID}_t \times \text{Post}_{it} \times \text{CashHolding}_{it} \) | 0.0082*    |                          | 0.0070                  |
|                     | (1.81)      |                          | (1.48)                  |
| \( \text{Post}_{it} \times \text{CashHolding}_{it} \) | –0.0032    |                          | –0.0046                 |
|                     | (–0.93)     |                          | (–1.4)                  |
| \( \text{COVID}_t \times \text{CashHolding}_{it} \) | 0.0026     |                          | –0.0027                 |
|                     | (1.00)      |                          | (–1.05)                 |
| \( \text{CashHolding}_{it} \) | –0.0006    |                          | 0.0023*                 |
|                     | (–0.29)     |                          | (1.79)                  |
| \( \text{ROE}_{it} \) | –0.0391***  | –0.0251***               | –0.0258***              |
|                     | (–6.64)     | (–3.57)                  | (–7.36)                 |
| \( \text{Forecast Horizon}_{it} \) | –0.0016    | –0.0003                  | –0.0009                 |
|                     | (–0.94)     | (–0.16)                  | (–0.72)                 |
| \( \text{Return Volatility}_{it} \) | 0.1851**   | 0.1008**                 | 0.1610***               |
|                     | (2.21)      | (2.25)                   | (3.51)                  |
| \( \text{R} & \text{D}_{it} \) | –0.0047*   | –0.0046                  | –0.0198                 |
|                     | (0.31)      | (1.34)                   | (1.92)                  |
| \( \text{INST}_{it} \) | 0.0093**    | 0.0055                   | 0.0075**                |
|                     | (2.07)      | (1.44)                   | (2.33)                  |
| \( \text{B}/\text{M}_{it} \) | 0.0303***   | 0.0258***                | 0.0284***               |
|                     | (6.38)      | (3.81)                   | (7.27)                  |
| \( \text{Analyst Coverage}_{it} \) | –0.0026***  | –0.0024***               | –0.0024***              |
|                     | (–3.74)     | (–3.42)                  | (–4.74)                 |
| \( \text{Size}_{it} \) | –0.0037***  | –0.0008                  | –0.0026***              |
|                     | (–3.83)     | (–0.99)                  | (–3.64)                 |
| \( \text{Hitech}_{it} \) | 0.0042      | 0.0092                   | 0.0004                  |
|                     | (1.33)      | (1.44)                   | (0.14)                  |
| \( \text{SOE}_{it} \) | –0.0037     | –0.0055**                | –0.0044**               |
|                     | (–1.53)     | (–2.29)                  | (–2.49)                 |
| \( \text{Equity Issuance}_{it} \) | 0.0005      | 0.0035                   | 0.0018                  |
|                     | (0.15)      | (0.57)                   | (0.52)                  |
| \( \text{Year Fixed Effects} \) | Yes        | Yes                     | Yes                     |
| \( \text{Industry Fixed Effects} \) | Yes        | Yes                     | Yes                     |
| Obs.                 | 3578        | 1788                     | 5366                    |
| Adj. R²              | 0.127       | 0.094                    | 0.125                   |

Note: This table describes the panel regression of the DID estimation used to examine the preventive effect of cash reserves. CashHolding is an indicator variable for the anti-risk ability in case of an outbreak event, and it equals 1 if the enterprise’s cash reserves are insufficient. According to the ratio of cash and cash equivalents to total assets, the sample was divided into three groups by quantiles, and we identified the group with the highest cash holding amount as having the best anti-risk ability (CashHolding = 0), otherwise the groups with the lowest and medium levels of cash reserves are classified as the lower anti-risk ability group. Please see Appendix 1.1 for variable measurements in detail. The t-values in parentheses are adjusted by the company cluster; ***, **, * indicate significance at the statistical level of 1%, 5%, and 10%, respectively.
higher group was defined as the high-cash-reserve group (CashHoldingit = 0). The results were similar to those shown in Table 8. We further constrain our sample to mandatory disclosure only because we can observe the effect of managerial distraction more conveniently if managers are in a relatively more stressful environment, for example, managers might be warned and even punished by CSRC because of low-quality MEFs. Under such environment, they have less incentives to disclose a broader width of forecast deliberately to meet market expectation. Thus, we could ascribe the lower quality of MEFs to managerial distraction instead of managerial deliberation. The regression results were mostly consistent with the results shown in Table 4.

5. Conclusion

Through an empirical analysis of annual MEFs in 2018–2020 and data related to the COVID-19 in China, we examined the impact of managerial distraction on the quality of MEFs of A-share listed companies. Notably, we obtained three main findings. First, the predictive accuracy of MEFs was significantly reduced because of the adverse impact of the COVID-19, and the number of revisions was significantly reduced compared with the year without the pandemic. In addition, the adverse impact was more apparent after the Wuhan lockdown. Second, further analysis showed that the impact of managerial distraction on accuracy of MEFs was more apparent for firms with a high proportion of non-local employees from Hubei, as well as for those cases where the birthplace of executives or the company headquarters were in higher risk areas. Third, companies with larger cash reserves could significantly alleviate the adverse impact of the COVID-19. However, the economic fluctuations and uncertainty caused by the COVID-19 pandemic could have led managers strategically issue a broader forecast range to communicate this rational expectation to market participants. Arguably, our cross-sectional results can lend some support to the managerial distraction explanation, given that they are largely motivated by and consistent with psychology theories. Specially, sufficient resource reserves alleviating the negative influence on quality of MEFs suggests that the results appear to favor the managerial distraction interpretation. These findings indicate that the COVID-19 outbreak led to executives experiencing selective attention, which can ultimately reduce the quality of corporate information production and disclosure.

However, there are two limitations for our work. One limitation is that our sample (MEFs) is based in Chinese background under a strict regulatory environment, which limits the generalization of our approach to other country with voluntary disclosure regulation. Furthermore, in this study, we merely use COVID-19 pandemic because of its wide implications and acknowledged significance. Whether other emergencies would lead to managerial distraction and thus lower quality of MEFs should be further investigated.

Overall, our study extends the relevant research on MEFs by suggesting the important role of managerial distraction in MEF quality. In addition, our findings provide significant implications for regulators and market participants in an emerging market. This article can help market participants realize the impact of managerial distraction on corporate information disclosure behavior and thus interpret the information provided by managers better. Furthermore, it develops the literature on internal attributions of MEFs. Therefore, for regulators, special attention should be paid to balance the quality and amount or timeliness of information disclosure by incorporating the concern of regulatory burden on managers. Hence, when adjusting disclosure regulations to avoid market failure, the government could consider more factors related to those information disclosing, such as managerial attention.

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Appendix 1.1 Variable Definition

| VARIABLES | Variable symbols | Variable definitions |
|-----------|------------------|----------------------|
| Panel A. Explained Variables | | |
| Forecast accuracy | Widthit | The forecast width of company i's MEFs for the annual report of year t is equal to the absolute difference between the upper limit of the forecast net profit minus the lower limit of the forecast net profit divided by the annual closing price of the stock at the end of the previous year, and the absolute value is taken. |
| Number of earnings forecast revisions | Revisionit | The annual MEFs revision times of company i's annual report for year t, plus 1 to take the natural logarithm. |
| Panel B. Explanatory Variables | | |
| The timeline of the pandemic | Postit, COVIDit | The annual MEFs disclosed after December 31st, 2019, is taken as 1; otherwise, it is taken as 0. |

(continued on next page)
The extent of being affected by the pandemic

Panel C. Control Variables

| VARIABLES | Variable symbols | Variable definitions |
|-----------|------------------|----------------------|
| Return on equity | ROE<sub>t</sub> | The net profit deducted non-recurring gains and losses of company \( i \) in year \( t \) divided by average net assets. |
| Management forecast time difference | Forecast | For company \( i \), it refers to the number of days between the disclosure date of the annual MEFs and the end of the fiscal year of year \( t \), and then takes the natural logarithm. |
| Stock return volatility | Return | The standard deviation of the daily stock return within the 250 days prior to the disclosure date of the annual MEFs of company \( i \) for year \( t \). |
| R&D expenditure | R&D<sub>t</sub> | Total R&D expenditure of company \( i \) in year \( t \) divided by operating income. |
| Institutional investors’ shareholding ratio | INST<sub>t</sub> | Institutional investor shareholding ratio of company \( i \) in year \( t \). |
| Book-to-market ratio | B/M<sub>t</sub> | The book value of shareholders’ equity for company \( i \) in year \( t \) is divided by the total market value. |
| Number of analysts tracked | Analyst Coverage<sub>t</sub> | The number of analysts tracked by company \( i \) in year \( t \), plus 1, to take the natural logarithm. |
| Company size | Size<sub>t</sub> | The natural logarithm of total assets for company \( i \) at the end of year \( t \). |

According to the latest revision of the classification standards for high-tech industries by the National Bureau of Statistics, the classification of high-tech industries is compared with the industry classification of the China Securities Regulatory Commission. If the industry of company \( i \) in year \( t \) is a high-tech industry, the variable takes the value 1 and if a non-high-tech industry, otherwise takes 0. (High-tech industries include high-tech manufacturing and high-tech service industries. Among them, high-tech manufacturing refers to pharmaceutical manufacturing and aviation, spacecraft and equipment manufacturing, electronic and communication equipment manufacturing, computer and office equipment manufacturing, medical instrument equipment and instrumentation manufacturing, and electronic chemicals manufacturing. The high-tech service industry refers to the use of high-tech means for society and providing a collection of service activities, including information services, e-commerce services, inspection and testing services, high-tech services in the professional technical service industry, R&D and design services, scientific and technological achievements transformation services, intellectual property and related legal services, environmental monitoring and governance services.)

Panel D. Condition Variables

| VARIABLES | Variable symbols | Variable definitions |
|-----------|------------------|----------------------|
| Importance of Hubei employee | Employee<sub>hi</sub> | If company \( i \) issues additional shares in year \( t \), \( i \) takes 1, otherwise \( i \) takes 0. |
| Birthplace of executive | Birthplace<sub>hi</sub> | According to the pandemic statistics from the WIND database, we identified provinces with a high reliance on labor from Hubei by the median of the proportion of non-local employees from Hubei province to all non-local employees in Mainland China. The variable equals 1 if the company is in the group with the higher proportion of non-local employees from Hubei province to all non-local employees, otherwise it equals 0. |
| Cumulative confirmed number | Serious<sub>hi</sub> | According to the pandemic statistics from the WIND database, we identified high-risk provinces by the median of the cumulated number of confirmed diagnoses from provinces in Mainland China. It equals 1 if the headquarters of the enterprise is in a province with a higher cumulated number of confirmed diagnoses; otherwise, it equals 0. |
| Cash holding | CashHolding<sub>hi</sub> | According to the ratio of cash and cash equivalents to total assets, we divided into three groups by quantiles, and then identified the group with the highest cash holding levels as one with good anti-risk ability \( (\text{CashHolding}<sub>hi</sub> = 0) \); otherwise, groups with the lowest and medium levels of cash reserves are classified as the lower anti-risk ability group \( (\text{CashHolding}<sub>hi</sub> = 1) \). |
Appendix 1.2 Disclosure Requirements for MEFs in China

| Requirements of MEFs | Mandatory conditions | Deadline for mandatory disclosure | Voluntary condition |
|----------------------|----------------------|----------------------------------|-------------------|
| Main Board of Shanghai Stock Exchange | A situation in which a listed company is expected to make a loss, turn loss to profit, or its net profits decrease or increase its net profit by 50% over the last year | Before January 31 | Situation does not satisfy mandatory conditions |
| Main Board of Shenzhen Stock Exchange | A situation in which a listed company is expected to make a loss, turn loss to profit, or its net profits decrease or increase its net profit by 50% over the last year, or net assets at the end of the period are expected to be negative, or annual revenue is expected to be less than $10 million | Before January 31 | Situation does not satisfy mandatory conditions |
| Small and Medium-sized Enterprises (SMEs) Board | The annual MEF is due by January 31 (all disclosures are mandatory) | Before January 31 | |
| Growth Enterprise Market | The annual MEF is due by January 31 (all disclosures are mandatory) | Before January 31 | |

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