CEO overconfidence, corporate digitalization, and inventory management [*]

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Abstract

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JEL Classification: G34; G41; M12; O32

Keywords: CEO Overconfidence; Inventory management; Leanness; Corporate digitalization

[*] All remaining errors are ours. Declarations of interest: none.

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1. Introduction

Recent research suggests that decision-makers are not rational, and their personal traits will affect corporate outcomes. Among different characteristics, overconfidence is one of the most important factors that affects the decision-making process. As the CEO is the main decision maker within a company, increasing attention has been paid to how CEO overconfidence affects corporate outcomes (Malmendier and Tate, 2005, 2008; Hirshleifer et al., 2012; Hribar and Yang, 2016; Kim et al., 2016; McCarthy et al., 2017). Previous literature has examined how CEO overconfidence affects a set of different corporate policies, including corporate investment, such as M&As and R&D activities (Malmendier and Tate, 2005, 2008; Hirshleifer et al., 2012; Pikulina et al., 2017), corporate financing, such as bank loans and equity costs (Aghazadeh et al., 2018; Lin et al., 2020), management forecasting (Hribar and Yang, 2016), and stock price crash risk (Kim et al., 2016), among many others. However, it seems surprising that there has been little research on the impact of CEO overconfidence on corporate daily operations or operational efficiency, which is a crucial aspect of a company's revenue generation process. To fill the research gap, this paper investigates the relationship between CEO overconfidence and corporate inventory management.

In addition, the effect of corporate executives' personal traits on corporate outcomes raises an important corporate governance issue (Goel and Thakor, 2008), and we conjecture that those recent developments of information technology (e.g., big data, blockchain, AI, etc.) and corporate digitalization potentially act as a new form of corporate governance mechanism. When a firm's business operations are associated with a higher level of digitalization, operational information can be collected, integrated and incorporated into the management decision-making process (Kache and Seuring, 2017; Parviainen et al., 2017; Riedl et al., 2017; Waller and Fawcett,

2013). Moreover, firms with a higher level of corporate digitalization are likely to have a more transparent and informative environment, which helps to enhance corporate governance (Aben et al., 2021; Bankewitz et al., 2016; Grove et al., 2018) and, in turns, enhances audit quality and constrains corporate illegality (Pincus et al., 2017; Wang et al., 2024). In the same vein, our paper examines whether corporate digitalization acts as a new corporate governance mechanism and mitigates the impact of CEO overconfidence on corporate inventory management.

Our study investigates the effect for the Chinese listed companies due to several reasons. First and most importantly, the Chinese government has actively promoted the integration of digital technologies into business practices.[1] The Chinese government has initiated several different policies to develop digital technologies within all the firms to achieve a nationwide digital-driven economy (Zhang and Chen, 2019; Wang et al., 2023). Second, unlike the US which has a pervasive culture of individualism, China is the world's second largest economic entity but is dominated by traditional collectivist culture (Hofstede, 2005), making the investigation of CEO overconfidence more interesting and more important as this collectivist culture may effectively mitigate the influence of CEO overconfidence on corporate policies and decision making. In addition, Zhang et al. (2022) suggest that Chinese consumers, and retailers in particular, may be more irrational, resulting in major challenges for corporate inventory management. Finally, it has been pointed out in the literature that the Chinese markets are featured with high ownership concentration and weak minority shareholder protection. Several prior studies document that, compared with developed markets such as the US and UK, the salient institutional features of concentrated ownership and weak minority shareholder protection associated with the Chinese markets have led to higher agency costs such as poor quality

[1] See the news report below.
https://english.www.gov.cn/news/202405/15/content_WS66442044c6d0868f4e8e71c5.html#:~:text=China%20has%20set%20out%20a,drive%20the%20nation's%20opening%2Dup.

financial reporting, more earnings management activities and tunnelling, etc. (see, Allen et al., 2005; Bian et al., 2023; Firth et al., 2007; Hou et al., 2012; Jiang et al., 2010; Kuo et al., 2014, among many others). Thus, motivated by these unique characteristics, we investigate the relationship between CEO overconfidence, corporate digitalization, and inventory management in the context of the Chinese markets, and by comparing it with the US markets, we expect to find that CEO overconfidence has a distinctive effect in China.

We argue that CEO overconfidence positively affects inventory leanness, i.e., reduces inventory levels. Overconfident CEOs are more likely to exhibit excessive confidence in their judgments, particularly in situations where their knowledge about a specific matter is limited (Barber and Odean, 2001; Billett and Qian, 2008). They might believe that they have more control over the corporate daily operations and thus assume that they are capable of predicting sales, production, and inventory more precisely. Thus, they may conclude that the firm does not need to maintain a high level of inventory, i.e., to increase inventory leanness. In this case, firms managed by overconfident CEOs will reduce inventory levels and have higher inventory leanness.

To test the aforementioned argument, we construct a Chinese testing sample comprised of 8,801 firm-year observations from 2010 to 2022 and investigate whether CEO overconfidence affects firm's inventory leanness. Following Huang et al. (2011), Hribar and Yang (2016) and Kaplan et al. (2022), we construct CEO overconfidence based on the CEO's earnings forecast and the realized earnings.[2] When the forecasted earnings are higher than the realized earnings, CEOs are more optimistic and overconfident. To construct the inventory leanness measure, we

[2] In most of the U.S. studies, CEO overconfidence is constructed based on the option vesting data, such as Malmendier and Tate (2005, 2008) and Hirshleifer et al. (2012). However, the executive options are rarely used by the Chinese listed firms. Thus, we construct the CEO overconfidence measure in line with the literature on the Chinese firms. We discuss the construction in detail in Section 3.

follow Eroglu and Hofer (2011) and Na et al. (2020) and use the abnormal inventory adjusted by sales revenue. Specifically, we regress the inventory on firms' sales and take the residual part. We then multiply the regression residuals by (-1), whereby a large value represents lower inventory and greater inventory leanness. Our empirical results show that firms with overconfident CEOs are associated with about 7.9% lower inventory, thus providing support for the positive relationship between CEO overconfidence and firms' inventory leanness.[3] The results are economically meaningful, and remain robust using alternative overconfidence measurements, alternative leanness measurements, and different model specifications.

To address the potential endogeneity issues and establish a causal interpretation, we conduct three sets of tests. First, we conduct two tests using matched samples to mitigate omitted variable concerns, namely the PSM matched sample and the entropy balancing matched sample (Dehejia and Wahba, 2002; Hainmueller, 2012). We find that the baseline relationship still holds, suggesting that our results are not likely to be overturned by the omitted variables. Furthermore, there is a remote possibility that the corporate inventory could affect CEO overconfidence. To address this potential reverse causality concern, we apply the two-stage instrumental variable approach. Specifically, we use the annual average peer CEOs' overconfidence in the same city where the company is located as the instrumental variable, and document that it is significantly positively correlated with the focal firm's CEO overconfidence. This implies that the instrumental variable is relevant. In the second stage, we use the instrumented CEO overconfidence as the key explanatory variable, and still find a positive relationship with the

[3] Following Eroglu and Hofer (2011) and Na et al. (2020), we regress the log(inventory) on log(sales) within each industry. As the CEO overconfidence is a dummy variable and the adjusted inventory, by construction, is in logarithm, the regression coefficient is interpreted as a percentage change. Column (3) of Table 2 shows that the coefficient is 0.079, which is 7.9%. We discuss the variable construction in the empirical part in detail.

inventory leanness variable. Overall, these results collectively show that the documented relationship is likely to be causal.

Next, we explore the potential role of corporate digitalization as a new corporate governance mechanism. We predict that a high level of corporate digitalization will curtail the impact of personal preferences or personal traits, such as overconfidence, and weaken the relationship between CEO overconfidence and corporate inventory management due to the enhanced and more integrated information environment. Following Zhai et al. (2022) and Guo et al. (2023), we construct the corporate digitalization measure based on the textual analysis of the firm's annual report. Intuitively, when the firm uses more technical keywords or discusses more about the technologies or related strategic investment, the firm is more likely to incorporate digitalization into its daily operations and will have a higher level of corporate digitalization. We then add the interaction term between corporate digitalization and CEO overconfidence into the regression model. Our empirical results are consistent with our prediction that the impact of CEO overconfidence becomes weaker when the firm has a higher level of digitalization. The results are robust when we use the composite index or sub-dimensions of the composite index.

The results described above indeed confirm that corporate digitalization could function as a new form of corporate governance. We then continue to explore the effectiveness of this new form of corporate governance across different types of firms. Specifically, we find that the moderating role of corporate digitalization is stronger among non-SOE firms and lower-leverage firms. SOE firms could experience more governance frictions, which will constrain the impact of corporate digitalization. Higher-leverage firms may experience more bankruptcy pressure, whereby the CEO could have greater influence on corporate decisions. In addition, higher corporate governance quality, such as having more female directors or more analyst coverage,

could facilitate the moderating effect of digitalization as it increases the effectiveness of the information to be incorporated into the decision-making process. Furthermore, we also find that CEOs with lower educational qualifications or less financial work experience will rely more on the potential information associated with corporate digitalization, leading to stronger moderating effect of corporate digitalization. Overall, our cross-firm heterogeneity tests suggest that the impact of corporate digitalization becomes stronger when the CEO has a lower level of education or less financial experience; but becomes stronger among non-SOE firms, low-leverage firms, and firms with high governance quality.

Lastly, we also test whether our baseline results between CEO overconfidence and corporate inventory management manifested distinctively during the pandemic period, i.e., the Covid-19 period. Some recent studies have treated the outbreak of the Covid-19 pandemic as an exogenous shock to firms' operations and examined the corporate decisions and stock market reactions (Bae et al., 2021; Ding et al., 2022). Following these studies, we use the pandemic as a negative macro-economic shock and test whether the impact of CEO overconfidence on corporate inventory management exhibits a different pattern. Somewhat surprisingly, we do not find any significant differences before and after the outbreak of Covid-19, suggesting that the impact of CEO overconfidence is relatively stable, even during the pandemic.

The study makes a two-fold contribution to the current literature. Firstly, few scholars have paid attention to the relationship between the behavior of corporate managers and the leanness of company inventory. The existing literature mainly focuses on overconfident executives and over-investing, as well as internal investments (Daniel and Hirshleifer, 2015; He et al., 2019). However, few studies have focused on the company's day-to-day operations and the impact on inventory management. Our paper extends the existing literature by examining how the CEO's

personal traits affect corporate daily operations, especially in the Chinese markets where the collectivist culture dominates.

Second, our paper contributes to the recent literature on the impact of corporate digitalization on corporate governance. Previous literature shows that corporate digitalization can significantly increase total factor productivity (Guo et al., 2023), improve firms' risk-taking capacity (Tian et al., 2022), and enhance firms' financial performance (Zhai et al., 2022), among many others. We further show that corporate digitalization could function as a new form of corporate governance mechanism. We conjecture that firms with greater digitalization have advantages in terms of obtaining more timely information about their daily operations, which in turn improves information collection and processing efficiency. Timely firm-specific information helps to correct and constrain the impact of executives' personal traits on corporate operations, leading to more efficient internal governance.

Our study differs from previous research by Kim and Na (2022) that attempt to shed light on the effects of CEOs' and COOs' overconfidence on firms' inventory for the US markets. Our findings are in contrast to theirs as they found that US firms managed by CEOs with a higher level of overconfidence tend to have a lower level of inventory efficiency because overconfident CEOs tend to hold onto more inventory as a buffer for risk management. The difference in inventory strategy between overconfident CEOs in the US and those in China may be attributable to the weaker minority protection of the corporate governance system in the Chinese markets. In addition, our paper makes a further contribution to the literature by showing that corporate digitalization plays an influential role in curbing the biases induced by CEO overconfidence in the decision-making process.

The rest of the paper is organized as follows: Section 2 reviews the previous literature and develops our hypotheses. Section 3 presents the sample and variable construction. Sections 4 and 5 present the main empirical results. Section 6 concludes.

2. Literature Review and Hypotheses Development

In recent decades, the lean production philosophy, which views the corporate inventory as a waste of resources, has gained widespread acceptance. Leaner inventory management has become synonymous with efficient inventory management (Chen et al., 2005; Cooper and Maskell, 2008; Neukirchen et al., 2023). Playing a pivotal role in daily business operations, the use of efficient inventory management practices has the potential to reduce inventory turnover times and optimize the allocation of capital, leading to increased profitability for a company. Chen et al. (2005) show that a high inventory turnover rate enables a company to optimize the utilization of its resources to meet the expectations of its customers. Liu (2011) states that "zero-inventory" concept has increasingly been adopted by numerous companies, resulting in significant cost savings and improved profit margins. Bendig et al. (2017) document that firms with leaner inventory management are favored by credit rating agencies and are more likely to receive higher ratings. Neukirchen et al. (2023) suggest that institutional investors do care about the firm’s operational leanness as leaner operations reflect higher efficiency and lower monitoring and agency costs.

On the other hand, maintaining a sufficient amount of inventory is viewed as an effective corporate risk management practice, which helps to improve the company's capacity to adapt to uncertainty and environmental fluctuations (Hendricks et al., 2009; Azadegan et al., 2013). This view advocates the use of redundant inventory as part of slack resources, which gives the firm

more flexibility to cope with market uncertainties and reduces the survival and competition pressure. Previous studies have also documented some supporting evidence to suggest that the higher level of inventory acts as a buffer that allows firms to respond to environmental dynamics (Hendricks et al., 2009) and generate more innovations by providing companies with more opportunities to enter new markets (Tan and Peng, 2003). Moreover, in the event of unanticipated surges in sales or supplier failures, maintaining a larger inventory enables businesses to adapt promptly, thereby mitigating risks and minimizing costs associated with the need for immediate restocking (Manikas and Patel, 2016). Inadequate inventory could also lead to the loss of potential sales opportunities due to failure to satisfy unexpected client demand (Gaur et al., 2005), which further constrains business development. Therefore, in a complex business environment, such as that resulting from the recent pandemic or the Russia-Ukraine war, companies need to manage inventory cautiously. Determining the appropriate inventory level is challenging for executives and there is no easy solution.

We add to the literature by examining the impact of CEO personal traits on corporate inventory management, namely CEO overconfidence. Previous literature has documented several factors that affect a firm's inventory leanness, such as the dynamics of the external environment (Eroglu and Hofer 2014), corporate internal financial constraints (Guariglia, 1999), and the adoption of information technology systems (Rabinovich et al., 2003; Mishra, et al. 2013). However, few studies have investigated the impact of executives' personal traits on corporate inventory management, especially CEO overconfidence, which has increasingly attracted academic attention.

The classical economic theory assumes that all decision-makers exhibit rational behavior (Arrow et al., 1951). However, the recent development of behavioral finance suggests that the

personal characteristics of corporate executives have an influence on various corporate policies. Lichtenstein et al. (1977) state that overconfidence refers to a cognitive bias wherein individuals exhibit excessive confidence in their judgments, particularly in situations where their knowledge about a specific matter is limited. Accordingly, individuals may hold a firm conviction that they have more control over the projects or tasks under their management than is actually the case, and the projects will have a higher likelihood of producing favorable outcomes or projecting improved future performance (Malmendier and Tate, 2005; Hirshleifer et al. 2012).

Previous literature indicates that overconfident CEOs tend to pursue a more aggressive investment policy, leading to more M&As activities (Malmendier and Tate, 2005, 2008). However, the performance of the M&As undertaken by overconfident CEOs may not necessarily be superior as they might overestimate the potential synergy effect generated from the deal. Generally, overconfident CEOs will promote R&D investment and generate more innovations (Hirshleifer et al., 2012). Similarly, overconfident CEOs are over-optimistic about the future of their investment projects, leading them to underestimate the default probabilities and be more willing to provide downside protection to banks in exchange for a lower loan rate (Lin et al., 2020). They also make more optimistic management forecasts (Hribar and Yang, 2016), and are associated with higher stock price crash risks (Kim et al., 2016).

In the same vein, we conjecture that overconfident CEOs have a higher propensity to underestimate the potential business risks and future uncertainty, and in turn reduce the inventory level, leading to higher inventory leanness. In addition, they might believe that they have more control over daily corporate operations, and thus, even if they maintain a lower level of inventory, they could still think that the production and product sales targets will be met. Consequently, they believe that the firm does not need to maintain a high level of inventory; thus, firms

managed by overconfident CEOs will reduce their inventory level, leading to higher inventory leanness. We formally state the testable hypothesis as follows:

Hypothesis 1: CEO overconfidence will lead to higher inventory leanness.

Motivated by the recent development of information technology and the active governmental promotion of corporate digitalization in China, we further investigate how corporate digitalization could affect the impact of CEO overconfidence on corporate inventory management. When a higher level of digitalization is incorporated into a firm's business operations, first-hand production information from the workshops or plants can be collected and conveyed to the firm's managers in a more timely way (Parviainen et al., 2017; Riedl et al., 2017). Recent studies have reached the consensus that the main functions of information technology are to advance information management and process integration within a corporation to facilitate decision making (Kache and Seuring, 2017). Utilizing information processing theory (IPT), Aben et al. (2021) also suggest that the implementation of digital technologies can mitigate information uncertainty and equivocality as digital transformation can improve the quantity and quality of data available for managerial decision-making (Waller and Fawcett, 2013). Due to the enhancement of operational transparency and improvements in the internal information environment facilitated by digital technology, Pincus et al. (2017) and Wang et al. (2024) demonstrate that digital transformation has the ability to effectively reduce corporate illegality and elevate audit quality. Consequently, Zhang and Wang (2024) show that firms with a higher level of digital transformation tend to benefit from lower equity capital costs as such firms' corporate governance is enhanced by their digital transformation.

Therefore, we conjecture that this more efficient and scientific corporate management mechanism could act as a new form of corporate governance mechanism (Bankewitz et al., 2016;

Grove et al., 2018), which will constrain and weaken the impact of executives' personal characteristics on corporate operations. To sum up, we predict that a higher level of corporate digitalization will weaken the relationship between CEO overconfidence and inventory leanness, and thus state the testable hypothesis as follows:

Hypothesis 2: The impact of CEO overconfidence on inventory leanness becomes weaker when the firm is associated with a higher level of corporate digitalization.

3. Sample Selection and Descriptive Results

3.1 CEO overconfidence

When exploring the concept of CEO overconfidence, identifying suitable metrics to measure a CEO's level of overconfidence presents a formidable challenge. There are various approaches to assessing overconfidence and the most popular indicators are based on CEO's option exercise or stock hold (Malmendier and Tate, 2005, 2008; Hirshleifer et al., 2012). However, the option and equity share incentives are much less common and the information is not publicly available in China, and thus we adopt a different method to construct the CEO overconfidence measure.

Previous literature suggests that CEO overconfidence could also be inferred from the CEO's behaviors. Ben-David et al. (2013) and Hribar and Yang (2016) suggest that higher forecasts of future earnings are associated with managerial overconfidence. Lin et al. (2008) and Wei et al. (2011) apply this idea to the Chinese and Taiwan stock markets and examine CEO's earnings forecast to measure overconfidence. Intuitively, when the CEO forecast is higher than the actual earnings, the CEO is more likely to be overoptimistic and overconfident. Specifically, we compare the forecasted profit (in terms of net profit) provided by the company with the actual

reported profit to determine the appearance of overconfidence. In the baseline construction, we only examine the year-end profit forecasts. In the robust checks, we also consider the quarterly earnings forecast. When the forecasted profit exceeds the actual profit, the CEO is defined as overconfident CEO and marked as a value of 1 (i.e., the variable *Overconfidence*=1); otherwise, it is marked as 0 (i.e., the variable *Overconfidence*=0) (He et al., 2019; Chen et al., 2022).

3.2 Inventory management

To construct the inventory management measurement, we calculate the inventory leanness level. Unlike other inventory efficiency measurements such as inventory turnover, days of inventory turnover, or inventory to revenue ratio, the inventory leanness measure considers the cross-industry and cross-time effects into the calculation. The inventory levels are inherently industry-specific, with different standards across various sectors (Eroglu and Hofer, 2011). Thus, it is essential to account for the impact of these factors. Following the methodology of Eroglu and Hofer (2011) and Na et al. (2020), we employ the empirical inventory leanness indicator using the following model:

$$\ln(\text{inventories}_{it}) = \alpha_{it} + \beta_{it}\ln(\text{sales}_{it}) + \sum \lambda I + \sum \gamma Q + \varepsilon_{it} \qquad \text{Eq. (1)}$$

where inventories_{it} is the average total inventory (in RMB) of company *i* at the end of year *t*-1 and *t*, and the sales_{it} is the net annual sales revenue in RMB for company *i* in year *t*. Following Eroglu and Hofer (2011) and Na et al. (2020), we take the logarithm of these two variables when we do the regression estimation. Furthermore, to consider the cross-sector differences, we apply industry fixed effects and year fixed effects into the regression model. The regression residual, ε_{it}, forms the basis for the Leanness measure. To make the interpretation easier and more intuitive, the residuals are then multiplied by (-1) so that large value indicates a lower sales-adjusted

inventory level, i.e., a leaner inventory level than its industry peers. This estimation is our final proxy for the corporate leanness measure: *Leanness*. Due to the variable construction, i.e., we take the logarithm of the inventory and sales, any change of the variable *Leanness* will be interpreted as a percentage change of the actual inventory level.

3.3 Corporate digitalization

To construct the corporate digitalization measurement, we follow previous literature which apply textual analysis on the firms' financial reports (Zhai et al., 2022; Guo et al., 2023; Zhao et al., 2023). Specifically, we analyze the frequency of digital-related keywords in annual reports, and form a composite digitalization index, where a higher frequency/index indicates a greater degree of corporate digitalization. We further categorize the occurrence of various keywords into different dimensions, including digital management orientation, digital technology, and digital application.

For digital management orientation, we tally the frequency of digital-related keywords in the management discussion and analysis (MD&A) section. Digital technology involves counting the mentions of different digital technologies (such as AI, blockchain, cloud computing, and big data) outside the MD&A section. Digital application accounts for the frequency of keywords related to new integrated technologies, process upgrades, and business model changes brought about by digital transformation, also outside the MD&A section.

In addition to keywords frequency, we consider the company's investments in digital transformation. This includes digital human resources investment, the construction and purchase of digital facilities and R&D expenditure. We also take digital achievement into account, which encompasses the number of national and industry standards the company participated in, the

number of digital-related papers published domestically and internationally, the number of authorized digital-related patents, the quantity of recognized digital projects, and the number of national digital awards won. In our subsequent research, we also study two sub-indicators of the corporate digitalization: digital achievement index and digital application index.

After obtaining the raw data, to facilitate our results interpretations, we convert the above three continuous corporate digitalization index into dummy variables, namely the *High Digitalization, High Achievement, and High Application* variables. Specifically, we calculate the annual industry average (i.e., mean value) for either the overall index or the two sub-indicators to leverage the playground across different industries. If a company's score for the year exceeds the industry average for that year, it is marked as high digitalization firms with *High Digitalization=1, High Achievement=1, and High Application=1,* indicating a high level of digital transformation. Otherwise, it is marked as 0, indicating a low level of digital transformation. We do the grouping for each indicator separately; thus, these three variables are not perfectly correlated. It is possible that some firms perform better in one dimension, but worse in another dimension.

3.4 Control variables

To rule out the potential impact of confounding factors that would contaminate the relationship between CEO overconfidence and inventory management, we further include a set of control variables. Specifically, at the firm-level, we control for the basic firm characteristics, including the *firm size* (measured as the logarithm of the total asset), *leverage* (measured as the ratio of debt to total asset), *PPE* (measured as the PP&E scaled by total asset), *Cash Holding* (measured as the cash and cash equivalent scaled by total asset), *ROA* (measured as net income

scaled by total asset), *SG&A* (measured as the SG&A scaled by sales), and the *SOE* indicator variable. To control for the corporate governance quality, we include the board size (*Board Size*), the female board ratio (*Female Ratio*), the independent board ratio (*Independent Ratio*), and the number of supervisor (*Supervisor Size*), and the ownership concentration (*Owner Concentration*). Prior studies document that Chinese market is especially featured with concentrated ownership and weak minority shareholder protection, leading to higher agency costs (see, Allen et al., 2005; Bian et al., 2023; Firth et al., 2007; Hou et al., 2012; Jiang et al., 2010; Kuo et al., 2014, among many others). Lastly, we include a set of CEO characteristics, such as *CEO Age, CEO Duality, Total Salary*, and *CEO Gender*.

3.5 Descriptive evidence

Table 1 report the summary statistics of our final sample. The main testing sample covers 8,801 firm-year observations from 2010 to 2022. Following previous paper (Zhai et al., 2022; Guo et al., 2023), we construct the corporate digitalization data after 2018, thus the related sample has a smaller size. All continuous variables are winsorized to reduce the influence of extreme values on the regression results.

[Insert Table 1 here]

The mean value of *Leanness* is -0.001, which is not surprising as we use the regression residuals as the leanness measurement. The standard deviation of *Leanness* is relatively large with a value of 0.880, indicating a large variation in the inventory leanness among different firms. The mean of *Overconfidence* is 0.193, suggesting that 19.3% of the sample comprises overconfident CEOs, which is relatively low. This unbalanced distribution of the overconfident CEOs also motivates us to conduct the PSM matching and entropy matching tests in the

following sections. For other variables, the distributions are largely comparable to those in previous papers. For example, the average firm leverage is about 0.527, with the average CEO age at 49.686.

4. Main Empirical Results

4.1 Baseline results: CEO overconfidence and inventory management

To test our first hypotheses, we apply the OLS regression model as specified in the following Eq (2). Given that different industries have distinct inventory standards, there may be considerable differences in inventory situations across them. Similarly, variations in inventory situations might also arise due to different time periods. These discrepancies are not necessarily caused by the presence or absence of overconfident CEOs. To mitigate the effects of these two factors on the regression results, our regression model adopts the industry fixed effects and year fixed effects.

$$\text{Leanness}_{it} = \alpha_1 + \beta_1 \text{Overconfident CEO}_{it} + \sum \beta_{it} C_{it} + \sum \lambda I + \sum \gamma Q + \varepsilon_{it} \qquad \text{Eq. (2)}$$

Table 2 presents the empirical results. Column (1) includes only the key explanatory variable of CEO overconfidence and basic control variables reflecting the company's own characteristics. Column (2) further includes governance-related variables to control the potential effects of governance structure. Column (3), as the baseline model, incorporates CEO personal traits-related control variables, to construct a comprehensive analytical framework. This design allows this study to evaluate the effect of CEO overconfidence on inventory leanness after considering financial factors that might influence inventory management, including company characteristics, governance structure, and CEO personal traits.

[Insert Table 2 here]

Overall, all the three regression models collectively show a positive and significant relationship between CEO overconfidence and corporate inventory leanness. Specifically, the coefficients of CEO overconfidence (*Overconfidence*) are 0.075 (t-statistic=3.152), 0.074 (t-statistic=3.110), and 0.079 (t-statistic=3.326) respectively. All coefficients are positive and significant at the 1% level. Take Column (3) as an example, the coefficient of *Overconfidence* is 0.079, indicating that when *Overconfidence* changes from 0 to 1, *Leanness* increases by 0.079, i.e., the inventory level decreases by 7.9%. The results are non-trivial as we also control for a set of confounding factors.

Additionally, the results of other control variables indicate that lower operating expenses, lower asset levels, higher PPE investment, higher cash holdings, higher return on assets, non-state-owned companies, lower female director ratio, smaller supervisory board size, younger CEOs, non-dual roles, and higher CEO salaries are more associated with higher levels of inventory management.

4.2 Robustness checks

Our baseline results consistently suggest that firms managed by overconfident CEOs keep a leaner inventory. To show that our results are not sensitive to our empirical specifications, we present a set of robustness checks in the following section. Specifically, we use alternative CEO overconfidence construction, alternative inventory leanness measures, and alternative regression specification.

To construct the alternative CEO overconfidence measure, the first method is to use the CEO's salary level. This metric is based on the theoretical assumption that there is a positive correlation between an executive's salary and their status and influence within the organization. These attributes are believed to contribute to the display of overconfidence (Hayward and Hambrick, 1997). Following Xie and Kong (2018) and Jiang et al. (2009), we first calculate the ratio of the salaries of the top three executives to the total salaries of all executives, and then compare this ratio with the proportion of the CEO's salary to the total salaries of the top three executives. When the proportion of the CEO's salary exceeds the ratio of the top three executives' salaries to the total salaries of all executives, it indicates signs of CEO overconfidence. Our second method to define CEO overconfidence follows the same logic as our baseline construction, but we observe CEO overconfidence on a quarterly basis. If the CEO is overly optimistic in their profit forecasts in any quarter of the year, it is considered that the CEO exhibits overconfidence for that year.

To construct the alternative inventory leanness measure, we also adopt two other methods. The first proxy is the traditional inventory turnover ratio. And the second proxy is the Inventory on Sales (*IR*) ratio. Similarly, like *Leanness*, the value of *IR* is also multiplied by -1 to ensure that a positive regression coefficient indicates a decrease in inventory levels, indicating leaner inventory.

Lastly, to construct the alternative regression specification, we apply alternative fixed effect model and alternative time-alignment. Specifically, we change the industry fixed used in our baseline model to firm fixed effects, to further control for firm-level time-invariant confounding factors. Considering the potential lead-lag effect of independent variables helps to mitigate the potential reverse causality concern.

Table 3 presents the results of robustness checks. As seen in Panel A of Table 3, even after changing the way CEO overconfidence is measured, the positive relationship between CEO overconfidence and inventory management efficiency remains significantly positive. This indicates that changing the method of quantifying CEO overconfidence does not alter the positive impact of CEO overconfidence on inventory management efficiency. Similarly, as Panel B shows, after changing the metrics for measuring a firm's inventory management efficiency, the positive relationship between CEO overconfidence and inventory management efficiency remains robust. This finding further confirms that CEO personal traits may have a significant impact on the company's inventory management decisions, and this impact is independent of the specific measurement metrics used.

[Insert Table 3 here]

Panel C of Table 3 shows that the coefficient for CEO overconfidence remains significantly positive when firm-fixed effects are incorporated. This indicates that the positive impact of CEO overconfidence on inventory efficiency is robust to different model specifications. Specifically, it implies that even when controlling for company and time effects more rigorously, as well as incorporating lagged variables to account for potential temporal autocorrelation, the relationship between CEO overconfidence and improved inventory management persists.

4.3 Identification

Next, we further address the endogeneity issue. Although we have included a set of control variables in the baseline regression model, there could still exist some omitted variables. It is also remotely possible that it is the inventory leanness affect the CEO overconfidence. In the

following sections, we show two sets of results based on matched sample and one set of result using the instrumental variables approach.

4.3.1 Propensity score matching

Since CEO overconfidence cannot be randomly assigned, and to reduce the likelihood that overconfident CEOs are more likely to manage a particular type of company, we chose to use the propensity score matching (PSM) method. This method divides the sample into a treatment group, which includes overconfident CEOs, and a control group, which includes non-overconfident CEOs. Following the method proposed by Dehejia and Wahba (2002), we employ the nearest-neighbor matching process and impose a caliper width of 0.0001. The matching variables are derived from all control variables in the baseline model.

Table 4 presents the results. Panel A reports the characteristics of the treatment and control groups. It is evident that after matching, there are no significant differences in all variables between the two groups. Panel B of Table 4 shows the regression results for the sample obtained using PSM. It can be seen that the coefficient on *Overconfidence* remains significantly positive at the 1% level, consistent with the baseline results. This indicates that our main findings hold after addressing the heterogeneity issue.

[Insert Table 4 here]

4.3.2 Entropy balancing matching

To further validate causal relationships, we employed an additional matching method, Entropy balancing. This method maximizes entropy to ensure covariate balance between treatment and control groups, effectively addressing the issue of covariate imbalance. This

process also enhances the accuracy of causal effect estimation, reduces model dependency in causal relationship verification, and mitigates biases that may arise from covariate imbalance (Hainmueller, 2012; Watson and Elliot, 2016).

Panel A in Table 5 displays the covariate statistics between the matched control and treatment groups before and after matching. The results indicate that covariates between the treatment group before matching and the control group after matching are consistent. Panel B in Table 5 presents the regression results for the sample after entropy balancing matching. It shows that our key independent variable, *Overconfidence*, remains positive and significant at the 1% level, similar to the baseline results. This suggests that after balancing covariates between control and treatment groups, CEO overconfidence robustly contributes positively to inventory leanness in companies.

[Insert Table 5 here]

4.3.3 Instrumental variable method

In this section, we employ 2SLS to address potential omitted variable and reverse causality issues in our regression analyses, thereby enhancing the robustness of the baseline causal relationships. We use the level of CEO overconfidence in cities where CEOs' companies are located, excluding their own company, as an instrument variable for testing (*City Peer Overconfidence*). Previous literature indeed finds that firms headquartered in the same state are affected by the same culture and political environment. For instance, Mizruchi (1989) documents that geographic proximity between two firms leads to similar political behaviors. Pirinsky and Wang (2010) further show that managers are affected by their peers to work out appropriate strategic decisions. Du et al. (2017) show that cultural proximity facilities information sharing.

Thus, the focal CEO overconfidence could be affected by the economic development and management culture in the local city. Moreover, overconfidence among CEOs in other companies in the same city should not directly affect company operations, ensuring the exogeneity of the instrument variable.

Table 6 presents the results of the 2SLS two-stage regression. According to column (1), *City Peer Overconfidence* is significantly positive, confirming the correlation between the instrument variable and the key dependent variable. Additionally, the first-stage regression's F-statistic is 228.87, well above 10, indicating that the instrument variable is not weak (Staiger and Stock, 1997). Furthermore, based on the second-stage regression results in column (2), the coefficient on *Instrumented Overconfidence* is the same (i.e. positive and significant) as the baseline regression, indicating that our main findings remain materially unchanged after addressing potential endogeneity concerns.

[Insert Table 6 here]

5 Corporate digitalization as a new corporate governance mechanism

As discussed in the introduction, echoing the recent development in the digital economy, we also examine whether and how corporate digitalization could affect the corporate operation. In more detail, we investigate whether corporate digitalization could constrain the impact of CEO's personal traits on corporate policy.

5.1 The impact of corporate digitalization on the association between CEO overconfidence and inventory leanness

Digital transformation, as a strategic change for enterprises to adapt to technological advancements and market changes, involves not only the transformation of technology, culture, processes, and organizational structures but also potentially affects CEO's personal expressions. Firstly, digitization encourages companies to rely more on data for decision-making (Davenport and Kirby, 2016; Kache and Seuring, 2017), thereby reducing the opportunity for CEOs to rely on their intuition and personal beliefs in decision-making to some extent. Simultaneously, the application of digital achievements enhances transparency of information within the company and makes decision-making processes more open (Aben et al., 2021; Brynjolfsson and McAfee, 2012; Waller and Fawcett, 2013). We may expect that this enhanced transparency may help mitigate the potential impact of CEO overconfidence by allowing timely corrections to decisions influenced by CEO's personal beliefs.

To empirically test the above conjecture, we include the interaction term between corporate digitalization measures and the CEO overconfidence measure in our baseline regression model and examine whether the coefficient on the interaction term is significant or not. Mathematically, we use the following regression model:

$$\begin{aligned}\text{Leanness}_{it} = \alpha_1 + \beta_1 \text{Overconfident}_{it} + \beta_2 \text{Overconfident}_{it} * \text{Digitalization}_{it} + \\ \beta_3 \text{Digitalization}_{it} + \sum \beta_{it} C_{it} + \sum \lambda I + \sum \gamma Q + \varepsilon_{it} \qquad \text{Eq. (3)}\end{aligned}$$

where $\text{Digitalization}_{it}$ is the measure of the degree of corporate digitalization for each firm. To be more comprehensive and show the robustness, as discussed in Section 3, we use three measures for the corporate digitalization, namely the overall corporate digitalization index (*High Digitalization*), the achievement sub-dimension (*High Achievement*), and the application sub-dimension (*High Application*). We focus on the coefficients of the interaction terms. A

significant and negative coefficient suggests that a higher level of corporate digitalization helps to constrain the impact of CEO overconfidence on firm's inventory management.

Columns (1) to (3) of Table 7 report the results for the overall index, and the two sub-dimensions separately. In all three columns, the coefficients of the interaction terms between CEO overconfidence and digital transformation indicators are all significantly negative. This indicates that digitalization indeed affects the influence of CEO overconfidence on inventory management efficiency, acting as a negative buffer. Specifically, when CEOs exhibit overconfidence, their subjective judgments lead them to streamline inventory to achieve higher operational efficiency and reduce costs, whereas higher levels of digitalization weaken this effect.

[Insert Table 7 here]

5.2 Firm-level mediators: equity nature and leverage

The previous results suggest that corporate digital transformation indeed helps to constrain the impact of CEO personal traits on the firm operation. We continue to investigate whether this constraining effect varies across different circumstances.

Firstly, there are company-level factors to consider. An unique characteristic of the Chinese markets is the presence of numerous state-owned enterprises, whose agenda and operational goals differ significantly from those of non-state-owned enterprises (Vickers and Yarrow, 1991; Megginson and Netter, 2001). Similarly, the level of corporate debt may also influence CEO decision-making, as higher leverage levels can create financial pressures that alter CEO behavior (Boyallian and Ruiz-Verdú, 2018). Therefore, we explored whether digital transformation could mitigate the effect of CEO overconfidence on inventory reduction under different corporate

conditions, based on whether the company is state-owned and whether the company is under higher financial pressure.

Columns (1) and (2) in Table 8 present the cross-sectional results for state-owned and non-state-owned firms respectively. It can be observed that the coefficient on the interaction term between *Overconfidence* and *High Digitalization* for state-owned companies is not significant, whereas for non-state-owned companies, the coefficient is significantly negative. This implies that in non-state-owned companies, high levels of digital transformation can suppress overconfident CEOs' tendencies towards inventory reduction, whereas this effect is not significant in state-owned firms. This phenomenon may arise because state-owned firms are more influenced by national policies, where the impact of digital transformation may not directly affect CEO decision-making processes.

[Insert Table 8 here]

Columns (3) and (4) in Table 8 display the differences in the moderating effect of corporate digitalization between high and low leverage levels. It can be seen that the interaction term coefficient is not significant in high-leverage companies, while it is significantly negative in low-leverage companies. This result suggests that the weakened effect of digital transformation on the association between CEO personal traits and inventory management is more pronounced in low-leverage companies. This could be due to the bankruptcy pressures associated with high leverage making CEOs more influential and less able to further reduce their inventory levels.

5.3 The impact of internal and external corporate governance mechanisms

In addition, other corporate governance environments may also influence the effect of digital transformation on CEO overconfidence expression. For instance, higher proportions of female directors and greater analyst coverage could impact the effectiveness of digital transformation post-implementation (Adams and Ferreira, 2009; Nielsen and Huse, 2010; Chen et al., 2015) Adams and Ferreira (2009) argue that female directors are more likely to raise different opinions and enhance board effectiveness. Chen et al. (2015) document that more equity analyst coverage leads to tighter external monitoring and more effective corporate governance. Therefore, we divided the sample into two groups based on high and low proportions of female directors and high and low analyst coverage for cross-sectional regression analyses. The medians of these two variables are used to sperate the sample into firms with high and low proportions of female directors and high and low financial analyst coverage.

Columns (1) and (2) in Table 9 present the results under different proportions of female directors. It can be observed that in companies with a higher proportion of female directors, digital transformation significantly diminishes the CEO's tendency to reduce inventory due to overconfidence, whereas this effect is less pronounced in companies with lower proportions of female directors.

[Insert Table 9 here]

Similarly, columns (3) and (4) show a similar pattern where in the case of high analyst coverage, effective digital transformation significantly weakens the impact of CEO overconfidence on inventory management, but this moderating effect of digital transformation is not significant in the case of low analyst coverage. These results indicate that better corporate governance facilitates a more pronounced weakening effect of digital transformation on CEO

personal traits. This could be because higher corporate governance quality allows the effects of digital transformation post-implementation to influence CEO behavior more significantly.

5.4 The impact of CEO experience

Additionally, CEO characteristics such as personal experiences may also influence how they are affected by digital transformation. For example, CEO's educational degree and work experience may lead to different levels of impact. CEOs with higher educational levels and previous working experience in finance may rely more on their own judgments because they believe in their abilities rather than other information sources (Xu and Zhang, 2023; Chi and Gooda, 2024). In this study, CEOs with a master's degree or higher are defined as having a high educational level, while others are considered to have a low educational level. CEOs who have had previous working experience in finance are defined as having a financial background, while others are not.

Columns (1) and (2) in Table 10 demonstrate the impact of digital transformation on the tendency of CEOs with different educational levels to reduce inventory due to overconfidence. It is evident that effective digital transformation mitigates the tendency of CEOs with lower educational levels to streamline inventory due to overconfidence.

[Insert Table 10 here]

Columns (3) and (4) in Table 10 show that in companies with CEOs lacking a financial background, effective digital transformation significantly reduces the tendency of CEOs to streamline inventory due to overconfidence. Conversely, in companies with CEOs having a financial background, effective digital transformation exacerbates the tendency of CEOs to

streamline inventory due to overconfidence. This could be because CEOs with lower educational levels and no financial background are more inclined to use digital tools and rely more on the information produced by digital technologies, while those with higher educational levels and financial backgrounds may perceive themselves to have a deeper understanding of financial markets, thereby relying less on data or information provided by digital tools to support their decisions.

5.5 The impact of COVID

In addition to the above analyses, we still have concerns about external shocks, such as the impact of CEO overconfidence on inventory leanness in the baseline possibly stemming from larger macroeconomic shocks, such as the Covid-19 pandemic. For instance, studies like Goldstein et al. (2021) have found that the pandemic led to extensive interventions in monetary and fiscal policies. Therefore, we divided our sample into periods before and after the Covid-19 outbreak, using 2020 as the dividing year, and conducted baseline regressions for both sample periods. The regression results reported in Table 11 indicate that both before and after the Covid-19 outbreak, CEO overconfidence significantly and positively affected inventory leanness in companies, suggesting that our baseline conclusions are not solely due to specific events.

[Insert Table 11 here]

6. Conclusion

Information and communication technologies have grown rapidly over the decades. Nowadays, the advances in information technology and digitalization, such as blockchain,

artificial intelligence, and robotics, have largely shaped the business model. However, this new digitalization trend also generates significant challenges to the corporate operation and governance. Echoing the Chinese government's actively promotion of the integration of digital technologies in business practices of Chinese firms, our study investigates how the firm-level corporate digitalization transformation could affect the firm operations. Specifically, we test whether corporate digitalization could act as a new form of corporate governance and constrain the impact of executives' personal traits on the corporate policies.

Our empirical results suggest that even in a collectivism culture dominated country (i.e., China), CEO overconfidence could still largely affect the firm's inventory management. Firms managed by overconfident CEOs are more likely to maintain lower levels of inventory as the CEOs could feel to have more control of the daily operation and be over-optimistic. More importantly, we find that the impact of CEO overconfidence on the firm's inventory management could be moderated by the firm's digitalization transformation. Higher levels of corporate digitalization could enable the information transmission within the firms, leading to a more scientific management style and a more transparent and informative environment, which constrain the impact of personal preference on the corporate policies.

Our study highlights the pervasiveness of executives' personal traits on corporate policies. However, corporate digitalization could act as a new form of corporate governance, which helps to constrain the impact of executives' personal taste and improve the corporate governance quality. Future studies could continue to explore and to develop new thinking and insights into the real impact of technological development and digitalization on corporate operation.

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Appendix A. Definition of variables

Variable	Description and definition
Leanness	Inventory leanness is measured by the empirical inventory leanness indicator, which is calculated by adjusting for industry and economic factors through a regression analysis of inventory and sales data, with the resulting regression residuals indicating a company's inventory efficiency relative to industry peers. Source: CSMAR
Overconfidence	CEO overconfidence is operationalized by comparing the precision of CEO-forecasted net profits against actual outcomes, with overconfident executives identified by a dummy variable of 1 for forecasts exceeding actual profits, and 0 otherwise. Source: CSMAR.
Firm-level control variables	
Firm Size	The logarithm of a firm's total assets. Source: CSMAR.
Leverage	The firm's debt divided by total assets. Source: CSMAR.
PPE	The firm's property, plant, and equipment divided by total assets. Source: CSMAR.
Cash Holding	Total cash holding and cash equivalent divided by total assets. Source: CSMAR.
ROA	Net profit divided by total assets. Source: CSMAR.
SG&A	The ratio of a firm's total Selling, General, and Administrative expenses to its net sales revenue. Source: CSMAR.
SOE	Dummy variable: 1 indicates a state-owned enterprise. Source: CSMAR.
Corporate governance control variables	
Board Size	The logarithm of a firm's total number of directors. Source: CSMAR.
Female Ratio	Total number of female directors divided by total number of directors. Source: CSMAR.
Independent Ratio	Total number of independent directors divided by total number of directors. Source: CSMAR.
Supervisor Size	The logarithm of a firm's total number of supervisory board members. Source: CSMAR.
Owner Concentration	The sum of the squares of the holdings of the top 10 largest shareholders in a company. Source: CSMAR.
CEO characteristics control variables	
CEO Age	Age of CEO. Source: CSMAR.
CEO Duality	Dummy variable: 1 indicates the company has the same CEO and chairman. Source: CSMAR.
Total Salary	The logarithm of a firm's salary of CEO. Source: CSMAR.
CEO Gender	Dummy variable: 1 indicates the CEO is a woman. Source: CSMAR.
Variables for other tests	
High Digitalization	Dummy variable: 1 indicates high level digital transformation. Source: CSMAR, Annual report, China Statistical Yearbook.
High Achievement	Dummy variable: 1 indicates high level digital achievement. Source: CSMAR, Annual report, China Statistical Yearbook.
High Application	Dummy variable: 1 indicates high level digital application. Source: CSMAR, Annual report, China Statistical Yearbook.
Turnover Ratio	Operating cost divided by ending inventory balance. Source: CSMAR.
IR	(-1) times inventory divided by revenue. Source: CSMAR.
Forecast Coverage	The quantity of reports that have tracked the company. Source: CSMAR.
CEO EduDegree	Dummy variable :1 indicates Master degree or above. Source: CSMAR.
CEO FinBackground	Dummy variable: 1 indicates a background in finance. Source: CSMAR.

Table 1. Sample distribution and summary statistics

This table presents the sample summary statistics. We report the number of observations, mean, standard deviations, and percentile distributions for all variables. The sample period is from 2010 to 2022, except for the corporate digitalization related variables (i.e., *High Digitalization, High Achievement, and High Application*), which cover a shorter time span from 2018-2022. The detailed variable definition can be found in Appendix A.

Variable	N	Mean	Std Dev	P25	P50	P75
Leanness	8801	-0.001	0.880	-0.504	-0.015	0.472
Overconfidence	8801	0.193	0.395	0	0	0
Firm-level control variables						
Firm Size	8801	22.373	1.338	21.461	22.289	23.217
Leverage	8801	0.527	0.216	0.366	0.533	0.687
PPE	8801	0.054	0.063	0.013	0.029	0.067
Cash Holding	8801	0.129	0.104	0.053	0.101	0.172
ROA	8801	0.006	0.080	-0.015	0.014	0.044
SG&A	8801	0.198	0.161	0.086	0.145	0.246
SOE	8801	0.492	0.500	0	0	1
Corporate governance						
Board Size	8801	2.133	0.194	1.946	2.197	2.197
Female Ratio	8801	0.144	0.124	0	0.111	0.222
Independent Ratio	8801	0.374	0.050	0.333	0.364	0.429
Supervisor Size	8801	1.267	0.254	1.099	1.099	1.609
Owner Concentration	8801	0.136	0.106	0.058	0.102	0.185
CEO characteristics control						
CEO Age	8801	49.686	6.439	45	50	54
CEO Duality	8801	0.203	0.402	0	0	0
Total Salary	8801	13.336	0.860	12.794	13.335	13.86
CEO Gender	8801	0.064	0.244	0	0	0
Variables for other tests						
High Digitalization	4757	0.483	0.500	0	0	1
High Achievement	4757	0.308	0.462	0	0	1
High Application	4757	0.339	0.473	0	0	1
Turnover Ratio	8747	1.39	1.350	0.666	1.444	2.167
IR	8748	-0.423	0.687	-0.368	-0.181	-0.092
Forecast Coverage	4593	17.128	25.515	2	7	21
CEO EduDegree	6265	0.549	0.498	0	1	1
CEO FinBackground	8801	0.071	0.256	0	0	0

Table 2. CEO overconfidence and inventory management

This table reports the baseline regression results of the impact of CEO overconfidence on firm inventory management efficiency. *Overconfidence* is the measure of CEO overconfidence, defined as a dummy variable where 1 indicates the presence of overconfidence by the CEO in that year. *Leanness* represents the firm's inventory management efficiency, which is the unexplained spread of inventory over sales. Column (1) presents the basic regression model including only firm-level control variables. Column (2) incorporates additional corporate governance-related variables. Column (3) is our complete baseline specification, which includes the full set of control variables and fixed effects for industry and year. The detailed definitions of variables are found in Appendix A. The t-statistics in parentheses are based on standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1) Basic	(2) +Governance Controls	(3) Baseline
Overconfidence	0.075***	0.074***	0.079***
	(3.152)	(3.110)	(3.326)
Firm Size	-0.153***	-0.157***	-0.166***
	(-17.310)	(-16.961)	(-16.718)
Leverage	0.043	0.052	0.057
	(0.756)	(0.916)	(1.000)
PPE	0.964***	0.951***	0.937***
	(5.360)	(5.286)	(5.214)
Cash Holding	1.241***	1.242***	1.227***
	(12.682)	(12.680)	(12.526)
ROA	0.980***	0.979***	0.922***
	(7.182)	(7.164)	(6.692)
SG&A	-1.078***	-1.070***	-1.063***
	(-15.147)	(-15.012)	(-14.911)
SOE	-0.054***	-0.056***	-0.054**
	(-2.652)	(-2.625)	(-2.494)
Board Size		0.016	0.007
		(0.272)	(0.110)
Female Ratio		-0.294***	-0.289***
		(-3.873)	(-3.704)
Independent Ratio		0.178	0.216
		(0.816)	(0.991)
Supervisor Size		-0.078*	-0.075*
		(-1.943)	(-1.863)
Owner Concentration		0.143	0.147
		(1.478)	(1.520)
CEO Age			-0.004**
			(-2.526)
CEO Duality			-0.065***
			(-2.716)
Total Salary			0.042***
			(3.167)
CEO Gender			0.017
			(0.451)
Year FEs	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes
Observations	8,801	8,801	8,801
Adjusted R^2	0.102	0.103	0.105

Table 3. Robustness Checks

This table reports a set of robustness checks on the impact of CEO overconfidence on firm inventory management efficiency. Panel A employs alternative measures to capture CEO overconfidence: one based on CEO salary relative to other top executives, where overconfidence is indicated when the CEO's salary as a ratio to the top three executives' compensation exceeds the ratio of the top three to the top ten executives' salary; and another using quarterly data, where the CEO is considered overconfident for the entire year if overconfidence is observed in any quarter. Panel B utilizes alternative proxies for inventory management efficiency: the inventory turnover ratio (*Turnover ratio*) and the ratio of inventory to revenue (*IR*), serving as substitutes for the original inventory management efficiency measure. Panel C presents the results from more stringent fixed effects models, incorporating CEO overconfidence scores and lagged control variables. Industry fixed effects and year fixed effects are applied across all regressions, with the exception of Panel C Column (1). The t-statistics in parentheses are based on robust standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. The detailed variable definitions are listed in Appendix A.

Panel A: Alternative CEO overconfidence construction

	(1) Salary	(2) Quarterly data
Overconfidence	0.082** (1.997)	0.057** (2.557)
Baseline controls	Yes	Yes
Year FEs	Yes	Yes
Industry FEs	Yes	Yes
Observations	8,801	8,801
Adjusted R^2	0.105	0.105

Panel B: Alternative inventory management efficiency construction

	(1) Turnover ratio	(2) IR
Overconfidence	0.071** (2.527)	0.033** (2.494)
Baseline controls	Yes	Yes
Year FEs	Yes	Yes
Industry FEs	Yes	Yes
Observations	8,747	8,748
Adjusted R^2	0.461	0.552

Panel C: Alternative fixed effect specification and Lead-lag regression specification

	(1)	(2)
Overconfidence	0.032* (1.712)	
Overconfidence (t-1)		0.061** (2.372)
Baseline controls	Yes	Yes
Year FEs	Yes	Yes
Industry FEs	No	Yes
Firm FEs	Yes	No
Observations	8,448	7,588
Adjusted R^2	0.611	0.088

Table 4. Propensity score matching

This table reports the results of a propensity score matching (PSM) approach. To balance the observed differences in covariates between firms with overconfident and not overconfident CEOs, we divide our sample into treatment and control groups, based on the 1 and 0 in *Overconfidence*. We match firms in the treatment and control groups based on the control variables in regression Eq. (1). We adopt the nearest neighbor matching without replacement and require a caliper width of 0.0001. Panel A reports diagnostic statistics for the differences in covariates using t-tests. Panel B reports the regression results based on the propensity score matched sample. The detailed definitions of all variables are in Appendix A. The t-values and z-values reported in parentheses are based on standard errors. ***, **, and * denote statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

Panel A: Diagnostics statistics – differences in firm characteristics

	Pre-match				Post-match			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Control	Treatment	Diff.	T-stat.	Control	Treatment	Diff	T-stat.
Firm Size	22.412	22.210	-0.202***	-5.61	22.270	22.330	0.060	1.17
Leverage	0.518	0.563	0.045***	7.65	0.542	0.539	-0.003	-0.39
PPE	0.052	0.063	0.011***	6.70	0.055	0.055	0.000	0.07
Cash Holding	0.134	0.110	-0.024***	-8.53	0.116	0.118	0.002	0.51
ROA	0.015	-0.033	-0.048***	-23.19	-0.002	-0.005	-0.003	-1.11
SG&A	0.190	0.227	0.037***	8.47	0.209	0.207	-0.002	-0.42
SOE	0.513	0.403	-0.110***	-8.17	0.447	0.456	0.009	0.51
Board Size	2.136	2.119	-0.017***	-3.15	2.124	2.128	0.004	0.58
Female Ratio	0.143	0.147	0.004	1.07	0.143	0.145	0.002	0.33
Independent Ratio	0.374	0.377	0.003**	2.06	0.376	0.375	-0.001	-0.32
Supervisor Size	1.272	1.246	-0.026***	-3.67	1.258	1.262	0.004	0.38
Owner Concentration	0.139	0.124	-0.015**	-5.24	0.130	0.133	0.003	0.68
CEO Age	49.723	49.530	-0.193	-1.11	49.535	49.458	-0.077	-0.31
CEO Duality	0.193	0.244	0.051***	4.71	0.230	0.214	-0.016	-0.97
Total Salary	13.371	13.191	-0.180***	-7.76	13.209	13.237	0.028	0.84
CEO Gender	0.066	0.055	-0.011	-1.55	0.056	0.055	-0.001	-0.08

Panel B: Propensity score matching estimators

	Leanness
Overconfidence	0.088***
	(3.074)
Firm Size	-0.179***
	(-12.122)
Leverage	0.038
	(0.447)
PPE	1.015***
	(3.802)
Cash Holding	1.195***
	(7.997)
ROA	1.281***
	(4.998)
SG&A	-0.941***
	(-8.904)
SOE	-0.019
	(-0.582)
Board Size	0.020
	(0.231)
Female Ratio	-0.409***
	(-3.584)
Independent Ratio	-0.235
	(-0.725)
Supervisor Size	-0.078
	(-1.315)
Owner Concentration	0.237
	(1.617)
CEO Age	-0.000
	(-0.154)
CEO Duality	-0.075**
	(-2.142)
Total Salary	0.036*
	(1.829)
CEO Gender	0.052
	(0.842)
Year FEs	Yes
Industry FEs	Yes
Observations	4,075
Adjusted R^2	0.106

Table 5. Entropy balancing matching.

This table reports the results of an entropy balancing matching approach. To balance the observed differences in covariates between firms with overconfident and not overconfident CEOs, we divide our sample into treatment and control groups, based on the 1 and 0 in Overconfidence. We reweight the observations in the control group so that the mean, variance, and skewness of the covariates are the same between the treatment and control groups. Panel A reports the matching efficiency of Entropy balancing matching. Panel B reports the regression results based on the Entropy balancing sample. The detailed definitions of all variables are in Appendix A. The t-values reported in parentheses are based on standard errors. ***, **, and * denote statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

Panel A: Covariate balance

	Before matching						After-matching		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Treatment			Control			Control	
	Mean	Variance	Skewness	Mean	Variance	Skewness	Mean	Variance	Skewness
Firm Size	22.210	1.629	0.335	22.410	1.821	0.294	22.210	1.630	0.335
Leverage	0.563	0.052	-0.208	0.518	0.045	-0.071	0.563	0.052	-0.208
PPE	0.063	0.005	1.476	0.052	0.004	2.036	0.063	0.005	1.476
Cash Holding	0.110	0.010	1.687	0.134	0.011	1.461	0.110	0.010	1.686
ROA	-0.033	0.009	-1.143	0.015	0.005	-1.390	-0.033	0.009	-1.142
SG&A	0.227	0.031	1.191	0.190	0.025	1.610	0.227	0.031	1.191
SOE	0.403	0.241	0.394	0.513	0.250	-0.053	0.404	0.241	0.393
Board Size	2.119	0.037	-0.561	2.136	0.038	-0.533	2.119	0.037	-0.561
Female Ratio	0.147	0.016	0.637	0.143	0.015	0.637	0.147	0.016	0.637
Independent Ratio	0.377	0.002	0.868	0.374	0.002	1.030	0.377	0.002	0.868
Supervisor Size	1.246	0.060	1.229	1.271	0.065	0.978	1.246	0.060	1.229
Owner Concentration	0.124	0.010	1.500	0.139	0.011	1.295	0.124	0.010	1.500
CEO Age	49.530	47.070	-0.235	49.720	40.110	-0.191	49.530	47.070	-0.235
CEO Duality	0.244	0.185	1.193	0.193	0.156	1.558	0.244	0.185	1.192
Total Salary	13.190	0.710	0.083	13.370	0.742	0.034	13.190	0.711	0.083
CEO Gender	0.055	0.052	3.889	0.066	0.061	3.509	0.055	0.052	3.888

Panel B: Entropy balancing matching estimators

	Leanness
Overconfidence	0.087***
	(3.441)
Firm Size	-0.197***
	(-13.398)
Leverage	0.124
	(1.490)
PPE	0.587**
	(2.161)
Cash Holding	1.346***
	(8.233)
ROA	0.643***
	(3.343)
SG&A	-1.141***
	(-9.967)
SOE	-0.048
	(-1.602)
Board Size	-0.057
	(-0.646)
Female Ratio	-0.349***
	(-3.175)
Independent Ratio	0.080
	(0.270)
Supervisor Size	-0.085
	(-1.557)
Owner Concentration	0.293**
	(2.249)
CEO Age	-0.002
	(-1.109)
CEO Duality	-0.043
	(-1.334)
Total Salary	0.019
	(0.956)
CEO Gender	0.020
	(0.306)
Year FEs	Yes
Industry FEs	Yes
Observations	8,801
Adjusted R^2	0.132

Table 6. Instrumental variable method

This table reports the results of a two-stage least squares regression with an instrumental variable (IV). The IV is the degree of overconfidence in the city where the company is registered this year (*City Peer Overconfidence*). The detailed definitions of all variables are in Appendix A. The t-values reported in parentheses are based on standard errors. ***, **, and * denote statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

	First stage	Second stage
	(1)	(2)
	City Peer Overconfidence	Leanness
Instrumented Overconfidence		0.133***
		(2.794)
City Peer Overconfidence	0.067***	
	(53.550)	
Firm Size	-0.000	-0.166***
	(-0.116)	(-16.697)
Leverage	0.034	0.055
	(1.525)	(0.962)
PPE	-0.041	0.937***
	(-0.578)	(5.209)
Cash Holding	-0.123***	1.234***
	(-3.213)	(12.576)
ROA	-0.708***	0.979***
	(-13.233)	(6.777)
SG&A	0.002	-1.061***
	(0.082)	(-14.892)
SOE	-0.062***	-0.051**
	(-7.319)	(-2.317)
Board Size	0.015	0.005
	(0.629)	(0.089)
Female Ratio	0.006	-0.289***
	(0.212)	(-3.698)
Independent Ratio	0.095	0.209
	(1.116)	(0.962)
Supervisor Size	0.009	-0.074*
	(0.543)	(-1.847)
Owner Concentration	-0.024	0.146
	(-0.624)	(1.514)
CEO Age	0.001*	-0.004**
	(1.676)	(-2.540)
CEO Duality	0.014	-0.067***
	(1.450)	(-2.775)
Total Salary	-0.031***	0.043***
	(-5.890)	(3.244)
CEO Gender	-0.037**	0.019
	(-2.468)	(0.496)
Year FEs	Yes	Yes
Industry FEs	Yes	Yes
Observations	8,801	8,801
Adjusted R2	0.301	0.105

Table 7. The impact of corporate digitalization

This table reports the results on the impact of digital transformation on the relationship between CEO overconfidence and firm inventory management efficiency. *High Digitalization* is a dummy variable that equals 1 if a firm has undergone good digital transformation, defined as when a firm's corresponding indicator exceeds the industry mean for that year. *High Achievement* is a dummy variable that equals 1 if a firm has achieved good digital outcomes, defined similarly based on industry benchmarks. *High Application* is a dummy variable that equals 1 if a firm has good digital applications, also determined by comparison with the industry average. The regression analysis begins in 2018 due to limitations in the availability of raw data. The detailed definitions of variables are found in Appendix A. The t-statistics in parentheses are based on standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
Overconfidence	0.151***	0.122***	0.128***
	(3.291)	(3.139)	(3.224)
Overconfidence × High Digitalization	-0.149**		
	(-2.366)		
Overconfidence × High Achievement		-0.154**	
		(-2.232)	
Overconfidence × High Application			-0.158**
			(-2.348)
High Digitalization	0.036		
	(1.262)		
High Achievement		0.013	
		(0.396)	
High Application			0.061**
			(2.010)
Baseline Controls	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes
Observations	4,757	4,757	4,757
Adjusted R^2	0.100	0.099	0.100

Table 8. The impact of firm-level mediators

This table reports the results on whether the moderation effect of digital transformation still exists for different firm-level mediators. The results were measured in terms of the nature of corporate equity and the level leverage ratio. The detailed definitions of variables are found in Appendix A. The t-statistics in parentheses are based on standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Nature of corporate equity		Leverage ratio	
	State-owned	Non-state-owned	High leverage	Low leverage
Overconfidence	0.056	0.189***	0.084	0.209***
	(0.717)	(3.474)	(1.399)	(3.090)
Overconfidence × High Digitaliztion	0.009	-0.191**	-0.073	-0.223**
	(0.088)	(-2.527)	(-0.894)	(-2.355)
High Digitalization	0.036	0.043	-0.041	0.121***
	(0.851)	(1.143)	(-1.023)	(3.004)
Baseline Controls	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes
Observations	1,946	2,811	2,380	2,378
Adjusted R^2	0.169	0.160	0.181	0.112

Table 9. The impact of corporate governance quality

This table reports the results on whether the dampening effect of digital transformation still exists for different corporate governance mediators. The results were measured in terms of the proportion of female directors and the level of external analyst forecast coverage. The detailed definitions of variables are found in Appendix A. The t-statistics in parentheses are based on standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Female directors ratio		Forecast Coverage	
	High female	Low female	High coverage	Low coverage
Overconfidence	0.244***	0.034	0.216*	0.000
	(3.768)	(0.536)	(1.662)	(0.002)
Overconfidence × High Digitalization	-0.242***	-0.014	-0.380**	0.039
	(-2.695)	(-0.166)	(-2.429)	(0.295)
High Digitalization	0.119***	-0.049	0.058	-0.055
	(2.829)	(-1.276)	(1.149)	(-0.938)
Baseline Controls	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes
Observations	2,440	2,317	1,038	1,003
Adjusted R^2	0.126	0.136	0.180	0.171

Table 10. The impact of CEO characteristics

This table reports the results on whether the dampening effect of digital transformation still exists for different CEO characteristics mediators. The results were measured in terms of the CEO's educational degree and their work background. The detailed definitions of variables are found in Appendix A. The t-statistics in parentheses are based on standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Educational degree		Financial work background	
	High degree	Low degree	Yes	No
Overconfidence	0.120*	0.143*	-0.345	0.158***
	(1.666)	(1.959)	(-1.380)	(3.470)
Overconfidence × High Digitalization	0.022	-0.299***	0.720**	-0.198***
	(0.220)	(-2.923)	(2.264)	(-3.160)
High Digitalization	0.015	0.068	0.138	0.048*
	(0.349)	(1.440)	(0.959)	(1.648)
Baseline Controls	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes
Observations	2,061	1,575	299	4,376
Adjusted R^2	0.121	0.171	0.328	0.127

Table 11. The impact of COVID

This table explores the potential impact of COVID. We divide the full sample into pre-COVID period and post-COVID period and repeat the baseline test separately. Column (1) reports the result of pre-COVID subsample. Column (2) presents the result of post-COVID subsample. Industry fixed effects and year fixed effects are applied in all regressions. The t-statistics in parentheses are based on robust standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. The detailed variable definition is listed in Appendix A.

	(1) Pre-COVID	(2) Post-COVID
Overconfidence	0.080***	0.075**
	(2.665)	(1.986)
Baseline Controls	Yes	Yes
Year FEs	Yes	Yes
Industry FEs	Yes	Yes
Observations	5,471	3,327
Adjusted R^2	0.109	0.135